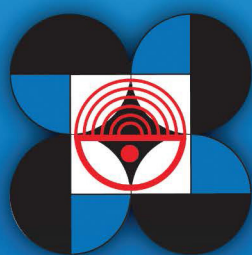


# **PHILIPPINE SCIENCE & TECHNOLOGY ABSTRACTS**



**SCIENCE AND TECHNOLOGY INFORMATION INSTITUTE  
INFORMATION RESOURCES AND ANALYSIS DIVISION**

**Department of Science and Technology  
Bicutan, Taguig City, Metro Manila  
Philippines**

**JUNE 2020**



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SCIENCE AND TECHNOLOGY INFORMATION INSTITUTE  
Department of Science and Technology  
Bicutan, Taguig City, Metro Manila  
Philippines**

**PSTA Production Team:**

**ALAN C. TAULE  
ARJAY C. ESCONDO  
MARIEVIC V. NARQUITA  
LOUELLA D. LABASBAS  
JEFRREY T. CENTENO**

# **PHILIPPINE SCIENCE AND TECHNOLOGY ABSTRACTS**

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**Agro-morphological characterization, evaluation, and cluster analysis of soybean (*Glycine max* (L.) Merrill) accessions grown under organic production system in La Trinidad, Benguet**

*Tandang, Leoncia L., Macyon, Danny T. Jr., Epie, Margie S*

The study conducted a cluster analysis of 14 soybean accessions to characterize and evaluate their agro-morphological characteristics, determine which soybean accession is most suitable to the organic production system in La Trinidad, Benguet. The 14 soybean accessions varied in qualitative characters except for growth pattern, wing opening, pod dehiscence, pod beak shape, and keel color. All accessions have determinate growth habit, intermediate wing opening, shattering pods, short beak, and pink keel. They also differed significantly in the 36 quantitative characters measured, except for number of days from sowing to emergence. They emerged at 8 days after planting. Bakun was the earliest to flower, set pods, and fill pod. Accessions 2008-05-12A, Tiwala 6, 2008-05-58, and 2008-01-05 were identified as the top yielders that can be grown under organic production system in La Trinidad, Benguet. A cluster analysis was conducted on the 14 accessions based on the 36 quantitative characters. Results showed that there were five distinct clusters. The existence of clusters with three or more accessions indicated high variation among clusters of the accessions, and had high similarities of accessions within a cluster. Clusters with single character and those with two or more characters were distinct from one another. Each cluster of accessions with distinct characters could be used as parents for the development of new improved varieties of soybean. (**Author's abstract**)

**Keywords:** *Glycine max, Characterization, Evaluation, Cluster analysis, Organic agriculture production system, Agriculture*

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**Agronomic and grain quality analysis of gamma irradiated rice (Var 'Azucena') at M4 Malabanan-Bauan, Katrina B. , Gentallan, Jr., Renerio P. , Magnaye, Ann Mylalulex A. , Borromeo, Teresita H., Hernandez, Rebe**

'Azucena' is an aromatic traditional rice variety with good eating quality, but has several undesirable traits for farmers, such as low tillering, tall plant height and low yield. Mutation breeding was conducted to improve the agronomic and yield traits of 'Azucena' while maintaining its outstanding grain characteristics. 'Azucena' seeds were irradiated using Cobalt60 at several radiation doses (150-350 Gy) at the Philippine Nuclear Research Institute. The mutated seeds (M1) were planted in the field at the Central Experiment Station-UPLB for agronomic evaluation and generation advance. Based on phenotypic acceptability, 50 out of 134 M4 lines were considered promising lines. These lines were subsequently characterized in terms of agronomic traits, yield, yield-related characteristics and physico-chemical grain qualities. The promising M4 lines generally had 32.78% shorter culm length, 31.62% shorter plant height, 38.96% more tillers, and 42.38% more productive tillers compared to the non-irradiated 'Azucena'. The M4 lines also had better yield characteristics than the original variety, having a mean of 89.67% more panicles per plant, 10.94% more spikelets per panicle, and 184.17% higher plot yield. The promising M4 lines maintained several of the grain characteristics of the original 'Azucena' variety, including its slender shape and soft texture of cooked grains, except for five lines with intermediate texture. However, only 44.68% of the lines had low amylose content (AC) and 36.17% had high gelatinization temperature (GT), similar to 'Azucena' grain quality. Moreover, 48.94% and 53.19% of the lines had intermediate AC and GT, respectively. Fifteen M4 lines exhibited improved agronomic and yield characteristics while retaining the grain quality of the original 'Azucena', indicating that mutation can be effective in improving traits of traditional rice varieties. (**Author's abstract**)

**Keywords:** *Rice, Azucena, Gamma irradiation, Mutation, Grain quality, Agriculture*



**Allelopathic implications of aqueous extracts of paper mulberry (*Broussonetia papyrifera* (L.) Vent) to the morphological and physiological growth of supa (*Sindora supa* Merr.)**  
*Combalicer, Marilyn S., Mardia, Lerma S.J., Luna, Amelita C., Critica, Ma.*

Allelopathy is a phenomenon in which a plant is able to deter or stimulate the growth of another through releasing organic toxic substances called allelochemicals. This phenomenon is often associated with exotic species, as it was regarded to be one of their enabling mechanisms in bioinvasion. In Mt. Makiling Forest Reserve, one of the most prominent introduced species is *Broussonetia papyrifera*. This experiment determined whether allelopathy is partially responsible for the success of *B. papyrifera* in invading natural stands. Allelopathic potentials of the species were determined through using laboratory bioassays. Leaf extracts were prepared at concentrations 10%, 15%, 20%, and 30%. Their effects on seed germination and elongation were observed on petri dish-grown seeds of *Sindora supa*. Their effects on the morphological growth and physiological processes were observed on four-month old seedlings of *S. supa* by exposing these to extracts for three months. Results showed that the extracts retarded seed germination, root length, and dry weight. Maximum inhibition was observed on the 30% treatment. Germination speed and coefficient of velocity of germination, on the other hand, were found to be insignificant. (Author's abstract)

**Keywords:** Allelopathy, *Broussonetia papyrifera*, Laboratory bioassays, *Sindora supa*, Agriculture

**Analysis of the relationship of weather variables on the potential yield of *Cocos nucifera* L. in Zamboanga City**  
*dela Cruz, Christopher, Reaño, Consorcia, Crisostomo, Speed*

The study aimed to determine the effects of several weather variables on coconut production in Zamboanga City to further understand the relationship between weather and potential yield of coconut. A total of 30 palms from each of the five experimental blocks (CATD, BAYT, LAGT, RIT and TAGT) in PCA-ZRC were selected. Nut production data were collected from 2015 to 2016 while historical weather data were obtained from PAGASA. Pearson correlation coefficients between nut production data and weather variables during inflorescence opening (12 months earlier) and male and female flower development (24 MP to data collection) were generated using SAS version 9.4. The highest and lowest mean potential yield was observed from TAGT (approx. 149 nuts) and CATD (approx. 75 nuts), respectively. At  $\alpha=5\%$ , high Rf at 12 MP was strongly associated with high NY (0.9348), whereas NDD was moderately negatively correlated (-0.7618) in TAGT. Contrasting results were obtained for the same variables at 24 MP, with high Rf strongly associated with low NY (-0.9151) and NDD strongly associated with high NY (0.9811). In addition, Tmin at 24 months was negatively correlated with NY (-0.702). NDD and Tmax 24 MP were significantly correlated with NY (-0.7927 and -0.7646, respectively) in BAYT. Rf and NDD 12 MP (0.8908 and -0.8881, respectively) and 24 MP (-0.8228 and 0.8920, respectively) were significantly correlated with LAGT NY. Results of this study could serve as basis to further understand the relationship between weather variables and coconut yield. Also, adaptive farm management techniques could be developed with the knowledge on the behavior of yield responses during weather variability 12 and 24 MP to harvest. (Author's abstract)

**Keywords:** Coconut, Correlation, Weather, Yield, Agriculture

**Analysis of the willingness to pay for charcoal briquettes of food establishments in Los, Banos, Laguna, 2018**  
*Lumanog, Johannah Ma*

This study was undertaken to analyze the willingness to pay for charcoal briquettes of food establishments and to provide recommendations that will increase the marketability of the product. Hence, increasing the demand for the briquetting technology.

Descriptive statistics, Chi-Square Test, Attribute Importance Rating Analysis, Satisfier-Dissatisfier Analysis, and Price Sensitivity Analysis were employed to analyze the data obtained from the surveys conducted through personal interview of 42 registered food establishments in the municipality of Los Baños, Laguna as of 2017.

Based on the results of the study, 59.5 percent of the respondents are willing to pay for charcoal briquettes; 7.1 percent will utilize the briquettes as a main fuel source of their business, 9.5 percent as an additional fuel source, and the rest of the 42.9 percent as an alternative fuel source. Their willingness to pay ranges from 15 to 80 PhP/kg, with a mean of PhP44.28/kg. However, most are willing to pay at PhP30/kg. Price Sensitivity Analysis, on the other hand, revealed that the acceptable price per kilo of charcoal briquettes ranges from PhP36.00 to PhP66.50 with indifferent and optimum prices per kilo at PhP43.00 and PhP55.00, respectively.

The respondents are more willing to pay for the product when briquettes are easier to handle, easier to ignite, emit higher intensity of heat, has manageable heat intensity, last longer, and has lower selling price. Product improvement, introduction of product complement, market penetration, and appropriate product positioning, promotion and pricing must be taken into account to increase the marketability of the charcoal briquettes.  
(Author's abstract)

**Keywords:** *Willingness, WTP, Charcoal, Briquettes, Biomass, Agriculture*

**Application of biochars derived from agricultural wastes: An ecologically sound technology that promises improvement of soil properties and crop productivity**  
*Bulfa, Jr., Arsenio, Villegas-Pangga, Gina, Lasam, Ann Nic*

World hunger statistics highlights the importance of technologies that can help attain food security. In recent years, biochar has been identified as a potential tool to increase agricultural productivity and enhance agriculture's resilience to the impacts of climate change. Biochar is not a fertilizer. It is useful as soil conditioner applied as an additive to nutrient sources like fertilizers.

A series of pot experiment was conducted in the field laboratory of Agricultural Systems Institute, U.P. Los Baños to evaluate the effects of fertilizers treated with biochars on soil properties and growth performance of corn. Two types of biochars: corn cobs and corn husks and their combinations with mineral and organic fertilizers were applied as treatments. Corn var Macho F1 was used as the test crop grown in an acidic clay loam soil (*Typic Eutrudepts*). The treatments used are as follows: T1 NPK mineral fertilizer alone; T2 organic fertilizer (OF) alone; T3 NPK+corn cob (CC) biochar; T4 NPK+corn husk (CH) biochar; T5 OF+CC biochar; T6 OF+CH biochar. Results showed significant positive changes in plant growth and development, and soil chemical properties when fertilizers were combined with biochar relative to sole fertilizer application. It was hypothesized that these changes

are due to the potential of biochar to reduce nutrient leaching and increase nutrient holding capacity of the soil. Corn cob and corn husk biochars complemented the fertilizer in increasing root and aboveground biomass, soil pH, soil organic matter, soil P and soil K concentration, and soil cation exchange capacity. Biochar is a technology that provides conditions suitable for crop improvement by providing necessary nutrients for growth, development and yield. **(Author's abstract)**

**Keywords:** *Agricultural wastes, Pyrolysis, Soil conditioner, Agriculture*

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0007

### **Application of citronella oil and two botanical extracts against major diseases on mungbean**

*Olmoges, Recelle A., Marin, Mellprie*

Mungbean is a drought-tolerant plant and has the capacity to fix and supply its own nitrogen. However, the plant still suffers from many diseases caused by both biotic and abiotic causes. Hence, a study was conducted to evaluate the effects of plant extracts on major diseases on mungbean as well as to assess the agronomic and yield performance of the crop. The study was laid out in Randomized Complete Block Design. The treatments were the following: T<sub>1</sub> (Control), T<sub>2</sub> (Kocide-Chemical Check), T<sub>3</sub> (Citronella Oil), T<sub>4</sub> (Lemongrass) and T<sub>5</sub> (Lagundi). The foliar application of the plant extracts was done at 14 days after planting (DAP) and at two weeks interval thereafter. An emulsifier was added to citronella oil.

There were four diseases observed and assessed namely: leaf spot, anthracnose, powdery mildew and virus-like disease. Results of the study showed that the application of lagundi extract (T<sub>5</sub>) on mungbean plants significantly influenced the percent severity of *Cercospora* leaf spot (*Cercospora canescens*) at 49 DAP with a mean of 29.26% which is comparable to Kocide at 22.59%. On the other hand, application of Citronella (T<sub>3</sub>), Lemongrass (T<sub>4</sub>) and Lagundi (T<sub>5</sub>) did not significantly affect the severity of the other diseases observed and assessed. Furthermore, the application of the different plant extracts significantly influenced plot yield (kg/plot) and the adjusted yield (ton/ha) of mungbean. Plants applied with lemongrass (T<sub>4</sub>) had comparable effect with plants sprayed with Kocide obtaining a mean plot yield of 0.20 kg/plot and 0.27 kg/plot, respectively. Similarly, plants treated with Kocide obtained the highest adjusted yield at 0.18 ton/ha but was comparable to lemongrass (T<sub>4</sub>) at 0.14 ton/ha and showed the capacity to assist plants in obtaining higher crop yield. **(Author's abstract)**

**Keywords:** *Plant extracts, Diseases, Mungbean, Cercospora canescens, Agriculture*

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0008

### **Application of potassium on sweet corn for the management of major diseases**

*Pagutayao, Kenneth S., Marin, Mellprie*

With the aim of improving the quality of local sweet corn, this study attempted to identify the optimal level of potassium fertilization on a hybrid sweet corn variety while at the same time assessing its effects on major diseases of sweet corn. Six experimental levels of potassium (65-85-0, 65-85-42.50, 65-85-63.75, 65-85-85 as recommended rate, 65-85-127.50 and 65-85-148.75) were implemented in a Randomized Complete Block Design experiment. Analysis of variance revealed no significant difference among treatment means in terms of percentage disease severity in sweet corn, however, assessments show high severity ratings on leaf spot (*Curvularia* sp.) in T<sub>4</sub> (65-85-85.00) with 61.08%, leaf rust (*Puccinia* sp.) in T<sub>2</sub> (65-85-42.50) with 29.62%, brown spot (*Physoderma*

sp.) in T<sub>2</sub> (65-85-42.50) with 45.71% and leaf blight (*Bipolaris* sp.) in T<sub>3</sub> (65-85-63.75) with 55.38% during the last rating period (70 DAP).

Analysis of variance revealed that length of husked ears as well as Total Soluble Solids (TSS) were significantly affected by the application of different levels of potassium. Highest value for ear length was obtained in T<sub>5</sub> (65-85-127.50) with a mean of 28.22 cm while for TSS, the sweetest corn was recorded from T<sub>2</sub> (65-85-42.50) with a mean of 15.20° Brix. Throughout this experiment, the observed non-variability of mean values on most of the parameters can be attributed to the fact that there was one variety used in this experiment.

However, based on these findings, it is recommended that a similar experiment be conducted that will implement more rates of potassium fertilization to really dissect the effects of potassium on TSS as well as on deriving a more conclusive trend that will show the optimum level of potassium fertilization. (Author's abstract)

**Keywords:** Potassium, Total Soluble Solids, Sweet corn, Diseases, Agriculture

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0009

### **Assessment of selected Philippine maize variety (CGUARD N39) for high starch as an alternative to rice-corn blend**

**Laude, Tonette P. , Sumaoi, Joshua Daniel F. , Ardales, Gregorio Y. Jr. , Ledesma, Jamella Michaela Ezra S. , Ching, Julliana Maxine I. , Purificacion, Marynold V., Beltran, Ayn Kristina M**

In 2008, the Institute of Plant Breeding introduced rice-corn blend using an improved maize variety. The Department of Agriculture recently launched the rice-corn blend to gradually reduce rice importation in the country. Maize in the Philippines is genetically diverse and commercially available. Thus, high nutritive value can be easily explored and improved in corn. A farmer's collected variety, CGUARD N39, was observed to have a high-starch value and can be an alternative maize variety to blend with rice. The CGUARD N39 was improved through full-sib recurrent selection to increase the favorable alleles including starch. The starch content of improved (Cycle 1) and original (Cycle 0) population of CGUARD N39 were compared to see if the nutritional value of Cycle 1 has been improved. The results showed that Cycle 1 had a higher average total starch content (Cycle 0: 82.67%; Cycle 1: 89.62%) than Cycle 0. The proximate compositions of Cycle 0 and Cycle 1 were also compared. The results showed that Cycle 1 had a higher average crude fat (Cycle 0: 6.60%, Cycle 1: 8.71%); higher average crude fiber (Cycle 0: 2.70%, Cycle 1: 2.88%); and higher average crude protein percentage (Cycle 0: 10.43%, Cycle 1: 12.90%). The total ash content of Cycles 0 and 1 were both 0.60%. Overall, the nutritional value of CGUARD N39 improved after one cycle. Continued cycles of selection can be conducted until the desired gain from recurrent selection is achieved. Ultimately, improved CGUARD N39 would increase crop productivity and quality and would make it a good alternative to rice-corn blend. (Author's abstract)

**Keywords:** Philippine maize variety, High starch maize, Rice-corn blend, Proximate components, Agriculture

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0010

### **Assessment of the garlic production in Luzon, Philippines**

**Morales, Carlos, Recuenca, Monalisa, Bandojo, Glecya, Javier, Michelle, Mondoñedo, Melinda, Tepper, Lorna, Adorada**



The Philippine garlic industry has been declining for several years now. This study was done to assess the current condition of the different garlic-producing areas in Luzon and to identify the possible reasons for decreasing volume of production and area planted with garlic. The respondents for the study were garlic farmers from 17 municipalities/cities of Regions 1, 2, 3, and 4A. Results showed that extreme weather conditions, pest and diseases, and the market for locally produced garlic are the most commonly encountered problems that garlic farmers across the regions encounter. Continuous heavy rainfall during the planting season caused extreme damage to the crop (cited by 48% of the respondents). Also, infestation of different field and storage pests and diseases of garlic resulted in lower yield (cited by 38% of the respondents). Furthermore, the market for garlic is highly competitive due to the imported garlic varieties that are cheaper than locally produced garlic (cited by 33% of the respondents). Due to these conditions, farmers who used to plant garlic have switched to other crops such as squash. In other cases, they have chosen to sell their garlic as chives as this requires less input, and thus making it more profitable than producing bulbs as experienced in Batangas. (Author's abstract)

**Keywords:** *Garlic production, Luzon, Agriculture*

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0011

### ***Bacillus subtilis* for the control of damping-off on cavendish banana plantlets**

*Jariol, Rafael Jims C., Marin, Mellprie*

The Cavendish banana is a widely grown commercial cultivar and due to tremendous expansion of new areas for planting bananas, tissue culture laboratories also doubled in number to produce seedlings for massive planting. However, damping-off of plantlets caused increasing mortality to the seedlings. Hence, a study was conducted to assess the effectiveness of varying levels of *Bacillus subtilis* in controlling damping-off organisms on Cavendish plantlets. The experiment was laid out using Completely Randomized Design (CRD) with seven treatments replicated four times. The treatments were: T<sub>1</sub>- Untreated, T<sub>2</sub>-Thiophanate methyl, T<sub>3</sub> - 1ml/L of *B. subtilis*, T<sub>4</sub> - 2ml/L of *B. subtilis*, T<sub>5</sub> - 3ml/L of *B. subtilis*, T<sub>6</sub> - 4ml/L of *B. subtilis* and T<sub>7</sub> - 5ml/L of *B. subtilis*. The plantlets were dipped into the prepared *B. subtilis* suspensions before planting on sterile coir dust. Subsequent applications were done through drenching on the growing plantlets.

Results showed that the application of *B. subtilis* at higher concentrations of 4 and 5ml/L resulted to lowest percent incidence of damping-off of 2.25% and 1.50%, respectively at 15 DAP. There were four fungal pathogens identified as causal agents, namely: *Fusarium* sp., *Nigrospora* sp., *Aspergillus* sp. and *Penicillium* sp. Plantlets treated with 4ml of *B. subtilis* were the tallest at 6.61 cm. Those treated with 2 ml of *B. subtilis* had the longest roots at 45.20 cm, while those applied with 3 ml of *B. subtilis* had the heaviest roots at 40.15 g.

With these results, it was evident that the application of *Bacillus subtilis* on Cavendish banana positively influenced the growth of the plantlets and had a positive effect on the reduction of damping-off incidence. (Author's abstract)

**Keywords:** *Bacillus subtilis, Cavendish banana, Damping-off, Fusarium sp., Nigrospora sp., Aspergillus sp., Penicillium sp., Agriculture*

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0012

### **Biocontrol activity of foliar endophytic microbiome from balatinao black rice against**

***Xanthomonas oryzae***

*Indong, Rocel Amor, Samia, Geanne Samantha, Belino,*

Bacterial leaf streak, caused by *Xanthomonas oryzae* pv. *oryzicola*, is one of the most damaging rice diseases in Asia. Recent studies showed that endophytic bacteria from healthy rice leaves can act as biocontrol agents against *X. oryzae*, but there is little information regarding the biocontrol potential of microbes in Philippine varieties of black rice. This study explored the antagonistic potential of foliar-associated microbiome of the Cordilleran *Balatinao* cultivar. Using dual culture method and volatile organic compounds (VOCs) assay, fungal and bacterial residents from the leaf of the plant sample were tested against *X. oryzae*. Results showed that 10 bacterial isolates and 15 fungal strains have antagonistic potential against *X. oryzae*. Results of dual culture method showed susceptibility of *X. oryzae* to *Bacillus safensis*, and 64.58% and 60.42% growth inhibition by *Penicillium oxalicum* and *Colletotrichum gloeosporioides*, respectively. VOCs assay result revealed 44.00—58.67% induced growth inhibition by *Bacillus indicus*, *Staphylococcus equorum* and *Staphylococcus saprophyticus*, and 58.67-69.33% growth inhibition induced by *Microdochium lycopodium*, and *Leptosphaerulina chartarum* (**Author's abstract**)

**Keywords:** Biocontrol activity, Bacterial leaf streak, Balatinao, Dual culture, *Xanthomonas oryzae*, *Bacillus indicus*, *Staphylococcus equorum*, *Staphylococcus saprophyticus*, Agriculture

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0013

### **Breeding strategy for genetic improvement of Philippine native corn populations for waterlogging tolerance**

*Salazar, Artemio, Heredia, Maria Cristina C., Ladia, Villamor, Paril, Jefferson, Laude, Tonette, Sanchez, Ma. Alma, Ocampo, Eureka Ter*

The native corn populations in the Philippines have adapted to different environmental stresses, one of which is waterlogging or flooding stress. Thus, native corn populations could have an armory of stress adaptation genes, which can be utilized in developing new varieties, hybrids, and inbred lines. In this study, 48 native corn populations were screened under flooded conditions; from these 15 populations, 5 colored and 10 white colored lines were selected using survival and yield as the basic criteria. These 15 lines were selfed resulting in S1 lines or populations. The first and second synthetic populations with waterlogging tolerance were generated through intermating (chain sibbing) the white and colored S1 lines, respectively. The seeds produced from the chain sibbing were balanced bulk and were planted in isolation to allow random mating. The ears produced from random mating comprised Cycle 1 of waterlogging tolerant half-sib synthetic populations (214 half-sib lines). Cycle 1 populations were then assessed under waterlogged conditions in two consecutive field trials, wherein it was shown that some lines can yield as much as 2–3 t ha<sup>-1</sup> under prolonged period of flooding. This population was submitted to the National Corn Trials for evaluation and for varietal recommendation for regions/areas that often experience flooding. Further improvement is recommended (Cycle 2) to create a more homogenous genetic pool with waterlogging tolerance. (**Author's abstract**)

**Keywords:** Native maize, Waterlogging tolerance, Synthetics, Inbred, Agriculture

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0014

### **Bulk storage system of Ilocos garlic**

*Bartolome, Sherwin B., Franco, Sam*

The bulk storage of garlic grown in the Ilocos has been always a problem because it cannot last long compared to the imported varieties that are grown in temperate countries. Technologies that have been developed have been for small applications of 50 to 100 kg in storage and these have been found to be very impractical.

A postharvest system has been developed for storing large volume of Ilocos garlic in bulk without the use of pesticides in relation to its photoperiodism characteristics. The technology developed start with the harvesting of the mature garlic from the field as indicated by the browning of the flag leaf. The garlic are then sun dried for not more than three (3 days). These are afterwards placed in a garlic curing barn of shed until the stalk reaches a moisture content of 14 to 15% (dry-basis).

The garlic was bundled by the hundreds and each bunch contained 10 bundles. Dried leaves of kakawate [*Gliricidia sepium* (Jacq. Kunth ex Walper)] and lagundi [*Vitex negundo* L.] of equal proportion at a rate of 30 to 35 kg per ton of garlic placed in the bulk storage repelled the insects and mites during storage. In the storage shed, a temperature of not more than 25°C and relative humidity of not more than 75% were maintained. These resulted to a garlic bulb deterioration of more than 10%. Ten months after the start of storage, the garlic bulbs started to germinate and then to deteriorate. A storage temperature of 10°C and below was observed to induce the pre-germination of the garlic cloves. (Author's abstract)

**Keywords:** *Garlic, Bulk storage, Temperature, Relative humidity, Agriculture*

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0015

### **Cassava yield improvement through site specific nutrient management**

*Oberthur, Thomas , Santos, Primitivo Jose A. , Descalsota, Jesse , delos Santos, Ernesto , Mateo, Nel Oliver B. , Pampolino, Mirasol , Luar, Lovely , Ocampo, Apolonio M., Ruazol, Ae*

Diverse traditional upland rice (TUR) is at risk of genetic erosion due to displacement by modern high-yielding varieties and government restrictions on slash-and-burn farming. Many traditional varieties possess favorable characteristics (e.g., good eating qualities, aroma, and pigment), which necessitate the conservation of their gene pool. The Mariano Marcos State University conserved 146 accessions ex situ, characterized them morphologically, and evaluated them agronomically. The third and last batch of evaluation was conducted in two consecutive years in 2015 and 2016 wet seasons in rainfed lowland areas of Batac, Ilocos Norte. It aimed to evaluate the agronomic performance and identify high-yielding varieties for cultivation in the rainfed lowlands. Seven accessions were selected based on their growth and yield performances. These include: TUR 123 (Duyduyan), TUR121 (Ginorot), TUR129 (Maliket), TUR116 (Balsamo), TUR111, TUR 134 and TUR 136 (Olandis), with yields ranging from 3.0 to 3.4 tha<sup>-1</sup>. Selected accessions outyielded the check variety NSIC 146 and surpassed the documented farmers' yield (2.2 tha<sup>-1</sup>) in the upland areas of Ilocos Norte. Aside from the genetic make-up of these accessions, weather conditions in each evaluation trial contributed to the differences in their growth and yield performance. They were tall, with medium tillering ability, medium panicles, medium to long maturing, and fertile spikelets. (Author's abstract)

**Keywords:** *Traditional upland rice, Agronomic evaluation, Conservation, Rainfed lowland areas, Agriculture*

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0016

### **Chemometric differentiation of local and imported aromatic rice (*Oryza sativa* L.) varieties by electronic nose**

*Sevilla, Fortunato B. III , Serafico, Mich*

Aromatic rice has gained greater popularity recent years, and has commanded higher costs in the market. Traditional and locally bred aromatic rice varieties are marketed or cultivated to cater to the demands of quality-conscious consumers for premium rice, which includes imported aromatic rices. To investigate the variation

between local and imported aromatic rice varieties, the volatile component patterns were monitored using an electronic nose measurements and chemometric data analysis. The headspace generated from separately weighed (2g) sample was injected into the electronic nose system via an autosampler. An array of 18 metal oxide sensors in the detection system detects with partial specificity the volatile compounds in the sample headspace. The sensors' responses were assessed by principal component analysis (PCA), and agglomerative hierarchical clustering (AHC). Visual patterns from the PCA prove that the electronic nose was able to precisely classify (95.59%) the samples into different varieties. Reducing the number of sensors based on the generated loading plot further improved the differentiation resulting in a total variation of 96.32%. On the other hand, AHC generated three separate clusters: Group I–Basmati; Group II–*Dinurado*, *Milagrosa*, and *Jasmine*; and Group III–NSIC Rc148 (*Mabango 2*), and NSIC Rc218 (*Mabango 3*). The result demonstrated that the electronic nose can be used to differentiate local and imported aromatic rice varieties based on the generated volatile compounds from the samples. **(Author's abstract)**

**Keywords:** *Aromatic rice, Volatile compounds, Electronic nose, Headspace, Chemometrics, Agriculture*

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2018/07,  
(Filipiniana Analytics)  
NP

0017

### ***Commelina diffusa* BURM. F.: a certified weed of rice under saturated condition**

*Alberto, Ronaldo T., Cabiao, Maria Niña S., Quilantang, Jaime R., Donayre, Dindo King*

*C. diffusa* is one of the major weeds in rainfed rice areas. Its negative effect on yield of rice is not yet known under Philippine condition. An experiment was conducted from Aug to Dec 2018 at the Dept. of Crop Protection, CLSU to a) determine the competitive ability of *C. diffusa* against rice under saturated condition, and b) compare its effects on yield of transplanted (TP) versus direct-seeded (DS) rice. A plastic pot, (25 x 20 cm WH) filled w/ 5 kg sterilized soil and planted with either 21-day old or 3-day old pre-germinated rice seed (NSIC Rc222), was the experimental unit of the study. TP or DS rice in each pot was allowed to grow with *C. diffusa* at 1:0, 1:1, 1:3, 1:5, and 1:7 ratios. Each ratio was replicated 5 times arranged in RCBD. Yield and yield components of rice were gathered and analyzed through ANOVA (STAR 2.0.1). Results showed that *C. diffusa* had no significant effects on height, leaves, tillers, and panicles of TP rice. But its presence at increasing population significantly reduced the shoot-dry weight (14.5-55.9%), number and weight of filled grains (7.1-23.7%, 3.4-15.3%) of TP rice. Number of empty grains significantly increased by 53.4 to 90.1%. Yield and all yield components of DS rice were significantly reduced. Reduction on number and weight of filled grains ranged from 6.7 to 60.2% and 4.5 to 25.6%, respectively. Increase in number of empty grains ranged from 71.1 to 92.5%. Mean weights of filled grains between TP rice and DS rice had no significant differences at all population levels of *C. diffusa* except at 1:7 ratio. The results of this study proved that *C. diffusa* is a very competitive weed against rice under saturated condition. Thus, control of this weed is highly recommended. **(Author's abstract)**

**Keywords:** *Commelina diffusa, COMDI, Commelinaceae, Agriculture*

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NP

0018

### **Comparative expression analysis of small intestine nutrient transporters sodium/glucose cotransporter 1 (*SGLT1*) and peptide transporter 1 (*PepT1*) between *Itik Pinas* (*Anas platyrhynchos* L.) and commercial layer chicken (*Gallus gallus domesticus*)**

*Bautista, Herald Nygel F., Adiova, Christine B., Sangel, Percival P., Pinca, Alexandri*



*Itik Pinas* (IP) is an improved breed of egg-type Philippine mallard duck (*Anas platyrhynchos* L.) that was developed to address the low egg production of the traditional mallard ducks. However, the improvement in genetic potential can only be realized if appropriate care and management—including feeding system—will be provided to the ducks. The energy and nutrient requirements of IP has yet to be established. Most IP raisers use commercial layer diets that are being formulated based on nutrient recommendations for chickens. However, differences in digestive physiology among poultry species might cause differences in their nutrient requirements. One way to better understand the digestive capacity and absorption efficiency of IP is to know the expression levels of nutrient transporter genes in their small intestine. Two nutrient transporters, specifically sodium/glucose cotransporter 1 (*SGLT1*) and peptide transporter 1 (*PepT1*), were analyzed from the small intestine of IP and were compared with those of layer chicken. Total RNA was independently isolated from the three main segments of the small intestine (*i.e.*, duodenum, jejunum, and ileum) of IP-*Kayumanggi* and commercial layer chicken (CLC). The relative mRNA expression levels of the target genes from each of the intestinal segment in IP- *Kayumanggi* were assessed using real-time quantitative polymerase chain reaction (RT-qPCR) and were compared to the respective relative mRNA expression levels of the target genes in CLC. Results showed that *SGLT1* has significantly higher relative mRNA expression levels in the three intestinal segments of IP-*Kayumanggi* compared to that in CLC. *SGLT1* levels in IP were greatest in the ileum and jejunum. *PepT1* relative mRNA expression levels in IP from the three intestinal segments, however, were shown to be comparable with that of CLC. Dissociation curve analysis showed a single peak, which validated the fidelity of the results. These novel findings suggest higher absorptive capacity of IP for monosaccharides, which may lead to higher energy value of feed ingredients for IP compared to CLC. Further studies must be conducted to determine the feeding value of feeds specific for IP. (**Author's abstract**)

**Keywords:** *Commercial layer chicken, Itik Pinas, SGLT1, PepT1, Pfaffl Method, real-time qPCR, Agriculture*

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Philippine Journal of Science, Volume No. 148 Issue No. 3, 433-439  
 2019/09,  
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 NP

0019

## **Comparative performance of commercial and formulated plywood adhesive with tobacco particles additive**

*Jimenez, Jr., Juan*

The study investigated the use of tobacco (*Nicotiana tabacum* L) stalk particles as an additive with extender, filler, formaldehyde scavenger and termite repellent properties in urea formaldehyde (UF) adhesive formulation used to bond *Paraserianthes falcataria* (L) Nielsen veneers into plywood. The effect of varying amount of tobacco stalk particles (4, 8 and 12%) on adhesive working properties, shear strength (SS), wood failure (WF), formaldehyde emission (FE) and termite resistance (TR) of 3-ply plywood was investigated and compared with commercial formulation of UF. Adhesive mix containing UF resin with tobacco stalk particles up to 8% by mass blended very well and remained stable for at least 1 hour. An increase in SS and WF up to 8% tobacco stalk loading was observed compared to plywood that used a commercial glue formulation. Based on SS and WF, panels containing 4-8% tobacco stalk particles would pass the requirements of PNS ISO 12466-2. Examination of adhesive penetration and plywood strength suggest that tobacco particles could function as both filler and extender. The 8% tobacco stalk loading reduced FE up to 11%. TR improved as evidenced by lower weight loss on samples with incorporated tobacco particles. Thus, tobacco stalk particles offer an environmentally friendly, low cost and strong 4-in-1 additive as an alternative to conventional fibers used in plywood production. (**Author's abstract**)

**Keywords:** *Extender, Filler, Formaldehyde, Termite resistance, Nicotine, Agriculture*

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 (Filipiniana Analytics)  
 NP

**A comparative study on the nutritive content of banana flesh and banana peel ice cream**  
*Larubis, Esmael , Medellada, Charles Roy , Gadiane, Jr., Alex , Angon, Jezzah Kris, Layna, J*

The primary purpose of the study was to assess the acceptability of banana peel ice cream in terms of its appearance, aroma, flavor and texture. The study chose a total of 50 respondents, represented by 50 Asian Cuisine Students. The data gathered were analyzed and the overall all average determined by using Tukey-HSD. The results showed that banana peel ice cream is extremely acceptable in terms of aroma, texture, appearance and flavor. Significant differences in their qualities were observed among the three ice cream samples. Among the samples, banana peel ice cream was the most acceptable to the respondents as a form of dessert. Most particularly, the pureed banana peel ice cream gained the highest interest from the respondents as based on its quality. The pureed inner banana peel ice cream with one cup pureed inner banana peel had the highest amount of potassium, dietary fiber and protein, with a percent increase of 21.43%, 94% and 208.59% respectively. Further, it had 38.54% lower carbohydrate content than the banana flesh ice cream. **(Author's abstract)**

**Keywords:** *Banana, Potassium, Nutritive content, Banana peel, Ice cream, Agriculture*

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 (Filipiniana Analytics)  
 NP

**Comparative yield trial of potato planting materials from aeroponics and conventional potato seed production**

*Kiswa, Cynthia , Gonzales, Ines , Lapoot, Carmelito , Abragan, Fe , Descalsota, Jonathan , Santos, Primitivo Jose , Descalsota,*

Despite the importance of potato as a crop in the Philippines, its production is not high due to limited production area, variety for lowland cultivation, and availability of vigorous planting material. Crop failure in most production areas is due to weak or contaminated planting material. Aeroponics potato seed production is a promising solution to address the need for vigorous and sufficient planting material. To determine the effectiveness of aeroponics-derived planting materials, this study conducted pot and greenhouse experiments using different planting methods. Minitubers from three varieties, namely, Granola, Atlantic, and Astra were grown in pots, whereas different planting materials of Granola were grown in a greenhouse. Yield from each experiment were determined and then compared. The pot experiment using the three varieties of minitubers showed no differences in the number of potato tubers obtained. Similar result was obtained in the greenhouse experiment. Tuber yield difference was attributed to the differences in variety. However, the average weights of the tubers obtained from micro- and mini-tuber were the heaviest, with 20.41g and 19.52g, respectively. This was followed by cutting, with 17.67g; and lastly, by conventional tuber with 12.96 g. With these results, it can be said that using aeroponics derived-planting materials in potato production produces more yield and have higher capacity to generate more tubers as planting materials than using conventional method. **(Author's abstract)**

**Keywords:** *Aeroponics, Conventional, Minitubers, Microtubers, Cuttings, Agriculture*

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 2018/07,  
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 NP

**Comparing mustasa (*Brassica juncea*), pechay (*Brassica rapa*), and hot peppers (*Capsicum frutescens*) growth on four hydroponics setup**

*Untalan-Dizon, Suzzeth , Fernandez, Ashley Zane B. , Castro, Lance A. , Sandoval, Judaeo B. , Ampuan, Charl M. , Verganio, Ble*

Researchers probed into the possibility of using sewage water and ‘hugas bigas’ as alternative nutrient sources for plants in a nutrient film technique hydroponics setup. The effects of experimental treatments UV-treated sewage water and ‘hugas bigas’ on the physical growth parameters – plant height, leaf width, leaf area, and number of true leaves – of mustard (*Brassica juncea*), pechay (*Brassica rapa*), and hot pepper (*Capsicum frutescens*) were compared to the effects of control treatments tap water and normal nutrient. Significant differences ( $\alpha=0.05$ ) were determined using T-test of two-independent means and Chi-square test for independence. Through uncommon patterns only observed under tap water and ‘hugas bigas’ growth rates, researchers found out that ‘hugas bigas’ was not suitable for hydroponics setups since its spoilage afflicts samples; and tap water does not sustain plant growth for long. Sewage, however, has comparable performance with the commercially available normal nutrient, as determined by various negligible differences in statistical tests’ results. (Author's abstract)

**Keywords:** *Hyonics, Hugas-bigas, Sewage, Growth parameters, Nutrient film technique, Agriculture*

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NP

0023

### **Decadal land use change dynamics in the City of Santa Rosa, Laguna, Philippines** *Tiburan, Jr., Cristino L. , Bato, Victorino A. , Ancog, Rico C. , Faustino Eslava, Decibel V. , Fucio, R*

Land use change analysis is an important approach to better understand global environmental changes. Rapid urbanization in rural areas is one of the major drivers of agricultural land conversion. Santa Rosa City in the province of Laguna has shown distinct changes in land use towards a more urbanized environment from being agricultural. In order to understand and quantify these land use changes, a Geographic Information System-based unsupervised classification of three Landsat satellite images taken in 1990, 2000 and 2016 was performed. The study quantified changes in agricultural areas and analyzed their impacts on the agricultural productivity of the city over the last 2 decades. Results show that 78% of agricultural lands have been converted to other uses from being the dominant land use type. Most conversions were towards residential developments. In 1990, residential areas covered only 18% of the city, but later increased to 49% by 2016. This change has resulted in a net decrease in rice production of the city from 34,440MT to 7840MT in a matter of 16 years. Additionally, about 21% of the original agricultural areas that have been allocated for other developments are currently idle. This quantitative data on land use and land use changes can be considered by the city government in planning for a more efficient use of their natural resources, particularly as a guide for land use appraisal, alternative land use plans, and in designing novel policies on optimizing the use of land resources while also moving towards sustainable urban development. (Author's abstract)

**Keywords:** *Geographic Information System, Remote sensing, Urbanization, Land use change, Agriculture*

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Transactions of the National Academy of Science and Technology, Volume No. 41 Issue No. 1, 13  
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NP

0024

### **Dediscovers the indigenous vegetable *Broussonetia luzonica* (Alokon) towards enhancing its potential for food and nutrition** *Galacgac, Evangeline S. , Utrera, Rodel T. , Antonio, Men*

*Broussonetia luzonica*, Family Moraceae, locally called alokon (Ilk.), himbabao (Tag.) or alibabag (Itawis), is a popular indigenous vegetable in the Ilocos Region as well as in Cagayan and Apayao. It is a wild and seasonal

vegetable, commanding high price of P200 to P500 per kilogram of inflorescence depending on the month of availability. Initial studies done on its components and biological activities proved its potential on health and nutrition. Literature on the crop is still limiting, and no variety has been identified nor formal production technology has been developed. Thus, this research documented the species' growth and developmental stages, and determined climatic/weather factors that affect growth and development. These information will serve as bases for possible interventions to induce/promote flowering, especially before and after the regular flowering period. Additionally, accessions/'varieties' with decided consumer appeal and acceptability and good flowering and flower characteristics were identified. To enhance its domestication and commercial production, propagation of planting materials and establishment of duplicate mother trees of selected 'varieties' at MMSU, and development of management technologies are recommended. **(Author's abstract)**

**Keywords:** *Broussonetia luzonica*, Growth and development, Phenology, Promising varieties, Good eating qualities, Agriculture

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 NP

0025

### **Detection of the endophytic colonization of *Lasiodiplodia theobromae* (Pat.) Griff. and Maubl., causal organism of stem end rot in "carabao" mango**

*Mendoza, Mary Joy , Dalisay, Teresita , Montecalvo, M*

Stem end rot (SER) is a postharvest disease problem that limits the quality and marketability of mango fruits. The preharvest infection of SER pathogen, *Lasiodiplodia theobromae* (Pat.) Griff. and Maubl., has not been studied in Carabao mango. This present study determined the endophytic colonization of the pathogen, which has implication on disease management. Fruit panicles were collected at harvesting stage from bearing mango trees in Laguna. Employing the isolation technique for endophytes, plant tissues were obtained aseptically from each panicle. Initial results suggested that the pathogen colonizes the panicle endophytically. *L. theobromae* was recovered from the base of panicle near the fruit and from the top of the panicle. Pathogenicity test of these isolates revealed typical symptom of SER disease. Fruits from these panicles were incubated and did not show SER symptoms at ripe stage. **(Author's abstract)**

**Keywords:** *Mango*, Stem end rot, Endophytic colonization, Agriculture

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 NP

0026

### **Development of microsatellite markers from sugarcane (*Saccharum officinarum* L.) Phil 97-3933**

*Relles, John Moises G., Laurena, Antonio C*

The efficiency of commercial farms can improve through the application of developed technologies such as microsatellite repeats or simple sequence repeats (SSRs) as genetic markers in plant species. This study developed sets of SSRs from Phil 97-3933 variety, a cultivar known to be highly resistant to sugarcane smut and downy mildew. For the library construction, genomic DNA of Phil 97-3933 was extracted and was digested using methyl-sensitive restriction enzymes *Pst*I and *Aat*II, with six base pair recognition sites. A total of 200 sequences were analyzed. Twenty-seven SSR primers were developed from sugarcane CV Phil 97-3933 using BatchPrimer3 (You *et al.* 2008). Results showed that SGS P20 had similar gene identity to *Saccharum* hybrid cultivar R570 clone BAC 227O17, while SGS P141 had similar gene identity to *S. officinarum* clone LA154P24. Other SSR primers that returned BLASTn similar gene identities were SGS P131 (*Sorghum* hypothetical protein), SGS P76 (*S.*



*officinarum* clone LA34B02), SGS P112 (*Saccharum* hybrid BAC 235G19), SGS P125 (*Sorghum* hypothetical protein), and SGS P139 (*Sorghum* voucher BTx623 locus pSB1123). The rest of the identified primers did not return any BLASTn result. The challenge in a sugarcane sequencing project is the size and complexity of its genome structure, which is highly polyploid and aneuploidy. The highly polymorphic nature of sugarcane represents another challenge. (Author's abstract)

**Keywords:** Sugarcane, Microsatellite markers, Genomic library, Agriculture

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NP

0027

### **Differences in root characteristics in mungbean (*Vigna radiata* L. Wilczek) subjected to water deficit**

*Ocampo, Eureka Teresa M., Reyes, Jose Ar*

A greenhouse study was conducted to identify root characteristics of mungbean under water deficit conditions that complement if not, form basis for drought tolerance. Seven mungbean drought tolerant genotypes consisting of 3 IPB Pag-asa varieties, 4 elite mungbean breeding lines, and susceptible check Pag-asa 19 were grown in PVC pipes (0.8 m height x 0.2 m diameter) filled with 20 kg soil. The experiment was laid out following a randomized complete block design with split-plot with 3 replications. The main plot was water regime, with the genotypes as subplot. The water deficit stress was imposed before flowering, 30 days after planting (DAP), by stopping irrigation for a week. One week after rewatering, whole plants were harvested. Roots were scanned and images analysed using root image analysis software, WinRHIZO™. Seed yield, SPAD and dry matter were also recorded.

Variation in the growth and development of the mungbean lines were observed under well-watered and water deficit treatments. Pag-asa 5, positive control variety, was observed to have highest total root length and root surface area with 4% and 7% significant increase respectively compared to the susceptible check Pag-asa 19. Similarly, Line15-5 and 16-37 were able to perform well over the other mungbean genotypes. In terms of root volume, significant differences were observed only between Pag-asa 19 and Pag-asa 3 with approximately 57% difference. A Pearson's correlation coefficient analysis correlated root parameters and different agronomic traits i.e. SPAD value, dry matter, leaf area and seed yield. Positive correlation between seed yield was observed with total root length ( $r = 0.643$ ), total root surface area ( $r = 0.419$ ), root dry matter ( $r = 0.626$ ), suggesting an important role that root growth and development have on drought tolerance in mungbean. Also, variation in these root characteristics can point to possible mechanisms that govern complex responses of crops to drought conditions. (Author's abstract)

**Keywords:** Drought, Mungbean, Root imaging, Root, Agriculture

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NP

0028

### **Differentiating *Ralstonia pseudosolanacearum* from *R. solanacearum* by combined morpho-cultural characterization and microscopy**

*Dela Cueva, Fe M., Tiongco, Rizalina L., Balendres, Mark Ang*

Potato bacterial wilt is caused by *Ralstonia pseudosolanacearum* and *R. solanacearum*. These two genomic species can be discriminated by using the Phylotyping scheme and by Biovar analysis. Differentiation of the two species by colony morphology is rarely reported and only by visualization of colony growth. The latter, relative to the first two methods, is simpler, less time-consuming and economical. This study shows that microscopic examination of colony morphology can be also used to discriminate potato isolates of *R. pseudosolanacearum*

from *R. solanacearum*. Visual observation of the colony in growth media was not sufficient to separate the two species. By examining individual colonies under 40X microscope magnification, colony characteristics of the two species were found distinct. Color and the ratio of the white and colored portion of the colony proved to be the two discriminating factors. The variations were observed in repeated tests conducted on reference isolates and in representative *Ralstonia* spp. collection. These results demonstrate how colony morphology examination, with microscopy, can still be used to identify species causing bacterial wilt in potato. This test may be used to partially screen large number of isolates, may be used alongside biovar analysis and may substitute the Phylotyping scheme for potato isolates. (**Author's abstract**)

**Keywords:** *Bacterial wilt, Phylotyping, Biovar analysis, Microscopy, Ralstonia pseudosolanacearum, R. solanacearum, Ralstonia spp., Agriculture*

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Transactions of the National Academy of Science and Technology, Volume No. 41 Issue No. 1, 43  
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NP

0029

### **Ecological engineering for a healthy upland rice ecosystem**

*Balleras, Gina D., Endonela, Leah*

Researchers are currently facing with the global challenges of increasing food security while at the same time taking climatic uncertainty that requires sustainable and resilient ecosystems, and a need to conserve or restore biodiversity and optimize ecosystem functions. Therefore, new directions in research are needed to create healthy rice ecosystems. Ecologically-based pest management methods like ecological engineering has recently emerged as a paradigm for sustainable and resilient upland rice ecosystems, but still unexplored due to limited on-farm research attention in this field. This paper presents a framework for a holistic approach to 'rice upland ecosystem health' in a local level geared at securing food production while protecting farmer and ecosystem health. An assessment was carried out using combined quality and qualitative data collected from a diverse vegetation patches (DVP), focus group discussion with stakeholders including officers of the Department of Agriculture (Philippines) and rice farmers. Results revealed that DVP had significant effects (50%) on the diversity and abundance of natural enemies, but lowers insect pest activity. Positive association was found among insect pests' species and their natural enemies' in terms of economic damage. DVP including action threshold, series of pest management evaluations, decision combined with indigenous management practices were remarkably effective in promoting population balance among families of insect pests and natural enemies. Furthermore, socio-economic profile, religious and cultural beliefs directly affect perceptions on ecologically-based pest management methods. Our results suggest that sustainable and resilient upland rice ecosystems could be developed using ecological engineering approaches that employ both vegetation strips and DVPs. (**Author's abstract**)

**Keywords:** *Ecological Engineering, Upland Rice Ecosystems, Natural Enemies, Rice insect Pests, Agriculture*

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Transactions of the National Academy of Science and Technology, Volume No. 41 Issue No. 1, 13  
2019 July,  
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NP

0030

### **Effect of different row spacing and fungicide application on the growth and yield performance of genetically modified corn**

*Simon, Samuel R., Quilang, Janet B., Silvestre, Mary Ann S., Villanueva, Dar*

The study was conducted to evaluate the effect of different row spacing and schedule of fungicide application on the growth and yield performance of genetically modified corn. The experiment was laid out using Split-plot Design with four replications using the following treatment combinations: Mainplot factor (row spacing): a1 – 70 cm x 20cm, a2 – 65cm x 20cm, and a3 – 60cm x 20cm, a4 – 40cm x 40cm x 100cm (double row); Subplot factor (schedule of fungicide application: b1 – No application (Control), b2 – 45 Days After Planting (DAP), b3 – 65

DAP, and b4 – 85 DAP. Among the four row spacing tested, crops planted with closer spacing performed better than those that are planted in wider spacing (a1) as it exhibited significant difference in grain filling, ear weight per plot, grain yield per plot and computed yield per hectare (tons/ha). There was no significant difference on the effect of the four schedules of fungicide application in almost all parameters except in the common corn rust infection rate and bacterial leaf and sheath blight. (Author's abstract)

**Keywords:** Row spacing, Fungicide application, Genetically modified corn, Agriculture

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NP

0031

### **Effect of long-term storage and host exposure on the aggressiveness and virulence of *Colletotrichum* spp. from chilli**

*Balendres, Mark Angelo O., Dela Cueva, Fe M., De Torres, Rach*

Anthrachnose is a threat to profitable chilli production in the Philippines. The disease, known to be caused by a number of species of *Colletotrichum*, causes sunken necrotic lesions, with concentric rings of acervuli, both on preharvest and postharvest conditions. In this study, we examined the effect of long term storage and host exposure to the aggressiveness and virulence of select *Colletotrichum* spp. isolated from chilli. Assays were done by using cultures stored for a year and stored for a week and inoculating them to chilli fruits var. Django. For the host exposure, we used reisolated (isolates previously inoculated to chilli) and 7-day old pathogens (from PDA) and inoculated them on the same chilli variety. Results showed that younger cultures (7-day old) are more aggressive and more virulent than the older ones (1-year old). Large to medium sized lesions on wounded and watersoaking symptoms on unwounded chilli fruits inoculated with the seven-day old cultures appeared two days after inoculation (DAI), while minute lesions on wounded chilli fruits inoculated with the 1-year old cultures were apparent only at three DAI. Concurrently, no symptoms on unwounded chilli fruits inoculated with 1-year old cultures were observed. Lesion lengths seven DAI were also significantly higher in fruits inoculated with the seven-day old cultures than those inoculated with one-year old cultures. On the other hand, observations from the experiment suggest that host exposure may not affect aggressiveness but may significantly affect virulence of the pathogen. Necrotic and watersoaked lesions were observed three DAI with both reisolated and 7-day old pathogens. However, lesion measurements seven DAI with the reisolated pathogens were significantly higher than those inoculated with the 7-day old pathogens. This study provides insights into the biology of *Colletotrichum* spp. as influenced by prior and post host-plant recognition. (Author's abstract)

**Keywords:** *Colletotrichum*, Aggressiveness, Virulence, *Colletotrichum* spp., Agriculture

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0032

### **Effect of mulching materials in the control of major pests and yield of solanaceous vegetables during the wet season**

*Legaspi, Noralyn B., Nalundasan, Mary*

This study conducted an experiment at the MMSU, Experimental Farm, Batac City during the wet seasons of 2012–2015 to investigate the effects of different mulching materials in controlling major pests and yield in solanaceous vegetables. Mulching materials like plastic mulch (PM), rice straw (RS), rice hull (RH), carbonized rice hull (CRH), sawdust (SD), and dried grasses (DG) (including unmulched [UM]) were used as treatments. Results showed that tomato plots mulched with RH, CRH, and SD, along with UM plants had the highest weed biomass. Using RS and DG as mulching materials were found to be effective in controlling weeds. However,

using PM was the most effective as it showed lesser weed biomass. The common pests observed were fruitworm, leaf curling, and leaf blight. The net return in growing tomato using different mulching materials was highest in plants with PM at PHP 390,350, with an average yield of 27.18 tha<sup>-1</sup>. This was followed by plants mulched with DG and RS. The least net returns were obtained from the UM plants and in plots mulched with SD, CRH, and RH. Eggplants mulched with plastic sheet had the least weed biomass collected in all evaluation trials. However, this was comparable with the plots mulched with RS, DG and RH. Unmulched plots of eggplant had the highest weed biomass, followed by plots with CRH and SD mulching materials. The net return in growing eggplant using different mulching materials was highest with the use of PM at PHP 243,300, with an average yield of 17.94 tha<sup>-1</sup>. This was followed by plants mulched with RS, DG, and RH. Unmulched plants and plants mulched with SD and CRH had the lowest net returns. (**Author's abstract**)

**Keywords:** *Tomato pests weed persistence, Mulching materials, Yield, Cost and return analysis, Agriculture*

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0033

### **Effect of pokkah boeng infection on the yield of local sugarcane varieties**

*Balendres, Mark Angelo O., Dela Cueva, Fe M., De Torres, Rachele L., Mendoza, Jay*

Pokkah Boeng is caused by various *Fusarium* species and was recently identified as an emerging disease of sugarcane. Several few studies have been conducted in the Philippines on the Pokkah boeng pathosystem, but the extent of damage caused by the disease has not yet been quantified. This study quantified the yield of 10 local sugarcane cultivars grown in the field that were naturally exposed to pokkah boeng. Yield parameters such as stalk height, stalk width, millable weight, sugar content and disease scores were gathered prior to harvesting, at 10 months after transplanting. Millable volume in liters was computed by using a modified equation by Lofton et al. 2012. Results show that infection decreased the volume of canes by at least 20%. ( $r=30$ ). Sugar content in grams was computed using a modified equation from Lingle et al. 2010. Results show that infection decreased the sugar content of the canes by at least 16% ( $r=30$ ). In conclusion, natural infection of pokkah boeng caused significant yield loss and is a possible threat to the sugarcane industry. (**Author's abstract**)

**Keywords:** *Sugarcane, Pokkah boeng, Yield loss, Fusarium sp., Agriculture*

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NP

0034

### **Effectiveness of predator control set-up for aquatic pest control in organic and conventional earthen ponds for extensive culture of *Penaeus monodon* (Fabricius, 1798)**

*Ledesma, Rene Geraldo Gu*

To control pest entry in *Penaeus monodon* earthen ponds, this study tested whether using a carnivore fish-based set-up would be more effective in reducing pest infiltration in an organically-prepared pond ("H") than using fine net barrier at the inlet gate of a conventional, control pond ("J"). To eliminate pests, estuarine water was diverted toward compartments that held 50 5-gram *Lates calcarifer* and 19 300–400-gram *Epinephelus coioides* before entering Pond "H". After 88 DOC, three pest categories were identified: (1) shrimp predators: *Megalops cyprinoides*; (2) opportunistic feeders: *Tilapia mossambicus*, *Chanos chanos*; and (3) benthic scavengers: *Cerithidea cingulata*. The set-up prevented smaller *T. mossambicus* from entering, but it was ineffective against the larger predators. Wet biomass of fish pests were 1.92kg and 2.12kg, while that of *C. cingulata* were 29kg and 80kg for Ponds "H" and "J", respectively. Shrimp harvest was reduced to 3.9kg in Pond "H" and 0.88kg in Pond "J". Shrimp length-frequencies obtained from 30% of the biomass revealed that the independent sample cohorts manifested negatively skewed population curves, having a common range of 111–120mm. Pond "H" had a smaller



skewness value (-10.68) than Pond "J" (-20.64). A significant t-value of -1.39 at  $p < 0.10$  and  $df_{18}$  at  $t_{90}$  indicates that organically-grown shrimps were larger than the controls. (**Author's abstract**)

**Keywords:** Earthen pond, Organic, *Penaeus monodon*, Predator control, Extensive, Agriculture

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0035

### **Effects of different soil media on the rooting and survival of anonang (*Cordia dichotoma* Forst) cuttings**

**Eggoy, Errol L. , Lacaden, Loreto Max P. , Peralta, Mary Jane A. , Vallesteros, Shierel F., Camat, Benson S.**

Anonang (*Cordia dichotoma* Forst) stem cuttings were rooted in five different soil media to determine survival and rooting performances. Significant differences among four rooting media came out. Treatment 4 (1:1:1 mixture of top soil, fine sand, and partly decomposed rice hull) had the highest mean survival of 47.5%. This was significantly higher than T2 (partly decomposed rice hull), T1 (top soil), and T3 (1:1 mixture of fine river sand and top soil) with a mean survival of 25%, 10%, and 5%, respectively. The results of the number of adventitious roots formed during the rooting period showed that there were no significant differences among the media used for rooting. Although T4 obtained the highest number of roots with a mean of 2.5, this was not significantly higher than the rest of the media used for rooting. As regards rooting, Treatment 4 resulted in longest roots with a mean length of 15.92cm. This was significantly different those from T2, T1, and T2, which had a mean length of 5.46 cm, 4.43 cm, and 2.28 cm, respectively. Among the five rooting media used in propagating Anonang cuttings, T4 was found to be the best medium in rooting stem cuttings. (**Author's abstract**)

**Keywords:** Anonang, *Cordia dichotoma*, Soil media, Agriculture

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0036

### **The effects of organic amendments on the incidence of major diseases and yield of three peanut genotypes**

**Saludaes, G**

Peanut is an important legume crop in many tropical and subtropical countries. However, farmers experience great losses in its production due to disease, and thus the need to undertake measures to control its incidence. This study investigated the effectiveness of different organic amendments applied on different peanut genotypes to resist major diseases in peanuts. The study was laid out in a split plot experiment arranged in Randomized Complete Block Design. The different peanut genotypes (i.e., NSIC Pn8, NSIC Pn9, and PSB Pn16) represented the main plot, whereas the different organic amendments (vermi compost, chicken manure, carbonized rice hull) represented the subplot. The three peanut genotypes showed different responses to leaf spot and leaf rust infection. Peanut genotype NSIC Pn9 consistently showed the least severity rating, whereas NSIC Pn8 recorded the least severity on leaf rust infection. The application of the different organic amendments on the different peanut genotypes failed to show any significant variations at 35–50 days after planting (DAP). However, significant difference was observed at 58–75 DAP. Peanuts grown in plots applied with vermi compost (B2) consistently recorded the least percent severity of leaf spot and leaf rust infection. Most of the yield parameters showed higher value when the plants were applied with organic amendments, specifically those applied with carbonized rice hull (B4). However, a comparable result was observed on the use of other organic amendments. (**Author's abstract**)

**Keywords:** Genotypes, Severity, Amendments, Parameters, Infection, Agriculture

## Effects of plant extracts on the severity of major foliar diseases on hybrid corn

Marin, Mellprie B. , Pableo, Lei-yon

The experiment was conducted at the Agricultural Experiment Center, Central Mindanao University, Musuan, Bukidnon to assess the effects of plant extracts on the severity of major foliar diseases on hybrid corn (Pioneer P3654YR) and to evaluate its influence on the agronomic characteristics and yield of the hybrid variety. Seven treatments were laid out in Randomized Complete Block Design with three replications: (Control), T<sub>2</sub> (Daconil), T<sub>3</sub> (*Piper betel* "buyo"), T<sub>4</sub> (*Tinospora cordifolia* "panyawan"), T<sub>5</sub> (*Anethum graveolens* "dill"), T<sub>6</sub> (*Morinda citrifolia* "noni"), and T<sub>7</sub> (*Ficus septica* "lagnob"). Results showed that applying different plant extracts on diseased corn significantly affected the percent severity of brown spot (*Physoderma* sp.) at 21, 35, 49, 63, and 91 days after planting (DAP). Moreover, the effect of the plant extracts on the severity of leaf blight (*Stenocarpella* sp.) at 21–77 DAP and of leaf spot (*Curvularia* sp.) at 91 DAP on T<sub>2</sub> (Daconil) was highly significant. T<sub>3</sub> (*P. betel*) showed comparable effects with T<sub>2</sub> (Daconil) on rust (*Puccinia* sp.). Agronomic and yield components were not significantly affected by the application of plant extracts; however, plots sprayed with T<sub>6</sub> (*M. citrifolia*) obtained the highest yield of 7,799.07 kg ha<sup>-1</sup> compared with that of T<sub>2</sub> (Daconil), with 7,441.86 kg ha<sup>-1</sup>. On the other hand, T<sub>4</sub> (*T. cordifolia*) gave the highest percent shelling recovery of 93.62% compared with that of T<sub>2</sub> (Daconil), which obtained 74.06%. The plant extracts used in this study have potential phytochemicals that can be used against foliar diseases of corn. (Author's abstract)

**Keywords:** Extracts, Percent severity, Foliar diseases, Agriculture

## Enhancing peanut production through innovative water management strategies

Bucao, Dionisio S. , Alibuyog, Nathaniel R. , Manzano, Jr., Virgilio Julius P., Utrera, Rodel

A study on enhancing peanut production through drip irrigation (DI) technology was conducted to increase the productivity and profitability of peanut production in the Ilocos region. To achieve this goal, irrigation management strategies suitable for peanut were developed. The study was able to generate and develop the best irrigation scheme for peanut (PN 9 variety) using drip irrigation technology through Decision Support System for Agro-technology Transfer (DSSAT) simulation and field validation. Three pilot test farms showcasing the DI technology was established in (1) Brgy. Bago, Vintar, Ilocos Norte, (2) MMSU, Batac, Ilocos Norte, and (3) Brgy. Lanna, Enrile, Cagayan. Using the DI scheme, dry pod yield increased from 1.59 MT ha<sup>-1</sup> to 2.09 MT ha<sup>-1</sup> (31.45%). This result is a little higher than the target increase in yield of 30%. On the other hand, water productivity was only increased by around 16% due to the limited water application of farmers. In terms of seed quality based on seed size, DI and farmer's practice (FP) were comparable. Based on the results of the economic analysis, the use of DI technology was profitable through yield improvement with a return on investment (ROI) of 0.25. Water savings was not a factor in profitability due to under-irrigation by farmers. (Author's abstract)

**Keywords:** Drip irrigation, Irrigation scheme, Water productivity, Water savings, Agriculture

## **Establishment of seed production areas/individual plus trees in the Province of Lanao Del Norte, Region 10**

*Garrido, Alfredo Jr., Calago, Jersa*

It is a national obligation to rehabilitate the seriously damage natural resources of the country, particularly denuded forests. All local government units are mandated to establish nurseries to produce planting materials in support of the National Greening Program of the government. The existing policy requires using only seeds from the identified seed sources. This study was conducted to determine the potential seed production areas in Lanao Del Norte province. A preliminary assessment of the deliberated possible areas was undertaken to determine the species that can be considered as seed sources. The identified species were graded, measured, tagged, and marked following the standard methods and systems. The clusters were delineated for boundary establishment, and silvicultural treatments were undertaken to the selected trees. Five clusters were identified and established to possess the requirements for seed sources: Cluster 1 in CENRO 1B-Kolambugan, with six plus trees; two clusters in Barangay Lapinig, both with Pedada (Perara) *Sonneratia caseolaris*, Kapatagan; Lawiga Datu, Magsaysay with two species; and Barangay Dalama, Tubod, with three plus trees species. Moreover, a total of 12 plus trees were identified in the province. These include Narra (Fabaceae), Molave (Verbenaceae), Katmon (Dilleniaceae), Big Leaf Mahogany (Meliaceae), Ipil (Fabaceae), Banuyo (Fabaceae), Pedada or Perara (*Sonneratiaceae*), Mangium (Fabaceae), Agoho del Monte (Casuarinaceae), Kamagong or Mabolo (Ebenaceae), Mangkono (Myrtaceae) and Olayan (Fagaceae). The established individual plus trees for Lanao Del Norte can be sources of seeds for industrial and mangrove rehabilitation, propagation of endangered and endemic species, and high-altitude reforestation. **(Author's abstract)**

**Keywords:** *Clusters, Plus trees, Reforestation, Rehabilitation, Agriculture*

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## **Evaluation of mungbean genotypes with tolerance to post-emergence wateloggng**

*Tanaka, Kristelle R , Delfin, Evelyn F. , Arcillas, Loise Sharmaine N., Enicola, Elmer*

A series of evaluation of mungbean *Vigna radiata* (L.) Wilczek) for post-emergence water flooding tolerance was conducted in the greenhouse of the Institute of Plant Breeding. Initially, 44 mungbean entries were subjected to flooding treatment at three weeks after sowing in styroboxes. The trial was laid out in a split-plot design with well-drained and flooded treatments as main plots and genotypes as subplots with 2 replications. During flooding, styroboxes were placed inside concrete tanks filled with water up to 5 cm above the soil surface. Water treatment was maintained for 1 week and allowed to drain for the recovery period. Plant survival, number of plants with aboveground roots and adventitious roots and SPAD chlorophyll measurement were evaluated at one week after the recovery period. Percent survival ranged from 28 to 90%, the highest survival rate was observed in PHL 12930. Not all entries formed adventitious roots, a unique response of plants subjected to flooded condition. Only PHL 14477 and PHL 6522 showed 100% of its plants with copious amount of root above the soil surface. SPAD-502 chlorophyll meter measurement showed significant interaction between water treatment and genotype. Twenty entries were selected for confirmatory screening with three replications and arranged in split-plot design. The selected entries varied significantly in terms of survival and percentage of plants within accession with roots formed above the soil surface. Survival rate ranged from 72 to 100%, with 9 germplasm accessions exhibiting 100% survival. Preliminary data on seed yield, showed an average yield reduction of 15%. The evaluation showed genotypic variability of mungbean grown under flooded condition which can be utilized in varietal development for flooding tolerance. **(Author's abstract)**

**Keywords:** *Mungbean, Flooding tolerance, Chlorophyll meter, Survival, Adventitious roots, Agriculture*

### **Evaluation of postharvest physiological deterioration and yield of different cassava (*Manihot esculenta* Crantz) genotypes**

*Lalusin, Antonio , Abustan, Mary Ann , Sazon, Luzviminda Ann , Crisostomo,*

Cassava (*Manihot esculenta* Crantz) is an important root crop that is widely grown in tropical countries for food, feed, biofuel and industrial uses. Postharvest physiological deterioration (PPD) is an endogenous phenomenon in fresh cassava roots that shortens its shelf-life and causes significant loss. The study aimed to evaluate 59 cassava germplasm collection from the Institute of Plant Breeding in UP Los Baños. The trial was conducted during the 2017-2018 cropping season and laid out in a randomized complete block design (RCBD) with 2 replications. At harvest (10 MAP), roots were assessed for yield and PPD using the protocol of Fukuda et al. (2010). Yield showed significant variation at  $\alpha=0.05$ . Each plant produced 0.55 to 4.15 kg of roots or 5.50 to 41.50 t/ha of fresh root. Twenty-nine out of 59 accessions had yield greater than or equal to 20 t/ha. Moreover, results revealed that PPD of the genotypes assessed ranged from 0 to 97%. Davao City 3, Malate Ubeh and PR-C312 showed no sign of PPD while 48 out of 59 genotypes showed less than 50% PPD level. The identification of cassava genotypes with high-yielding trait and tolerance to PPD suggests availability of breeding materials for yield and resistance to the postharvest problem of cassava. **(Author's abstract)**

**Keywords:** PPD, Yield, Germplasm, Postharvest, Agriculture

### **Evaluation of rice germplasm against brown planthopper (*Nilaparvata lugens* Stål) and green leafhopper (*Nephotettix virescens* Distant)**

*Duldulao, Malvin D. , Ferrer, Marilyn C. , Caguilat, Xavier Greg I. , Niones, Jonathan M. , Alfonso, Danny O., Santiago, Gilely*

Rice is an important staple worldwide. High impact on hunger results from rice production constraint caused by various biotic stresses. The use of resistant varieties is still one of the effective major solutions. However, there is scarcity in the source of resistance genes which slows the development of resistant varieties particularly against economically important insect pests that act as vectors for viruses leading up to 100% yield loss such as brown and green leafhoppers. The vast reservoir of rice accessions in Genebank could be a source of these resistances that could help accelerate the breeding for insect pests-resistant varieties. This study aims to evaluate rice germplasm against brown planthopper (BPH) and green leafhoppers (GLH) and determine possible sources of resistant genes against either or both pest. A total of 2055 traditional rice germplasm were evaluated against BPH and 2049 accessions against GLH. Thirty-two rice accessions showed moderately resistance to GLH while 843 had intermediate reaction while 66 showed resistant reaction and 892 had intermediate reaction to BPH. Notably, three accessions were moderately resistant to both BPH and GLH: "Saigon" (PRRI000039), "Bandera" (PRRI000040) and "Luding-luding" (PRRI000113). The evaluated accessions exhibited resistance to one or more insect pests would be recommended for further validation and could be utilized as source of resistance for the development of new resistant rice varieties. **(Author's abstract)**

**Keywords:** Brown planthopper, Evaluation, Genebank, Green leafhopper, Resistance, Rice, *Nilaparvata lugens* STÅL, *Nephotettix virescens* DISTANT, Agriculture

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### **Evaluation of rice germplasm against major diseases**

*TorreÃ±a, Pernalyn S. , Santiago, Nerissa D. , Rillon, Juliet P. , Guarin, Keith Marielle B. , Niones, Jonathan M. , Caguiat, Xavier Greg I. , Santiago, J*

Genebank is the national repository of diverse pool of rice germplasm collected from different parts of the country, particularly from the upland areas. These germplasms possess useful genes that serve as building blocks for the improvement of new rice varieties. Thus, this study was carried out to evaluate the PhilRice germplasm for resistance to four major rice diseases such as blast disease, rice tungro disease (RTD), bacterial leaf blight (BLB) and sheath blight (ShB). A total of 6,895 rice germplasm from the PhilRice Genebank were evaluated against major rice diseases in screen house and field at the Philippine Rice Research Institute, in wet seasons of 2012 to 2017 following the protocol and evaluation scale of Standard Evaluation System (SES). Results showed 23.81% recorded resistant reactions in terms of blast disease, 8.48% showed the resistance to BLB, 1% of rice germplasm showed resistance to RTD and one of the genotypes was resistant to Shb. Based on the results of the study, germplasms that were evaluated to be resistant against major rice diseases can be considered in the selection of donor or parent materials for breeding, as well as in the production of varieties that provide suitable performance in rice productivity. Validation of the results of the phenotypic data is highly recommended particularly on the aid of gene-specific markers and high-throughput phenotyping. Data from these evaluations would be incorporated in the database that could be available to interested researchers and breeders in the future. (Author's abstract)

**Keywords:** *Bacterial leaf blight, Rice blast, Sheath blight, Tungro disease, Viruliferous, Agriculture*

### **Evaluation of the agronomic performance of tradional upland rice varieties in rainfed lowland areas of Batac, Ilocos Norte**

*Antonio, Menisa A., Badar, Arac*

Diverse traditional upland rice (TUR) is at risk of genetic erosion due to displacement by modern high-yielding varieties and government restrictions on slash-and-burn farming. Many traditional varieties possess favorable characteristics (e.g., good eating qualities, aroma, and pigment), which necessitate the conservation of their genepool. The Mariano Marcos State University conserved 146 accessions ex situ, characterized them morphologically, and evaluated them agronomically. The third and last batch of evaluation was conducted in two consecutive years in 2015 and 2016 wet seasons in rainfed lowland areas of Batac, Ilocos Norte. It aimed to evaluate the agronomic performance and identify high-yielding varieties for cultivation in the rainfed lowlands. Seven accessions were selected based on their growth and yield performances. These include: TUR 123 (Duyduyan), TUR121 (Ginorot), TUR129 (Maliket), TUR116 (Balsamo), TUR111, TUR 134 and TUR 136 (Olandis), with yields ranging from 3.0 to 3.4 tha<sup>-1</sup>. Selected accessions outyielded the check variety NSIC 146 and surpassed the documented farmers' yield (2.2 tha<sup>-1</sup>) in the upland areas of Ilocos Norte. Aside from the genetic make-up of these accessions, weather conditions in each evaluation trial contributed to the differences in their growth and yield performance. They were tall, with medium tillering ability, medium panicles, medium to long maturing, and fertile spikelets. (Author's abstract)

**Keywords:** *Traditional upland rice, Agronomic evaluation, Conservation, Rainfed lowland areas, Agriculture*

**Extracts of makahiya lantana: Effective against bacterial leaf blight disease of rice**  
*Duca, Ma. Salome V., Nagaosa, Lena Q., Gaspar, Jerandel M., Donayre, Dindo King*

Bacterial leaf blight, caused by *Xanthomonas oryzae* pv. *oryzae*, is one of the major diseases of rice in the Philippines. Severe infections by the causal bacterium in susceptible rice plants, particularly at tillering stage, can lead to wilting and dying of young plants, which eventually result to yield reduction to more than 60%. The use of botanical plants has been long considered an alternative control against many diseases of rice. The use of makahiya (*Mimosa pudica* L.) and Lantana (*Lantana camara* L.) extracts against the bacterium causing bacterial leaf blight of rice, however, has never been known. A study was conducted at the screenhouse of the Crop Protection Division of Philippine Rice Research Institute Central Experiment Station, Maligaya, Science City of Muñoz, Nueva Ecija from June to July 2017 to determine the efficacy of ethanolic extracts of makahiya and lantana plants against bacterial leaf blight disease of rice. Treatments used were makahiya and lantana at 100 and 75% ethanolic extracts, respectively. Each test plant had positive control (Copper oxychloride) and negative control (Ethanol alone). Each treatment was sprayed after the symptoms appeared on previously-inoculated leaves of rice plants (Taichung Native 1). The experiment was arranged in Completely Randomized Design with five replications. Severity of bacterial leaf blight infections on leaves were measured using a grid method. All the data were subjected to one-way Analysis of Variance while treatment means were compared using the Least Significant Difference at 5% level of significance. Statistical analysis revealed that extracts of makahiya and lantana at 100 and 75% solutions effectively reduced the severity of bacterial leaf blight disease. Rice plants sprayed with the extracts had less area under disease progress curve (AUDPC) values than the negative control. Results suggest that extracts of makahiya and lantana have potentials as biopesticides against bacterial leaf blight disease of rice. (Author's abstract)

**Keywords:** Bacterial leaf blight, *Mimosa*, *Lantana*, *Xanthomonas oryzae*, *Xoo*, Agriculture

**Foliar endophytic fungi from diket red rice show biocontrol activity against bacterial leaf blight (BLB) and have polyketide synthase (PKS) genes**  
*Hipol, Roland, Tomas, Princess Ashley, Baluyot, Jobrielle, Viz,*

*Oryza sativa*, considered the most important food crop in the Philippines, is frequently attacked by phytopathogens such as *Xanthomonas oryzae*, which causes Bacterial Leaf Blight (BLB). Endophytic fungi have secondary metabolites that yield efficient drugs and, most importantly, possess agricultural potential. One of the known fungal metabolites is the polyketides. Polyketides or Polyketide synthase (PKS) are a class of secondary metabolites, which are known for their therapeutic and agricultural applications. In this study, the potential of ethyl acetate extracts from foliar endophytic fungi present in Diket red rice to produce bioactive antibacterial compound was determined through in vitro antimicrobial activity against *X. oryzae*. Also, the presence of PKS genes was determined using primer pairs KAF1/KAR1 that screened the Ketoacyl synthase (KS) domains, which is highly conserved sequences shared among all PKS. A total of 12 isolates were identified up to species level and belonged three genera: *Aspergillus*, *Penicillium*, and *Cladosporium*. Four isolates, namely, *Aspergillus spelaus*, *Penicillium steckii*, *Penicillium chrysogenum*, and *Cladosporium oxysporum* significantly reduced the OD 600 absorbances of *X. oryzae* broth cultures, which implies that these isolates had biocontrol activity. *C. oxysporum* obtained the highest antimicrobial activity. PKS genes were observed in six distinct strains. The four foliar endophytes with significant antimicrobial activity and PKS genes may be a source of bioactive compound for biocontrol of BLB in rice fields in the near future. (Author's abstract)

**Keywords:** *Endophytic fungi, Polyketide, BLB, Agriculture*

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0047

### **Fruit ripening behaviour of three PRSV-tolerant papaya varieties revealed by digital photometry and physico-chemical analyses**

*Magdalita, Pablito M. , de Jesus, Donna Trixia O., del Rosario, Ernesto J. , Serrano, Edralina*

The fruit ripening behavior of PRSV-tolerant papaya (*Carica papaya* L.) varieties ‘Pineras, ‘Cavite Special’ and ‘Cariflora’ was observed by determining the interaction of digital photometric and physico-chemical analyses. Papaya peel colors at different stages of maturity obtained from the digital camera were quantified using the Byers (2006) RGB analysis of Colors Software. The RGB (Red, Green, Blue) values are correlated with the physico-chemical parameters such as pulp firmness, total soluble solids (TSS), titratable acidity (TA) and total carbohydrates to determine if the changes in color are associated with fruit ripening. Statistical analysis showed that the R and G values of the fruit samples increased at increasing stages of maturity, confirming that RGB values of the papaya peel color can be used to predict the ripening of papaya harvested at the mature green stage, i.e. stage 1, without going through destructive analysis. Upon maturity, RGB values of mature and immature green fruits were compared to determine whether there is a difference in color. The RGB values are converted into Hue Saturation Lightness (HSL) to give more information on color based on another color space; the HSL. Results showed that R and G values of the RGB color space and the S and L of the HSL color space are significantly different for the mature and immature green fruits. Thus, it is confirmed that the RGB and HSL color spaces that correlated physico-chemical parameters such as pulp firmness, TSS, TA and total carbohydrates can be used to predict ripening behavior of papaya fruits harvested while they still at the mature green stage. This basic information are important in the postharvest of papaya to avoid rapid ripening and softening especially if they are intended for long distance transport. **(Author's abstract)**

**Keywords:** *Carica papaya L., HSL value, Physico-chemical, Postharvest, RGB values, Agriculture*

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0048

### **Garlic bulbils as alternative source of clean planting material in garlic seed production system**

*Gabriel, Maura Luisa S. , Cocson, Lucricia Conchita G. , Imbat, Resurreccion Bernadette C. , Badar, Araceli J. , Atis, Mari*

Garlic bulbils serve as an alternative source of clean planting materials in garlic production. Tissue culture technique was the common method used by many institutions, which has been successful. However, in 2014–2017, the Mariano Marcos State University identified and evaluated an alternative source of clean planting materials for garlic production. Experiments were conducted to evaluate the performance of bulbil under nursery and field conditions treated with different treatments for optimum growth and quality of garlic seed bulbs. Under nursery condition, G<sub>0</sub> garlic bulbils, spaced at either 3×3×5×5 cm, and 7×7 cm in plastic tray performed well and successfully produced G<sub>1</sub> single-cloved bulbs. A soil mixture of 2:1 ratio of carbonized rice hull (CRH) and organic fertilizer (OF), and 1:1:1 ratio of ordinary garden soil+ OF+CRH were the best media for growing G<sub>0</sub> bulbils and as the media produced multiple-cloved bulbs. G<sub>1</sub> bulbil-derived bulbs under field condition, when planted without fertilizer or with organic or inorganic fertilizers, produced yield of 6.70–7.05 tha<sup>-1</sup>. Plant spacing of 10 cm x 10 cm and 10 cm x 15 cm gave the highest yield of 5.53 and 5.06 tha<sup>-1</sup>, respectively. Bigger bulbs were produced as the distance of planting was wider; 91.19% extra large-sized bulbs were obtained from plants

spaced at 15 cm x 15 cm. Yield of G<sub>1</sub> bulbil-derived bulbs planted under field condition produced 7.07 tha<sup>-1</sup>. It was comparable with the yield obtained from G<sub>1</sub> tissue culture-derived bulbs as planting materials. G<sub>2</sub> bulbils are clean planting materials, which were able to provide 10–15 cloves per bulb. With these results, farmers can have alternative sources of planting materials. (**Author's abstract**)

**Keywords:** Clean planting materials, G<sub>0</sub> bulbil, G<sub>1</sub> bulbil derived bulbs, planting spacing, alternative source, Agriculture

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0049

### Genetic diversity analysis of selected sugarcane (*Saccharum* spp. hybrids) varieties using DArT-Seq technology

Bello, Erin B., Rasco, Jhun Laurence S., Sendon, Pamella Marie D., Dela Cueva, Fe M., Lalusin, Antonio G., Laurena, Antonio C

Sugarcane is an economically important crop grown for sugar and bioethanol. Most commercial varieties are hybrids of the noble cane *Saccharum officinarum* and its wild relative *S. spontaneum*. Sugarcane breeding in the Philippines is focused on the development of new varieties with higher sucrose content and resistance to major fungal diseases. Evaluation of parents for crossing depends on the knowledge of the genetic diversity of the available sugarcane germplasm. In this study, the genetic diversity of 54 local and foreign sugarcane varieties selected from the local germplasm was evaluated through genotyping-by-sequencing (GBS) using diversity arrays technology (DArT). Single nucleotide polymorphisms (SNPs) and silico-DArT (presence/absence) dominant markers were developed using DArT-Seq method, which employs genome complexity reduction method using methylation-sensitive restriction enzymes (REs) and high-throughput next-generation sequencing (NGS). Polymorphism information content (PIC) values of resulting SNP markers range from 0.009 to 0.5 with an average of 0.195, while Silico-DArT markers have PIC values from 0.02 to 0.5 with an average of 0.271. Silico-DArT markers were considered more informative based on higher average reproducibility, call rate, and PIC values. Cluster analysis and principal coordinate analysis using scoring data from SNP and silico-DArT markers showed low-sucrose varieties grouping separately from commercial hybrids developed in the Philippines. However, observed genetic distances among varieties genotyped indicate moderate to high genetic relatedness within the local germplasm, especially among commercially-available varieties in the country. DArT-Seq genotyping was successfully used in analysis of genetic diversity among current commercial varieties and can be a useful tool in the evaluation of new breeding materials for the development of more improved varieties. (**Author's abstract**)

**Keywords:** Diversity arrays technology, Genotyping-by-sequencing, silico-DArT, single nucleotide polymorphisms, sugarcane, Agriculture

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0050

### Genetic diversity of *Oryza* species in the Philippines

Alfonso, Danny O., Santiago, Jaec C., Ferrer, Marilyn C., Rañeses, Mary Ann M., Caguiat, Xavier Greg

Philippines is home of four wild rice species, namely: *Oryza officinalis*, *Oryza minuta*, *Oryza meyeriana* and *Oryza rufipogon*. Rice breeders used these wild rice relatives to draw genes needed to develop varieties that are resistant to pests and diseases and can adapt to adverse environments. This study was conducted to evaluate the genetic diversity of the three wild rice relatives (*O. minuta*, *O. meyeriana* and *O. rufipogon*) and 23 selected *Oryza sativa* species from the Philippines. Genetic diversity was determined using 14 highly polymorphic microsatellite SSR markers. Overall diversity among the entries observed was 42%. Polymorphism information content (PIC)



values ranged from 0.33 (RM24843) to 0.73 (RM19754) with an average of 0.51. The UPGMA cluster analysis grouped the 37 entries into three distinct clusters at 0.55 similarity coefficient. *O. minuta* and *O. meyeriana* were grouped in Cluster 1 showing that they are more closely related wild rice relatives in the Philippines. Moreover, 100% similarity was observed in *O. minuta* 8 and *O. minuta* 9. Cluster 2 composed of 16 *O. sativa* species wherein 100% similarity was observed between variety Ampipit (PhilC1) and Dicula (Phil4). Cluster 3 includes the other species of wild rice relatives specifically *Oryza rufipogon* together with the 7 other *O. sativa* species. The study showed variability of the 37 entries comprising wild rice relatives and *O. sativa* species that would be useful for varietal improvement. Information on the genetic variability at molecular level is suitable to identify, develop and acquire genetically unique germplasm. This study will benefit the plant breeders especially in breeding rice varieties that can combat biotic and abiotic stresses. (**Author's abstract**)

**Keywords:** Diversity, Genetic diversity, Rice, Wild rice relatives, Agriculture

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NP

0051

### **Genetic diversity of selected Philippine white corn germplasm**

*Diaz, Ma. Genaleen , Gregorio, Glenn , Saldares, Rica Amor, Laude, Tone*

To evaluate the genetic diversity of the germplasm, 143 Philippine white corn accessions collected across different regions of the country, which were obtained from the Institute of Plant Breeding- University of the Philippines Los Baños and East West Seed Company, were characterized for 11 morpho-agronomic traits. All traits except shelling percentage and grain moisture differed among accessions as per ANOVA. The hybrid check variety, P30W40 had the highest yield and had no significant difference from the ten accessions. Correlation analysis showed 37 significant associations. Days to anthesis and days to silking had the highest correlation ( $r=0.878$ ). Cluster analysis based on morpho-agronomic traits showed the grouping of all accessions collected from Mindanao which were tall and low yielding; high yielding accessions including the three commercial check varieties (P30W40, IPB Var 6 and IPB Var 8); and all the early-maturing glutinous accessions including USM Var 8. Maize is one of the most highly genetically and phenotypically diverse crops. These results can be utilized to identify genetic sources for further maize improvement. (**Author's abstract**)

**Keywords:** Genetic diversity, Morpho-agronomic traits, Philippine white corn germplasm, Agriculture

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0052

### **Genetic variation of selected Philippine rice varieties for VarMix technology**

*Celestino, Ma. Theresa F., dela Cruz, Arlen A. , Pacada, Imelda*

To date, no single varieties have the capacity to lessen the effect of biotic and abiotic stresses. Thus, this study evaluated the capability of using Varietal Mixture (VarMix) system to mitigate stresses. The strength of VarMix lies on its distinct genetic variation, and thus identifying diverse rice varieties is important to develop VarMix combination. A total of 36 Philippine inbred rice varieties were determined in this study using 42 polymorphic simple sequence repeats markers. A total of 128 alleles were detected, with an average of 3.05 alleles per locus. Cluster analysis was performed using the UPGMA method based on simple matching and Roger and Tanimoto (R and T) similarity coefficients. Two major clusters were identified, and the six selected varieties (i.e., PSB Rc82, NSIC Rc214, NSIC Rc216, NSIC Rc238, NSIC Rc298, and NSIC Rc300) formed distinct subgroupings. The subgroupings of these six varieties signify their genetic variation, in which their genetic similarity contributed to express more diversified functions to both above and below ground environment, thus, expressing mechanism for reducing disease intensity and increasing yield and yield stability. (**Author's abstract**)

**Keywords:** Genetic diversity, SSR markers, VarMix, UPGMA, Agriculture

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0053

### **Genotypic variation of VarMix root system under soil moisture fluctuation**

*Suralta, Roel, Pascua, Abegail, Pacada, Imeldaly*

The root system is the plant organ directly in contact with the soil; thus, it is the first line of defense for maintaining plant productivity under soil moisture fluctuation (SMF) condition. Varietal Mixture (VarMix) is a well-known approach for disease management. Previous studies have shown that aside from reducing disease incidence, it can also mitigate the negative effects of drought stress condition on yield. This study investigated the mechanisms involved from below ground environment that would scientifically explain why VarMix is comparable to, or even performs better than, its single variety. Thus, the study compared the root system development (RSD) and yield of rice between VarMix and single variety planted under SMF condition. Twelve VarMix combinations and its corresponding single varieties (i.e., NSIC Rc216, Rc298, Rc214, Rc238, Rc300, and PSB Rc82) were used in the study. Treatments were subjected to SMF condition until maturity. Among VarMix combinations, five ratio combinations, namely, NSIC Rc216, Rc298, Rc238, Rc300, and PSB Rc82 showed higher yield under SMF condition. This was attributed to the positive significant relationship between RSD (based on total root length) and yield in VarMix. Results showed that VarMix, depending on varietal mixing, increased yield under SMF. (Author's abstract)

**Keywords:** Roots, Drought, Soil moisture fluctuations, Varietal Mixture, Yield, Agriculture

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0054

### **Gibberellic acid application to increase yield of *Momordica charantia* Var. Bonito F<sub>1</sub>**

*Galinato, Richard G., Rosales, Raymund Julius G*

Various studies have proven that the application of gibberellic acid (GA<sub>3</sub>), a plant growth regulator (PGR), improves crop performance. Hence, a field experiment of trellised bittergourd was conducted from December 2016 to May 2017 in the City of Batac, Ilocos Norte, Philippines. The study was conducted to (1) determine the effect of GA<sub>3</sub> on flowering, (2) identify the best concentration that give high yield of the tested crop, and (3) determine the profitability of growing bitter gourd using GA<sub>3</sub>. Concentrations of GA<sub>3</sub> (0ppm, 10ppm, 25ppm, and 50ppm) were used and laid out in Randomized Complete Block Design with three replications. A plot size of 20 m<sup>2</sup> was used with 1.5m distance between plots and blocks. One plant per hill was done with 1m between rows and 0.75m between hills distance. GA<sub>3</sub> was sprayed at 20, 40, and 60 days after transplanting. This PGR application significantly affected the number of staminate flowers, number of fruits per hill, and fruit yield. Treated bittergourd produced more number of staminate flowers than the untreated plants did. Those treated with GA<sub>3</sub> significantly produced more number of fruits/hill and fruit yield per hectare than those without. Higher concentrations of GA<sub>3</sub> concentrations (25ppm and 50ppm) significantly produced higher yield than those with lower concentration (10ppm) and untreated plants. Application of GA<sub>3</sub> is more profitable than no application. (Author's abstract)

**Keywords:** Bitter gourd, Plant growth regulator, 10 ppm, 25 ppm, 50 ppm, Agriculture

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## **Greenhouse evaluation of high-yielding sugarcane varieties for drought tolerance**

*Delfin, Evelyn F. , Santos, Primitivo Jose A. , Valle, Michelle Lyka S. , Maravilla, Ana Mika*

A total of 10 high-yielding sugarcane varieties (HYVs) were evaluated for drought tolerance under greenhouse conditions. The 10 HYVs developed by the Sugar Regulatory Administration (SRA) were subjected to drought by withholding water for 10 days. This was followed by two-month recovery period. Plants were monitored in three-day intervals for chlorophyll content using SPAD 502 chlorophyll meter and for antioxidant content using colorimetric assay. After six months, plants were harvested and were evaluated for their agronomic traits. Antioxidant analysis showed a general trend of peak antioxidant concentration and percent scavenging activity (%SA) at six days after last watering. Phil 00-0791 had the highest antioxidant concentration of 2621.63  $\mu\text{g g}^{-1}$  leaf sample, and Phil 03-1389 had the highest %SA at 25.81%. Agronomic data showed significant variety-water treatment interaction in terms of leaf area; Phil 06-2289 had the highest leaf area under drought condition, with 23% reduction in total leaf area. Further reductions were observed in terms of 25% reduction in millable stalk weight and 24% reduction in total stalk weight. Overall, the 10 HYVs showed significant differences in terms of all agronomic traits, chlorophyll, and antioxidant content across water treatments. This is a good indication that would help to identify the sources of drought tolerance among sugarcane germplasm. Further field evaluation is being done to confirm initial findings. (**Author's abstract**)

**Keywords:** *Sugarcane, Drought, Drought tolerance, Antioxidant assay, Chlorophyll meter, Agriculture*

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## **Greenhouse screening of high yielding sugarcane varieties for waterlogging tolerance and effect of nodal position in germination response**

*Gandia, Jayson L., Delfin, Evelyn*

Sugarcane is susceptible to waterlogging during the germination stage, leading to lower plant stand. To test variable cane points' germination potential, 10 High-Yielding Varieties (HYV) were tested for germination response after waterlogging. Cane points were selected based on their nodal position from the cane, with the cane point from the topmost node assigned as cane position 1, going down until cane position 6. Each cane point was pre-germinated before being planted on styrofoam trays and submerged underwater at 5 cm above the soil surface inside concrete tanks. Cane points were divided into three waterlogging treatments; 5 and 7-days waterlogging, and control (well-drained). A week of recovery period was allotted before the germination count and plant height were measured weekly for 6 weeks. Results show waterlogging leads to 75% mortality rate overall, going as far as 97%. Plant height loss due to waterlogging averages at 81%, with some varieties losing 93-99% plant height. In general, extending waterlogging from 5 days to 7 days after planting has no added effect on germination and plant height. In terms of the effect of nodal position, the optimal range of cane position for germination and plant growth are positions 3-5. No apparent difference in rate of growth and germination among the 10 HYVs was observed over 6 weeks, however, results show that Phil 2155, Phil 00-2569, and Phil 2000-0791 had the highest mean plant growth and germination across treatments. Phil 2006-2289 and Phil 00-1419 had the lowest mean plant height and germination rates. (**Author's abstract**)

**Keywords:** *Sugarcane, Waterlogging, Waterlogging tolerance, Greenhouse screening, Agriculture*

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## Heat transfer analysis of carabao mango (*Mangifera indica* L.) fruit during postharvest hot water treatments

*Carpio, Ernesto V., Agngarayngay, Hazel James P., Yaptenco, Kevin F., Elepaño, Arnold R*

Thermal modeling of "Carabao" mango fruits, when subjected to different hot water treatments, was done in this study using the ANSYS CFD Software. The 3D mango fruit model, consisting of the peel, pulp, and seed, was meshed into finite control volumes. The energy equation for three-dimensional unsteady heat transfer was discretized and solved iteratively for each control volume, which resulted in the approximation of transient temperature values within the mango fruit model and in the heat flux at the model boundary. The heat transfer problem solved was a heat conduction problem; it has boundary condition of the third kind, which is a fixed parameter in the form of an estimated value of the convective heat transfer coefficient and a free stream temperature equal to the temperature of the heating medium. Experiment was also conducted to validate numerical results. Results showed that the simulation was able to accurately predict temperatures with a MTD of 0.50, 0.45 and 0.69°C for the conventional hot water treatment, rapid heat treatment, and extended hot water dip, respectively. This indicates good agreement between the simulated and actual temperature values. T-tests also showed no significant differences between the data sets. Heat flux, which is important in designing heaters and in estimating operational costs of a heat treatment facility, was also numerically estimated. Dimensionless parameters describing transient heat transfer, such as  $\theta$  as the non-dimensional temperature parameter and Fourier number, were also derived. Computer modeling and simulation can be used to simulate various processing operations. Also, the use of ANSYS software can be explored in other areas of research. (Author's abstract)

**Keywords:** *Carabao mango, Thermal modeling, Heat flux, ANSYS software, Agriculture*

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## Heterosis and combining ability: desirable traits in hybrid rice breeding

*Carampatana, Jake E., Millas, Reneth A., Caguiat, Joanne D., Gramaje, Leon*

Evaluating the combining ability of hybrid rice is essential in hybrid rice breeding, especially when considering a large number of potential parental lines. The study was conducted (1) to determine the general combining ability (GCA) and specific combining ability (SCA) of 14 parent lines for quantitative characters and (2) to measure the level of heterosis, and (3) identify the heterotic hybrids generated. A total of 33 hybrids were generated from the cross of three cytoplasmic male sterile lines and 11 restorer lines, following the line×tester mating design. Genotyping of parents was also done at this stage. Test entries also include Mestiso 19 and PSB Rc82 as yield checks. For standard heterosis, 51% of the hybrids had yield advantage of at least 15% over Mestiso 19. The top three highest yield were obtained by PR47775H (11.4 tha<sup>-1</sup>), PR47774H (10.6 tha<sup>-1</sup>) and PR477794H (10.5 tha<sup>-1</sup>). Positive and negative significant effects of midparent heterosis were shown in different traits. GCA values were generally lower than those of SCA for different characters, indicating predominant roles of additive gene effects for different characters. Moreover, components of variation due to interaction of line×tester were found to be significant only to days with 85% maturity, plant height, and spikelet fertility. Selections can be assembled among the parents to produce new untested testcrosses with expected relatively high SCA effects. Alternatively, lines with high GCA effects can also be endorsed to develop superior inbred lines. Relative to the performance estimates using yield and morpho-agronomic traits, the resulting high genetic similarity among parent lines may have caused relatively low heterosis levels of the testcrosses. This suggests the need to utilize more diverse parent lines. (Author's abstract)

**Keywords:** *Hybrid rice, Heterosis, General combining ability, Specific combining ability, Agriculture*

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## **Heterosis estimation for yield and yield components in aromatic rice**

*Gonzales, Marcial A., Alvaran, Paul*

Exploitation of heterosis has been one of the strategies to achieve targets in crop improvement. It serves as a guide in making sound decisions in selecting the best hybrids that could be used in selecting desirable recombinants in the succeeding generations to develop new lines. The study was carried out to measure the magnitude of heterosis on the yield and the component characters in eight genotypes and their  $F_1$ 's which aim to identify best cross combinations and parents. Twenty cross combinations were made following the line x tester mating fashion. The mid parent (MP) and best parent (BP) heterosis were estimated. CL 1/G 10, CL 2/G 12 and Pandan/P 20 had highly significant and positive MP (138.55%, 88.90% and 81.23%) and BP heterosis (66.00%, 125.36%, and 48.60%) for yield per se performance. CL 1/P 20, CL 1/G 12, CL 1/G 28 and CL 1/G 10 showed highly significant negative MP heterosis value for maturity of -6.2%, -6.85%, -7.41% and -9.01%, respectively, and BP heterosis with -8.01%, -7.41%, -10.06% and -9.97% respectively. Heterosis towards dwarfness was noted in Jasmine x P20 over its BP (-8.83%). CL 1/G 10, CL 2/G 12 and Pandan/P 20 were forwarded to the next generation for identification and selection of transgressive segregants CL 1/P 20, CL 1/G 12, CL 1/G 28 and CL 1/G 10 for earliness; and Jasmine x P20 for dwarfness or shortness. **(Author's abstract)**

**Keywords:** *Heterosis, Yield, Aromatic rice, Agriculture*

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## **Identification and prioritization of climate-resilient agriculture practices and adaptive capacity indices of local government units in Ilocos Sur, Philippines**

*Alibuyog, Nathaniel R. , Julian, Constante B., Utrera, Rodel T. , Bucao, Dionisio*

This study aimed to assess, target, and prioritize climate-resilient agriculture (CRA) practices and to determine the adaptive capacity indices of local government units (LGUs) in the province of Ilocos Sur, Philippines from August 2016 to July 2017. Data were gathered through survey. Primary data from households and experts were gathered using focus group discussions, key informant interviews, and questionnaires, while secondary data were gathered from reports/documents collected from the LGUs. The Cost-Benefit Analysis Tool developed by the International Center for Tropical Agriculture ([www.cbatool.ciat.cgiar.org](http://www.cbatool.ciat.cgiar.org)) was used to analyze the data using Net Present Value and Contingent Valuation Method; adaptive capacity indices were determined using the Capital Approach Method. Results of the study showed that flood and drought were the major hazards in the province that affect the residents' main commodities of rice, corn, tomato, and mango. Out of these commodities, three CRA practices were assessed: (1) improved variety of rice-tomato rotation combined with organic fertilizer, (2) improved variety of rice-corn rotation combined with organic fertilizer, and (3) integrated pest management for mango. All these CRA practices were privately and socially profitable. Vigan City had the highest adaptive capacity index, which could be attributed to its high values on human capital, physical capital, and natural capital. Santa Catalina had the lowest adaptive capacity index, which may due to its low capitals. This study can provide baseline information that would help in the decision and policy making processes of the different LGUs and communities, particularly in identifying CRA practices and adaptive capacity indices as resiliency measures towards a climate resilient community. **(Author's abstract)**

**Keywords:** *Adaptive capacity, Climate risk, Prioritization, Resiliency, Agriculture*

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## Identification of a fungal pathogen causing postharvest anthracnose in banana fruits cv. cavendish

*Mendoza, JayVee S., Dela Cueva, Fe M., Tiongco, Rizalina L. , Balendres, Mark Angelo*

Anthracnose is one of the major pre- and post-harvest diseases of banana. It is caused by multiple species of *Colletotrichum*. Apparently healthy banana cv. fruits harvested from the field showed anthracnose symptoms after several days in a plastic chamber. To identify the causal pathogen(s), samples were collected and subjected to further characterization. Fungi were isolated from anthracnose-infected banana tissues. Fungi were grown in Potato Dextrose Agar (PDA) and conidia were examined by microscopy. DNA was also extracted to amplify the internal transcribed spacer (ITS) region by polymerase chain reaction (PCR). The amplified PCR products were then sent for DNA sequencing. To establish Koch's postulate, the fungi were inoculated to healthy banana fruits in a detached assay. Two fungi were isolated from the anthracnose-infected tissues. Fungi A had falcate-shaped conidia and a white cottony growth in PDA. Fungi B had cylindrical-shaped conidia and a white cottony growth that turns orange with age in PDA. Based on DNA sequencing of the ITS region, Fungi A was *Fusarium* spp. and Fungi B was *Colletotrichum musae*. However, in the detached assay, only Fungi B caused anthracnose in banana fruits. Hence, *C. musae* was the causal pathogen of post-harvest anthracnose in banana cv. Cavendish. The findings provide useful information on the etiology of post-harvest banana anthracnose that would be useful in banana breeding programs. (**Author's abstract**)

**Keywords:** *Colletotrichum musae*, Internal transcribed spacer, *Fusarium* spp., Agriculture

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## Identifying suitable sites for small-scale irrigation projects (SSIP) in Region I through GIS-based water resources assessment

*Anggarayngay, Hazel James P., Alibuyog, Nathaniel R, Ines, Ryan J*

Developing small-scale water storage, diversion, and shallow well types of irrigation facilities may be able to address irrigation constraints in areas with small landholding such as in the Ilocos region. In addition, this will help to increase irrigated areas for rice and other crops and to make farmers more involved in its design, implementation, operation, and maintenance. This study aimed to develop a framework based on geographic information system (GIS-based) for use in determining suitable sites for small-scale irrigation projects (SSIP) and for developing a regional/provincial resource map for SSIP planning and development. GIS workflows in determining suitable sites for small farm reservoirs (SFR) and shallow tube wells (STW) were already developed. The factors considered, which were translated into thematic maps, in SFR suitability analysis were rainfall, soil texture, slope, land use, irrigation status, and proximity to water source. The factors used in the STW suitability mapping were the aquifer characteristics, such as static water level, storativity, specific capacity, and transmissivity. The resource maps showing the overall suitability of a certain SSIP were generated using GIS-based technology. The different factors were overlaid using a defined weighing factor for each of the individual factors. Resource maps were produced, which indicate the suitable areas for SFR and STW development for the different provinces in Region I. The existing and proposed SFR and STW locations served as validation points of the maps. The area per suitability rank (i.e., highly suitable, suitable, moderately suitable and not suitable) were likewise calculated. The GIS-based models served as a decision support framework to optimize and to identify the locations where SSIP can be implemented effectively and efficiently. Furthermore, the developed maps provide an efficient decision tool to promote optimal utilization of both physical and financial resources. (**Author's abstract**)

**Keywords:** *Small-scale irrigation project, Water resources assessment, Agriculture*

### **Impact of climatic variations in the productivity and yield performance of garlic**

*Ramos, Jonathan R., Lutap, Leticia A., Villarin, Alecsis G., Galacgac, Evangeline*

Garlic is known to be thermo and photo sensitive and its growth and development are greatly influenced by the growing environment. Different varieties of garlic were evaluated for their growth and yield performance at different dates of planting, to identify varieties suited for specific location and to know the effect and implications of different weather conditions to garlic production. Planting dates and the prevailing weather conditions during the growing period of the plants significantly influenced the growth and yield performance of the different varieties. Yield of garlic varies, and this can be attributed to the time of planting and the weather conditions during the growing period of the plants which affected the bulb development of the plants and desired maturity. Higher yield was obtained during regular planting as compared to early and late planting. Further evaluation of the promising varieties on farmers' field in different locations, also varies in their growth and productivity. Weather conditions like rainfall, temperature, and relative humidity had significant effect on garlic bulb and leaf size. As temperature increased and surpassed the optimum range of 21°C-24°C, bulb and leaf size was smaller, while less rainfall produced larger bulbs. Shorter daylength was necessary to initiate bulb growth and a windspeed of 8 meters per second. Relative humidity of 80% increased yield and beyond 80% favored the development of diseases. With the above observations, climatic variability has an effect on the yield and pest occurrence of garlic when planted at different dates including the desired maturity of the plant, thus affecting the storability of the harvested bulbs. These findings provide added information to researchers and extensionists in making recommendations to farmers on choosing the best time of planting and variety suited for a specific location. It will also help farmers in making decisions in their farm activities or their cropping system. **(Author's abstract)**

**Keywords:** *Planting dates, Location, Weather, Climatic variability, Yield, Agriculture*

### **Impact of soil and climatic conditions on the phytochemical property of *Livistona rotundifolia* shoot**

*Arzaga, Jallene E., Bucao, Xenia Erika N., Bucao, Dioni*

Anahaw (*Livistona rotundifolia*) is a non-timber forest species that grows in a wide range of soil and climatic conditions throughout the Philippines. Soil and climatic conditions and other factors can greatly affect the composition of biological active compounds in plants. The aim of this research is to evaluate the impact of soil and climatic conditions on the phytochemical property of *L. rotundifolia* shoot. Shoot samples of *L. rotundifolia* were taken from secondary forests of Pagudpud and Batac, Ilocos Norte with different soil characteristics and climatic condition with Type III and Type I, respectively. Taxonomic classification of soil samples was undertaken using standard procedures. Shoot samples were prepared following the standard protocol for plant extraction and phytochemical screening was done qualitatively. The ethanol extract of *L. rotundifolia* shoot from Batac with soil taxonomic classification of fine, montmorillonitic, acidic isohyperthermic, typic haplustalfs and climate characterized by two pronounced seasons, dry from November to April and wet during the rest of the year, exhibited the highest antioxidant potential. Its flavonoid and alkaloid contents were higher when compared with sample taken from Pagudpud with fine, montmorillonitic, acidic isohyperthermic, typic haplustalfs soil and climate characterized by seasons which were not very pronounced, relatively dry from November to April, and wet during

the rest of the year. Results suggested the robust impact of soil and climatic conditions on the phytochemical composition which further affected the antioxidant potential of *L. rotundifolia* shoot. **(Author's abstract)**

**Keywords:** *Anahaw, Soil and climatic conditions, Phytochemical screening, Taxonomic classification, Antioxidant, Agriculture*

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0065

**Improving the biotic resistance of NSIC RC 160 rice variety through gene stacking**  
*Manaquil, Jelyn M., Manangkil, Oliver E. , Tabanao, Dindo A. , Santiago, Jasmin II C. , Waing, Frodie P. , Caguia, Joa*

The development and improvement of rice varieties with tolerance to biotic stresses is very important and is possible through marker-assisted selection (MAS). This study aims to improve the tolerance to bacterial leaf blight (BLB) and tungro diseases by incorporating two *Xa* genes (*xa13+Xa21*) and BLB+ tungro QTL each into NSIC Rc160 released variety. Molecular marker genotyping using SSR and SNP markers, induced screening against the diseases and yield trial evaluation were simultaneously done to evaluate the best performing entries. Five populations of advanced lines were evaluated in replicated yield trial in 2018DS. The recorded mean yield ranged from 5.7 to 7.5 t/ha while NSIC Rc160 yielded 6.9t/ha. Presence of introgressed two *Xa* genes (*xa13+Xa21*) were confirmed through SNP genotyping. For BLB+tungro, three advanced lines designated as PR40843-B002 yielded 6.8 to 7.3 t/ha with intermediate to resistant reaction to BLB as compared to BLB susceptible NSIC Rc 160 with 7.0 t/ha yield. PR40843-B002-148-3-1-1-3-1-1 with yield of 7.3t/ha was nominated to multi-environment trial I (MET I). The stacking of genes for biotic tolerance contributed to the high yielding performance of selected entries without affecting the yield. These advanced lines will be nominated to MET and National Cooperative Test (NCT) to be used as released varieties by farmers and as donors for biotic tolerance by breeders and researchers. **(Author's abstract)**

**Keywords:** *Bacterial leaf blight, Tungro, Marker-assisted selection, NSIC Rc 160, Gene stacking, Agriculture*

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0066

**Inbred maize plant response to simulated drought pot experiment**  
*Nunez, John Paolo, Laude, Tonette, Descalsota, Jonathan, Descalsota, Jess*

Maize is second to wheat in terms of area harvested, but first in total production in the world (FAO, 2013). Although yellow maize serves as an alternative staple food, it is largely propagated for the feed industry. Drought may be the most important abiotic stress affecting agricultural crops worldwide, and thus screening for corn varieties with drought tolerance is essential to lessen the damage caused by this stress. However, such screening requires considerable land area and time; hence, alternative and rapid drought screening methods must be explored. In doing so, determining the response of plants to certain degrees of drought is essential for the development of this method. In this study, two acquired CIMMYT inbred lines (i.e., CML 161 and CML 551) were subjected to separate simulated drought pot experiments, namely, seedling stage, before flowering stage, and after flowering stage. Initially, seedlings were grown in pots with full watering capacity. Drought was initiated 7 days after germination, 50 days after germination, and after flowering stage. Constant soil sampling was done to determine soil moisture content (MC), and plant behavior was closely monitored. Leaf whorling and browning was observed 4-5 days after subjecting the seedling to drought at 9% soil MC; plant mortality was later observed. Similarly, these symptoms were observed among plants subjected to drought before and after the flowering stage. However, grown plants thrive at 9% MC for two weeks until MC dropped to 2%, leading to plant mortality. These



result show the importance of water during the seedling stage, and occurrence of drought at this particular stage of development would lead to less plant survival. Grown corn can manage drought but only up to certain degree. This result should be accompanied the development of a quick method for drought screening. (**Author's abstract**)

**Keywords:** *maize, Soil moisture, Drought, Plant response, CIMY, Agriculture*

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0067

### **Influence of single plant *Cyperus rotundus* L. on growth and development of rice under continuous flooded condition**

*Latonio, Anna Ma. Lourdes S., Capistrano, Ailon Oliver P., Bruno, Jobelle S., Donayre, Dindo K*

*C. rotundus* (CYPRO) is considered the world's worst weed. When it is not controlled, yield losses on major crops due to competition could reach up to 90%. In earlier times in the country, CYPRO was only a major and minor problem in upland and rainfed lowland areas. Later, reports confirmed that a lowland ecotype of CYPRO existed possessing different physiological mechanisms of survival under flooded condition. Despite the reports, its negative effect on rice under flooded condition is still unknown. An experiment was conducted at two trials at PhilRice CES from Feb. to Nov. 2018 to determine the effects of single plant-lowland ecotype CYPRO on growth and development of transplanted (TP) and direct-seeded (DS) rice under flooded condition (3 cm water level). Clay pots (6 x 5 inches WH) were planted under the following treatments: rice alone (TP/DS rice), rice + CYPRO, and CYPRO alone. The experiment was arranged in RCBD with 3 replications. Height, no. of leaves, tillers, chlorophyll contents, shoot and root weights, and no. of tubers were recorded and analyzed using STAR 201. SE was used to determine the variability within means and TTEST between treatments. Results showed that single plant-lowland ecotype CYPRO had no negative effects on growth and development of TP and DS rice under flooded condition. In reverse, growth and development of lowland ecotype *C. rotundus* were affected when grown with rice. Results suggest that presence and infestation of lowland ecotype CYPRO to rice at 1:1 ratio (weed: rice) had no negative effects on yield of the crop if water management is set at continuous flooding. (**Author's abstract**)

**Keywords:** *Cyperus rotundus, CYPRO, Cyperaceae, Purple nutsedge, Rice-weed competition, Agriculture*

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0068

### **Land capability assessment for crop production in the quiaoit river watershed**

*Alibuyog, Nathaniel R., Cruz, Rex Victor O. , Pastor, Floramante C. , Utrera, Rodel T. , Agreda, Joe*

Land capability assessment for general crop production was done in the Quiaoit River Watershed (QRW) to determine the suitability of growing general crops within the watershed. Four factors were used in delineating the suitable areas. These include climate, soil properties, water availability, and topography. For soil properties, soil samples were gathered within the watershed to characterize the physical and chemical properties of the soils. Soil sampling sites were located using GPS. Moreover, point data on the soil physical and chemical properties were interpolated using the ArcGIS software to come up with surface maps of the different soil properties. Finally, different soil properties maps were combined to come up with a soil property suitability map. The water availability factor was based on the previous aquifer characterization made by Utrera *et al.* (2005). Slope was used was topography, and this was extracted from interferometric synthetic aperture radar digital elevation model. Lastly, the four factors were combined using equal weights to come up with a suitability map for general crop production. Results showed that majority of the areas within the watershed were moderately suitable for crop production. This was attributed to moderately to highly suitable soil property factor, marginally to highly suitable supplementary factor, unsuitable to highly suitable topographic factor, and highly suitable climatic factor. Land

cover was also considered; forest class in the mountainous areas was classified as unsuitable for crop production. (Author's abstract)

**Keywords:** *Global positioning system, Geographic information system, Land capability assessment, Crop production, Watershed, Agriculture*

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0069

### **Molecular phylogenetics and the prepatent period detection of tomato leaf curl virus (TOLCV)**

*Elegado, Aileen M. , Padilla, Celynn O. , Romero, Ellen S. , Dela Cruz, Renmar M. , Paraguison-Alili, Rub*

Tomato yellow leaf curl disease is one of the most destructive tomato diseases destroying the tomato crops globally. Tomato leaf curl virus (ToLCV) spread of infection have been attributed to its vector, the silverleaf whiteflies (*Bemisia tabaci*). Here, CIRAP gene was targeted for molecular phylogenetics revealing that the Philippine strain formed monophyletic cluster with strains from South Korea, Africa, Israel and USA implicating that it is related to the Tomato Yellow Leaf Curl Virus (TYLCV) ancestor of ToLCV. Ninety-four (94) samples composed of leaves, whiteflies, soil, water samples and commercial seeds were purposively obtained from farms practicing organic farming. The application of PCR, Loop-Mediated Isothermal Amplification (LAMP) and Recombinase Polymerase Amplification (RPA) were investigated. Unexpectedly, ToLCV were detected in seedlings 0 day after inoculation even before the symptoms manifested that later appeared at 12-day post inoculation confirming that the soil and seeds can be probable sources of infection. (Author's abstract)

**Keywords:** *Molecular phylogenetics, Tomato leaf curl virus (ToLCV), Recombinase polymerase amplification (RPA), Polymerase chain reaction (PCR), Loop-mediated isothermal amplification (LAMP), Agriculture*

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0070

### **Molecular screening on the occurrence of the most important pathogens in organic fertilizers and liquid supplements for a safe organic and sustainable agriculture**

*Lopez, Lani Lou Mar A. , Paraguison-Alili, Rubigilda, Del Pilar, Rose Anne C. , Tuala, Ivan Patr*

The application of organic fertilizers and liquid supplements to promote sound state of health in crops is widely used despite the public health issues. The great risk can be attributed to the transmission of pathogens such as bacteria, protozoa and helminths present from biosolids to the local farmers and consumers through improper production. Here, a total of 47 samples consisting of normal organic solid fertilizers, vermicompost solid fertilizers and various types of liquid from different organic farms in Luzon were screened. Application of conventional methods such as microscopy and bacterial culture in parallel with Polymerase Chain Reaction (PCR) revealed the presence of important pathogens: *Escherichia coli* and *Salmonella enterica* subsp. *enterica* serovar *typhimurium*. Successful detection by PCR was confirmed by DNA sequencing, demonstrating the impartiality of PCR over the conventional method. Other target pathogens such as *Entamoeba histolytica* and *Toxoplasma gondii* along with *Trichuris trichiura* were also successfully detected on PCR. (Author's abstract)

**Keywords:** *Organic farming, Organic fertilizers, Liquid supplements, Polymerase chain reaction (PCR), Agriculture*

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### **Morpho-agronomic characterization of Philippine traditional rice varieties**

**Romero, Marissa, Mananghaya, Teodora E. , Perez, Loida M. , Duldulao, Malvin D. , Embate, Mary Valerie , Cabanting, RosaMia F. , Calayugan, Mark Ian C. , Ferrer, Mari**

Assessing agro-morphological diversity among rice germplasm is an important endeavor in any genetic resources management and crop improvement. Likewise, determining the desirable traits of traditional rice varieties (TRVs) and incorporating them in rice breeding efforts would greatly benefit rice farmers. It would help them to mitigate the effects of and better manage rice production under changing environmental conditions. This study (1) identified the morphological characteristics of the TRVs used to establish each accession's genetic identity, (2) identified varieties with desirable traits for direct utilization and potential donors for crop improvement, and (3) assessed the extent of genetic diversity of the collections. A total of 199 TRVs were planted during the wet cropping season of 2014–2017 for morphoagronomic characterization using 58 traits following the standard descriptors list for cultivated rice. Morpho-agronomic traits were analyzed using multivariate statistical analysis. The mean Shannon-Weaver diversity indices were  $H' = 0.52$  for all qualitative traits and  $H' = 0.81$  for quantitative traits. An overall genetic diversity was  $H' = 0.66$ , indicating a medium level of genetic variation among these TRVs. The rice collections that exhibited longest panicle ( $>32\text{cm}$ ) were *Sto. Nino*, *Speaker*, *Sampukoy*, *Salumanay*, *Putan-Kapa*, *Palaweña*, *Palawan*, *MalagkitKapa*, *Madya*, *Ilon-ilon*, *Gobierno*, *Galo* and *Canadal*. **Collections** *Tulloy*, *Salumanay*, *Pah-nga*, *Malagkit Kapa*, *Malagkit Black*, *Malagkit black*, *Kayasakas*, *Diko*, and *Bulgar* produced the heaviest grain ( $>35\text{g}$ ). Several traditional rice germplasm collections had desirable attributes. These should be further explored for direct utilization of these germplasm for varietal improvement programs. (Author's abstract)

**Keywords:** Diversity, Genetic resources, *Oryza sativa*, Shannon-Weaver diversity index, Agriculture

### **Morpho-cultural and genetic characterization of Philippine isolates of *Colletotrichum gloeosporioides* causing mango anthracnose**

**Dalisay, Teresita U. , Dela Cueva, Fe M. , Laurel, Ni**

Anthracnose, caused by *Colletotrichum* spp., has been considered as one of the most destructive postharvest diseases of mango in the Philippines. This study characterized *Colletotrichum gloeosporioides* isolates, causing mango anthracnose, through cultural, morphological and molecular analyses. Isolates were obtained from various areas in the Philippines and subjected to virulence assay. Isolates from Nueva Vizcaya, Guimaras and Davao had the highest mean lesion diameter. Morphological and cultural characterization revealed similar results for most of the isolates. Spores were unicellular, ovoid-shaped with obtuse ends and size ranges from 10.31 to 14.23  $\mu\text{m}$  in length and 3.06 to 4.99  $\mu\text{m}$  in width; while, growth on potato dextrose agar was circular, cottony mycelial growth, milky white colony with production of orange and black fruiting bodies. Fungal pathogens were molecularly identified using species-specific primers CgInt and ITS4 (450 bp). Phylogenetic analysis of the internal transcribed spacer (ITS) 18S rDNA (680 bp) and  $\beta$ -tubulin gene (1500 bp) revealed no distinct genetic relationship among the isolates based on their geographical origins and phenotypic characters. Gene sequences, however, revealed that the test isolates belong to the *Colletotrichum gloeosporioides* species complex. This is the first confirmed report describing the molecular characteristics of *C. gloeosporioides* causing anthracnose of mango in the Philippines. Information can be used in developing effective and durable disease management strategies for mango anthracnose. (Author's abstract)

**Keywords:** Anthracnose, *Colletotrichum gloeosporioides*, Morphology, Molecular, Agriculture

## **Morphological and physiological screening of rice (*Oryza sativa* L.) for salinity tolerance at seedling stage**

*Baltazar, Miriam D., de Ocampo, Marjorie P., Ismail, Abdelbagi M., Alcantara, Alfie*

The study generally aimed to screen rice (*Oryza sativa* L.) accessions under the Rice Diversity Panel (RDP) tolerant to salinity at seedling stage using morphological and physiological parameters. Specifically, it aimed to compare the growth and physiological responses of the different accessions under RDP to salinity stress, determine which are considered tolerant or susceptible, and assess which physiological characters best contribute to salinity tolerance. Morphological screening was based on modified Standard Evaluation System (SES) scores of visual salt injury at seedling stage. The samples were exposed to Yoshida's solution supplemented with sodium chloride to obtain a final electrical conductivity of 12 dS m<sup>-1</sup>. The physiological screenings done were vigor test, biomass test, chlorophyll content determination, and sodium-potassium ratio measurement. Morphological screening showed that out of the 324 rice accessions assessed, 87 rice accessions (27%) were classified as highly tolerant to salinity. M 202, MINGHUI 63, ECIA76-S89-1, and MING HUI showed the highest degree of tolerance. About 195 (60%) accessions were considered as tolerant, while 36 (11%) were moderately tolerant. Four (1%) accessions were classified as susceptible, and only two accessions (C57-5043 and WC4419) were highly susceptible. Among the physiological parameters used, vigor seedling growth and root biomass did not correlate with the morphological SES scores. Shoot biomass, chlorophyll content, and sodium-potassium ratio correlated with the morphological result. These indicate that the three latter physiological parameters must be considered for future studies in developing rice for salinity tolerance. (**Author's abstract**)

**Keywords:** *Rice, Salinity, Standard Evaluation System (SES), Yoshidas solution, Physiological parameters, Agriculture*

## **Morphological, growth, and yield responses of rice genotypes to potassium application and reproductive drought stress**

*Hernandez, Jose E., Cruz, Rolando T., Faustino, Gem P., Desamero, Nenette V.*

Low yields of 1.5–0.5 tha<sup>-1</sup> have been reported in drought-prone rainfed lowland rice areas in the Philippines. Given the scarcity of water resources, irrigation is not a practical option in most rainfed areas. Hence, genetic and agronomic management strategies need to focus on using available soil moisture. Field studies at the Philippine Rice Research Institute were conducted on Maligaya clay soil to assess the morphological, growth, and yield responses of rice genotypes NSIC Rc282, NSIC Rc222, and NSIC Rc418 to fertilizer management and to 20-day reproductive drought stress by withholding irrigation from 60–80 days after transplanting (DAT). In combination with equal amounts of N and P, two levels of K fertilizer were applied: (1) 120-40-60 and (2) 120-40-120 kg NPK ha<sup>-1</sup>. At 14 DAT, 1/3 of N and K and all P fertilizers were applied. At 40 DAT, the remaining 2/3 of N and K were applied. Drought stress development was characterized by the decrease in soil moisture content to 9.4% and increase in soil strength to 2.5 MPa. Compared with the other genotypes, NSIC Rc282 had slower progression of leaf rolling and higher leaf area with 120-40-120 kg NPK ha<sup>-1</sup> than with 120-40-60 kg NPK ha<sup>-1</sup>. With 120-40-120 kg NPK ha<sup>-1</sup>, grain yields of NSIC Rc282, NSIC Rc222, and NSIC Rc418 were 4.3, 4.2, and 3.6 tha<sup>-1</sup>, respectively, following reproductive drought stress and rewatering. Based on the well-watered control treatment, the average percent yield reductions were 15% with 120-40-120 kg NPK ha<sup>-1</sup> and 28% with 120-40-60 kg NPK ha<sup>-1</sup>. With higher level of K fertilizer application, production of proline could have increased and peroxidase and

catalase activities could have been enhanced, thereby maintaining photosynthesis during drought stress and minimizing yield reduction (Zain *et al.*, 2014; Wang *et al.*, 2016). (**Author's abstract**)

**Keywords:** Potassium application, Drought, Rice genotypes, Agriculture

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0075

### **Morpho-physiological characterization and floral biology of different hot pepper (*Capsicum* spp.) genotypes** *Capito, Christopher Q., Ebuña, Helen*

Characterization and diversity of hot pepper as one of the most important spice crops in the world have not been fully documented. A study was conducted to characterize the plant, floral and fruit morphology and physiology of 17 hot pepper genotypes from local and foreign collections, estimate the amount of diversity and relationships among genotypes, determine the degree of association between quantitative traits, and identify hot pepper genotypes that are adapted to Musuan condition. A functional ANOVA in Randomized Complete Block Design was constructed partitioning the genotypes into meaningful groups. Orthogonal comparison revealed that *C. annuum* genotypes had higher pollen viability (41.26%), longer fruits (7.45 cm) and outyielded the *C. frutescens* and *C. chinense* genotypes by 98.49% at 69.53 g/plant. Standardized Shannon-Weaver Mean Diversity Index was  $H' = 0.80$  (high variability) for quantitative characters and  $H' = 0.29$  (low variability) for qualitative characters. Strong positive association was found on days to 50% flowering and days to 50% fruiting ( $r = 0.98^{**}$ ), and petal length and fruit length ( $r = 0.71^{**}$ ). Cluster analysis divided the genotypes into three clusters, Cluster 1 for *C. frutescens*, Cluster 2 for *C. annuum*, and Cluster 3 for *C. chinense* genotypes including Cabai from *C. frutescens*. Recommended local genotypes are Django, Musuan ecotype, and Siling Demonyo, while Red Mini Bell and Space Chili After Glow are the foreign genotypes adapted to Musuan condition. These genotypes could be source of valuable genes for hot pepper breeding. (**Author's abstract**)

**Keywords:** Hot pepper, Diversity, Physiological characterization, Adaptation, Floral biology, Agriculture

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0076

### **Mungbean performance as cassava intercrop and its differential contribution to cassava performance**

*Maghirang, Rodel G. , Sabanal, Alvin Quiel , Rodriguez, Maria Cielo Paola B. , Alip, Ramon Christop*

This study was conducted to evaluate the performance of 15 selected mungbean entries intercropped with the cassava variety, 'Binulak' in terms of yield and morphological characteristics, as well as the effect of mungbean intercropping on cassava. The field trial was laid-out in a split plot design with cropping systems as main plot, and genotypes as sub-plots with 3 replications. Results showed that area wise, mungbean grown as monocrop has higher grain yield compared to mungbean grown as intercrop. Across cropping system, Pag-asa 7 had the highest grain yield among entries (2.8 t ha<sup>-1</sup> monocrop; 1.8 t ha<sup>-1</sup> intercrop). On the other hand, pod characteristics, leaf area, SPAD values of mungbean did not differ significantly between cropping systems. Plant height differed significantly among entries regardless of the cropping system. Sixty per cent of the cassava intercropped with mungbean showed an increase in root yield. Cassava intercropped with mungbean entry, PHL 152204 had the largest root yield of 31.91 ton/ha whereas the average yield of the monocrop counterpart was 22.15 ton/ha or equivalent to 30.59% increase. On the other hand, cassava intercropped with entry PHL 12782 had the lowest yield of 16.95 ton/ha corresponding to 24.42% reduction when compared to cassava grown as monocrop. All

cassava intercropped with mungbean showed an increase in per cent dry matter, with Pag-asa 7 having the highest increase of 47.85%. The trial showed that although all mungbean lines had lower yield when planted as intercrop, the Land Equivalent Ratio (LER) of cassava was increased with mungbean intercropping. The results further showed the differential ability of each mungbean genotype in increasing yield of cassava and that there are genotypes which can compete with cassava for nutrient resources thus reducing root yield. **(Author's abstract)**

**Keywords:** *Mungbean, Cassava, Intercropping, Yield, Agriculture*

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0077

**A narra leaf endophyte, *Bacillus amyloliquefaciens*, possesses antifungal activity against phytopathogenic fungi *Alternaria* sp., *Diaporthe* sp., and *Fusarium oxysporum***  
*Simbahan, Jessica, Atole, Liezel, Del Isagan, Margareth, Parcon, R*

Microbial endophytes are microorganisms that live within plant tissues but do not confer disease. Endophytes benefit their host plant by promotion of plant growth, reduction of disease severity, induction of the defense mechanisms of plants, secretion of products that prevent herbivory, fixation of nitrogen and by increasing nutrient uptake. Their relationship with their host plant makes them physiologically different from their soil-dwelling counterparts making them ideal sources of antimicrobial compounds that can be used as biocontrol agents against phytopathogenic fungi. As an initial step to the development of a biofungicide, 259 endophytic bacteria, yeast and fungi were screened. One isolate, N2B2, recovered from the leaves of *Pterocarpus indicus* or Narra, was able to exhibit antifungal activity against three phytopathogenic fungi namely, *Alternaria* sp., *Diaporthe* sp., and *Fusarium oxysporum*. *In vitro* assays showed that the bioactivity was due to multiple mechanisms intrinsic to the isolate. Identification of N2B2 by sequencing of its 16s rDNA revealed it to be *Bacillus amyloliquefaciens*. This is the first mention in literature of the isolation of *Bacillus amyloliquefaciens* from an indigenous tree species and posits the potential of endophytic *B. amyloliquefaciens* to be used as local biocontrol agent against pathogenic fungi of tomato. **(Author's abstract)**

**Keywords:** *Biocontrol, Bacillus amyloliquefaciens, Antifungal activity, Biofungicides, Phytopathogenic fungi, Alternaria sp., Diaporthe sp., Fusarium oxysporum, Agriculture*

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0078

**Neglected and underutilized fruit, vegetable, spice and root crop species of bukidnon**  
*Aribal, Lowell G., Abello, Ma. Joverly M., Sulatorio, Kristoffer M., Jamago,*

The increasing trend in the prices of food commodities pushes the consumers to opt for canned and processed foods since these are readily available and much cheaper. This leads to malnutrition among Filipinos. Although the country is very rich with a wide variety of food sources, some of these are neglected and/or underutilized. The study aimed to determine and document the NUS of Bukidnon and their uses. A mixed survey-interview was conducted from September 2017 to October 2018 in collaboration with the City and Municipal Agriculture Offices. A total of 174 respondents from 22 LGUs of Bukidnon were interviewed: 59.77% were women whereas 40.23% were men, 76% of the respondents were senior citizens, and 61% lived in the locality for 31-60 years. Data revealed that some respondents identified and used the NUS primarily for food (87), with 34 species of fruits, 27 vegetables, 13 spices, and 9 root crops. These NUS can be prepared in various ways: soups/stews (46%), fresh or raw salads (19%), sautéed (16%), and cooked or boiled (14%), among others. As to the plant part used, leaves are usually utilized (132 species), followed by roots/rhizomes (92), and stem/bark/vine (66). Filipinos are relatively generous since 43% of the respondents acquired the planting materials by sharing. They also perform

conservation practices through replanting (35%), continuous planting (33%), seed storage (22%). Whereas 10% of these NUS were obtained from the wild or by merely allowing them to grow naturally. The study can be used as reference to policy makers in addressing the issues of food security in the country. **(Author's abstract)**

**Keywords:** *Bukidnon, Fruits, Neglected and underutilized species, Spices, Vegetables, Agriculture*

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0079

## **Neglected and underutilized fruit, vegetables, spice and root crop species of Bukidnon**

*Aribal, Lowell G. Abello, Ma. Joverly M., Sulatorio, Kristoffer M., Jamago,*

The increasing trend in the prices of food commodities pushes the consumers to opt for canned and processed foods since these are readily available and much cheaper. This leads to malnutrition among Filipinos. Although the country is very rich with a wide variety of food sources, some of these are neglected and/or underutilized. The study aimed to determine and document the NUS of Bukidnon and their uses. A mixed survey-interview was conducted from September 2017 to October 2018 in collaboration with the City and Municipal Agriculture Offices. A total of 174 respondents from 22 LGUs of Bukidnon were interviewed: 59.77% were women whereas 40.23% were men, 76% of the respondents were senior citizens, and 61% lived in the locality for 31-60 years. Data revealed that some respondents identified and used the NUS primarily for food (87), with 34 species of fruits, 27 vegetables, 13 spices, and 9 root crops. These NUS can be prepared in various ways: soups/stews (46%), fresh or raw salads (19%), sautéed (16%), and cooked or boiled (14%), among others. As to the plant part used, leaves are usually utilized (132 species), followed by roots/rhizomes (92), and stem/bark/vine (66). Filipinos are relatively generous since 43% of the respondents acquired the planting materials by sharing. They also perform conservation practices through replanting (35%), continuous planting (33%), seed storage (22%). Whereas 10% of these NUS were obtained from the wild or by merely allowing them to grow naturally. The study can be used as reference to policy makers in addressing the issues of food security in the country. **(Author's abstract)**

**Keywords:** *Bukidnon, Fruits, Neglected and underutilized species, Spices, Vegetables, Agriculture*

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0080

## **Nutrient dynamics in hydroponic production of lettuce (*Lactuca sativa*, L. var. *crispa*) using household greenhouse module**

*Sace, Chito, Abella, Evaristo, Francia, Fre*

Changes in concentration of nutrients in a hydroponic system for lettuce after one week, three weeks and before harvest for a period of 40 days was determined. This was achieved by daily monitoring of the environmental and water quality parameters, nutrient solution analysis and measuring growth, yield and presence of nutrient deficiency. The nutrient solution was maintained by adjusting the electrical conductivity (EC) to 1.80 mS/cm and pH to 6.5. Results showed that the EC of the nutrient solution decreased as it was expended by the plants. The increased in pH affected some of the concentration of nutrients while the total dissolved solids (TDS) fell within the maximum range. The concentration of nutrients between collection points did not vary significantly from each other except for Cl. This result indicated that the hydroponic system used was efficient. On the other hand, changes in concentration of nutrient solution every week varied significantly from each other. The nutrients that increased in concentration were NO<sub>3</sub>-N, K, Ca and Cl; increased during the first and third week; total N and NH<sub>3</sub>-N; increased until third week but decreased before harvest; P, Mg, SO<sub>4</sub>, HCO<sub>3</sub>, Na, Cu, Zn, Fe and Mn; and increased only during the first week; B. In terms of growth and yield, and observed deficiency symptoms, plants in sampling point 1 significantly got more leaves and eventually, got the highest leaf area index (LAI) and fresh weight. Only

sampling point 1 did not exhibit tipburn and stunted growth. All of the other deficiency symptoms like chlorosis, necrosis and distorted or malformed leaves were observed in all of the sampling points. **(Author's abstract)**

**Keywords:** *Hyonics, Nutrient dynamics, Nutrient deficiency, Electrical conductivity, Agriculture*

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0081

### **Performance of podding radish (*Raphanus caudatus*) in different planting dates and rates of organic fertilizer**

*Dumaol, Aleta E., Atis, Marissa I*

Podding radish is an important indigenous food plant in Ilocos Norte. It can be utilized from vegetative to reproductive stage, has medicinal property for blood purification, and has an anti-cancer component. The dates of planting and fertilizer management influence the success of crop production. Hence, studies were conducted to (1) evaluate the growth and yield performance of two podding radish accessions, (2) determine the possibility of year-long production, and (3) determine the response to different rates of organic fertilizer application. Results showed that podding radish was best planted during the months of September, October, November, and December because they significantly exhibited superior plant and pod characteristics: 12–18 branches, 5.35–6.50 cm pod length, 0.62–0.72 cm pod diameter, and 4–5 seeds per pod. Also, planting during these months produced a yield of 2.38–9.32  $\text{tha}^{-1}$ . Growing radish from January to August exhibited severe insect pest damage; however, there was no disease observed. A benefit-cost ratio of 36.81 was obtained with the application of 10–15  $\text{tha}^{-1}$  of organic fertilizer, which implies a good return of investment. With this technology, farmers could be guided in planting their radish crop at best planting dates, as well as the proper rate of organic fertilizer to obtain good yield and profit. **(Author's abstract)**

**Keywords:** *Performance, Planting dates, Radish accessions, Organic fertilizer, Benefit-cost ratio, Agriculture*

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0082

### **Pesticide residue monitoring of organic and conventional vegetables using the rapid test kit (RTK)**

*Bajet, Cristina M., Sarmiento, Jasper A., Cruz, Eric Jhon D*

Excessive pesticide residues in food pose major concerns in consumer safety especially in the case of vegetables where its consumption is considered to be vital for human health. The Rapid Test Kit (RTK) developed by the National Crop Protection Center is a rapid, semiquantitative tool to detect organophosphate (OP) and carbamate (CM) residues in vegetables. RTK analysis was done on 74 organic and 143 conventional vegetable samples from selected markets and stalls in Metro Manila, Laguna, Quezon, and other selected areas to monitor whether vegetable farmers comply with the principles of organic farming or adhere to the preharvest interval (PHI) in conventional farming. Results showed that 21.6% ( $n=74$ ) of organic vegetables were positive for OP and/or CM residues compared with the 28.0% ( $n=143$ ) positive of the conventional vegetables. Eggplant and bitter melon were identified as the most frequently positive for OP and/or CM residues. Using RTK thus offers a potential for easy monitoring and screening of pesticide residues in vegetables produced by organic and conventional farming. **(Author's abstract)**

**Keywords:** *Pesticide residues, Rapid Test Kit, Vegetables, Organic, Food safety, Agriculture*

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## **Phenological events and purple blotch incidence of different varieties of garlic under Ilocos Norte condition**

*Sacupaso, Cristopher, Lutap, Leticia A., Galacgac, Evangeline*

Garlic is one of the most economically important cash crops in the Ilocos region but its productivity however, is hampered by the attack of pests. Phenology may help in predicting the incidence of pests (Nixon, 1998). This research was conducted to determine the phenophases and purple blotch (*Alternaria porri*) incidence of different varieties of garlic in the field under Ilocos Norte condition. Phenological observation and monitoring of purple blotch incidence were done. Correlation and regression analysis were employed. Results shows that the emergence of each leaf required an average of 5 to 6 days regardless of the weather condition or planting dates except for Batanes cultivar planted in November 14. This cultivar requires an average of 8 days for each leaf to emerge and 7 days for those that were planted in December 5. Results of the analysis revealed that temperature did not significantly affect the rate of phenophases of garlic. It was only the Batanes cultivar that air temperature significantly affected the rate of occurrence of the phenophases of the crop during November 14 planting. Lesions of purple blotch were noticed on older leaves during the development of the 10th leaf or at the later part of bulb formation stage during November 14 planting. Garlic planted on November 22 had purple blotch manifested during the development of the 9th leaf and on November 30 and December 5, during the development of the 8th leaf. Relative humidity significantly affected the occurrence of purple blotch at different planting dates. Air temperature significantly affected the occurrence of purple blotch during the November 30 planting only. The information derived is useful in determining the appropriate time of applying pest management strategies based on weather conditions and phenophases of garlic to minimize the application of pesticides which is toxic to the environment. **(Author's abstract)**

**Keywords:** *Garlic, Phenophases of garlic, Weather, Purple blotch, Agriculture*

## **The Philippine garlic industry: Knowledge inventory and networks**

*Demandante, Sosima R., Balisacan, Criselda M., Esteban, Carmelo*

A three-year project was carried out to undertake an inventory of the knowledge system on garlic (*Allium sativum* Linn) in Region 1, Philippines. This inventory aimed to discover *what kind, in what mode, over time and space*, bodies of knowledge to each particular aspect on *pre-production, production and post-production* phases of the garlic industry, were generated or have existed and how these were processed. The inventory, made primarily through secondary data analysis, covered a span of 47 years (1969-2016). Based on the inventory, there is a dual knowledge system in the garlic industry, the formal-scientific and the local-indigenous. The formal-scientific knowledge system (FSKS) dominates the widely shared KS which are produced by formal organizations, mostly government entities and academe. The local indigenous knowledge system (LIKS), is highly regarded, practiced, and shared by farmers and stakeholders. The FSKS was at its peak in the 1980s (1980-1989), half-divided during 1990-1999, and remained low during the inventory-decade before and after 1980s. On a per life-cycle basis, researches on the production phase was almost twice the number on pre-production and post-production phases combined. Across the phases, researches were predominantly applied rather than basic. After knowledge or technology generation, only a few, if any, gets published and/or presented in appropriate forums intended for end-users. Results of the inventory show the need for a more aggressive generation and dissemination of knowledge and technologies that provide solution to the problems of the garlic industry in the country. **(Author's abstract)**

**Keywords:** *Knowledge inventory, Formal, Indigenous, Tacit, Explicit, Agriculture*

### **PhilRice developed NSIC RC 440 (Tubigan 39) rice variety recommended nationally for irrigated lowland ecosystem**

*Santiago, Gilely C. , Rillon, Juliet P. , Dancel, Joselito M. , Barroga, Wilhelmina V. , Pariñas, Julieta F. , Canilang, Pinklet Athena C. , Osoteo, Gloria M. , Duque, Ma. Johna C. , dela Cruz, Arlen A. , Bracerros, Rustom C. , Orcino, Jose A. , Arocena, Emily C. , Padolina, Thelma F. , Banting, Maybell DM., Bandonill, Evelyn H. , Alegado, Thelma A. , Manangkil, Oliver*

Irrigated rice areas in the Philippines contributed to 69% of the harvested area and 76% (14.56 million metric tons) of the total rice production with mean yield of 4.42 tha. The Philippine Rice Research Institute (PhilRice) continues to develop new varieties with improved grain yield, resistant to major pests and diseases, has good grain quality, with value-added traits, and wide adaptability across environments to fulfill its vision of “A Rice Secure Philippines”. NSIC Rc 440 is one of recently released variety bred by PhilRice for irrigated lowland rice ecosystem. It was derived from a cross between PJ27 and C8088-13-2-1-3-1 in 2004 wet season and designated as PR36720. After selections and yield trials, the breeding line PR36720-17-1-2-1 was nominated to National Cooperative Test (NCT) during 2012 and recommended for varietal release in 2016. It is a semi-dwarf, early maturing variety, with 3.41% to 9.18% yield advantage over PSB Rc 82, mean yield ranged from 5.5 t/ha to 6.9 t/ha, and potential yield from 7.1 t/ha to 10.8 t/ha across sites during the Multi-Location Adaptation Trial (MAT) in 2014 to 2015. It has intermediate reaction to diseases such as blast and bacterial leaf blight, and intermediate resistance to yellow stem borer, white stem borer, brown plant hopper, and green leaf hopper. Its grain is long and intermediate shaped, has good grain quality, good milling potential, and excellent acceptability when cooked and raw. NSIC Rc 440 was recommended for national cultivation in irrigated lowland ecosystem for both transplanted and direct wet-seeded rice system. (**Author's abstract**)

**Keywords:** *Irrigated lowland, PhilRice, NCT, MAT, Agriculture*

### **Physico-chemical characterization and transcriptome analysis of 5-methyltryptophan resistant lines at different developing stages of rice**

*Kang, Kwon-Kyoo , Jung, Yu Jin , Nogoy, Franz Marielle, Cho, Yong*

Mutation breeding has brought significant contributions in the development of high value crops. It steered the first studies in generating plants with desired mutations in genes encoding key enzymes involved in important metabolic pathways. Molecular characterization of 5-methyl tryptophan resistant plants revealed the different base changes in OsASA that led to sensitivity to feedback inhibition in anthranilate synthase enzyme. In silico analysis of microarray data from different time points during grain filling was also performed in this study. Results showed the differentially expressed genes (DEGs) and the enrichment of these genes revealed their roles in amino acid transportation during grain filling. Surprisingly, among all DEGs, only LOC\_Os06g42560, a tryptophan synthase beta chain was found to be the only gene related directly to tryptophan biosynthesis, which may have affected the amino acid content during grain filling. For physico-chemical analysis, grain and eating qualities of the mutant rice lines were elucidated. The evaluation showed that 5MT-4 and 5MT-5, despite having 20 times higher tryptophan contents, measured in µg/100 mg seeds, showed approximately 60% chalkiness after milling. The taste quality in general was not affected significantly, however, other parameters like peak time of viscosity and gelatinization temperature showed different results relative to wildtype. Agronomic traits of the 5MT R-lines showed relatively poor performance compared to wildtype. 5-methyl tryptophan resistant plants, 5MT-4 and

5MT-5 having 20 times higher tryptophan contents, could be useful to develop new high nutrient rice varieties. (Author's abstract)

**Keywords:** *Microarray analysis, High nutrient, Gene regulation, Tryptophan content, Rice, Agriculture*

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0087

### **Physicochemical properties and grain pigmentation of special rice genotypes grown under irrigated lowland condition**

*Dela Cruz, Quirino D. , Garcia, Florida C. , Agustin, Mario B. , Tapic, Rosemarie T. , Astejada, Maribe*

Six special rice varieties were evaluated to determine the physicochemical properties and to measure the degree of grain pericarp pigmentation. Six rice genotypes were evaluated during the dry season (December 2016 to April 2017) under lowland irrigated condition at the Central Luzon State University. Grain quality analysis was done at the Rice Chemistry and Food Science Division, Philippine Rice Research Institute, Central Experiment Station. Results revealed that most of the genotypes had intermediate amylose content (17.1–22.0%) and gelatinization temperature (70–74°C). High crude protein was noted from Blonde Red at 9.5%. Soft gel consistency was observed from CL-1 while the rest of the genotypes were hard gel consistency. Anthocyanin content was high in Dujali Black and Porac-1 due to their purple pigments in the bran. \*L value of CL-1 was found lighter while Dujali Black and Porac-1 were noted to have darker grains. Unpolished grains of Luna Red and Blonde Red obtained the highest positive \*a value while CL-1 was found to have a negative \*a value, indicating toward greenness. On the other hand, \*b value of unpolished and polished grains of CL-1 exhibited the highest content, indicating toward yellowness. Results of this study could serve as baseline information for developing improved genotype of special rice with superior grain quality and could provide a better understanding of their potential uses for the health conscious consumers. (Author's abstract)

**Keywords:** *\*L value, \*a value, Anthocyanin, Genotypes, Special rice, Agriculture*

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0088

### **Phytoplasma and phytoplasma disease of papaya in the Philippines: a review**

*Justo, Valeriana P., Dela Cueva, Fe M., Waje, Aira F., Magdalita, Pablito M.*

Several phytoplasma diseases of papaya that are associated to a number of phytoplasma strains have been reported in the papaya-growing countries. In the Philippines, the recent occurrence of a yellow-type disease, characterized by yellowing of young leaves and death of papaya plants, prompted this study to identify the etiology of the disease. Preliminary diagnosis based on isolation of the causal pathogen revealed the absence of plant pathogens such as bacteria and fungi. However, using modern tools for molecular detection suggests a phytoplasma infection of the papaya plants. Results revealed that the causal organism belongs to the phytoplasma group of "Ca. *Phytoplasma aurantifolia*", which includes the papaya yellow crinkle and papaya mosaic disease. In cross reference to other older reported phytoplasma disease of papaya in the Philippines, only "Ca. *Phytoplasma aurantifolia*" has been identified to cause phytoplasma disease of papaya in the Philippines. (Author's abstract)

**Keywords:** *Detection, Papaya, Philippines, Phytoplasma, Plant disease, Agriculture*

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**Pilot-scale processing system for the production of pectin from mango peels**  
*Rustia, Jessica , Gantioque, Geraldine , de Leon, Alma , Gragasín, Ma. Cristina B., Caparino, Otero A. ,  
Ligisan, Aileen R*

The Philippines is totally dependent on imported pectin, valued at PHP 52 million, for the production of food, cosmetics, and pharmaceuticals. In 2012, PHilMech and DOST-ITDI developed a laboratory-scale pectin processing system from mango peels with UM Registration No. 22013000466. The present study verified the technical requirements, performance, and financial viability of the technology at a bigger scale. The technical performance was assessed based on the physico-chemical properties of the produced pectin and on the acceptability of mango pectin-based food products in terms of sensory attributes. The produced pectin met the United States Pharmacopeia specifications, indicating its superior quality. The physico-chemical properties remained stable for at least one year. Functional attributes were highly acceptable based on sensory evaluation of pectin-based food products. It contains 60–77% total dietary fiber, wherein 53% correspond to soluble dietary fiber, and thus provides many health benefits. Financial indicators showed that an upscale pectin production from mango peels was viable with a benefit-cost ratio of 2.12 and internal rate of return of 36.82. Therefore, the developed mango pectin processing system is ready for promotion and commercialization. (**Author's abstract**)

**Keywords:** *Pectin, Mango peels, United States Pharmacopeia, Agriculture*

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**Predicting single-cross hybrid rice performance using best linear unbiased prediction (BLUP)**

*Gramaje, Leonilo V. , Millas, Renneth A. , Caguat, Joanne D. , Enriquez, John Os*

Performance prediction of untested hybrids is an alternative to test crossing for identifying superior hybrids. In this study, the performance of untested single-cross hybrids was predicted through BLUP. A total of 33 hybrids were generated using the line by tester mating design from 11 restorer and 3 cytoplasmic male sterile (CMS) lines. Parent lines were genotyped with Infinium 7K SNP chip, and relationship was analyzed as per Queller and Goodnight's Model. Performance of hybrids was evaluated. Yield and other important agronomic traits such as maturity (MAT), plant height (PH), tiller number (TN), grain number (GN), fertility (FT), and thousand-grain-weight (TGW) were gathered. Prediction was performed as  $\hat{A}_{||U} = C_{UT}C_{TT}^{-1}\hat{A}_{||T}$  where:  $\hat{A}_{||U}$  = predicted performance of untested hybrids;  $C_{UT}$  = covariance between untested and tested hybrids; relatedness,  $V_{GCA}, V_{SCA}$ ;  $C_{TT}^{-1}$  = inverse of  $C_{TT}$  as phenotypic covariance among hybrids;  $\hat{A}_{||T}$  = performance of tested hybrids (SCA). Two sets were used for crossvalidation with 9 (2 untested) and 15 hybrids (3 untested) for the 1<sup>st</sup> and 2<sup>nd</sup> set, respectively. Prediction for the 1st group had an average deviation of 1.56 for yield ranking from actual values, and the Pearson's correlation between actual and predicted values for effects and yield was 82.45%, with 81.66% for yield ranking. High prediction accuracy with correlation  $\geq 80\%$  between actual and predicted values was obtained in GN (98.8%), TGW (86.7%), and PH (80.6%). Prediction for the 2<sup>nd</sup> group showed an average value of 1 for rank deviation and correlation between actual and predicted values for effects and yield was 91.67% with 95.68% for yield ranking. High prediction accuracy was obtained in TGW (98.9%), MAT (92.9%), PH (91.5%), and GN (82.7%). Results showed BLUP's efficiency in predicting performance of untested hybrids, which can help to improve the efficiency and cut expenses and efforts in hybrid rice breeding programs. (**Author's abstract**)

**Keywords:** *Best linear unbiased prediction, Rice, Agriculture*

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0091

**Pre-germination treatments and early growth of Anonang (*Cordia dichotoma* Forst) using different soil enhancers**

*Castaneto, Elmer T. , Vallesteros, Arvin P. , Vallesteros, Shierel F. , Bad-e, Melody, Rodriguez, Ramil*

Pre-germination treatments were applied to the seeds of Anonang (*Cordia dichotoma* Forst) to hasten germination. Treatments consisted of tap water, lukewarm water, hot water, and sodium chloride; each had a specific duration of soaking that are based on literature. The study was laid out in Completely Randomized Design, with five treatments and three replications. Significant differences between treatments were observed. However, soaking the seeds in tap water appeared to be the best treatment, resulting in 83.3% germination. Seedlings from tap water treatment were transplanted into five potting media, namely, garden soil (T1), (soil-cow manure combination) (T2), soil-coconut coir dust (T3), (soil-decomposed rice hay (T4), and (soil-carabao manure) (T5). Results revealed significant differences in seedling height, stem diameter, number of leaves, leaf area, shoot biomass, root biomass, and total plant biomass. Treatment 4 came out to be the most suitable soil enhancer for Anonang. **(Author's abstract)**

**Keywords:** *Anonang, Pre-germination treatments, Soil enhancers, Agriculture*

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0092

**Productivity of sweet pepper (*Capsicum annuum* L.) under different balance fertilization strategy**

*Mamauag, Angelica T., Obispo, Cynthia P., Simon, Samuel*

This study aims to determine the effect of different balance fertilization strategy (combination of inorganic and organic fertilizer at varying rates) on the growth and yield performance of sweet pepper (*Capsicum annuum* L.). The experiment was setup following the Randomized Complete Block Design in two factors with three replications and with the following treatments: Factor A (Sweet Pepper Variety): a1- Emperor F1 and a2- California Wonder and Factor B (Balanced Fertilization Strategy): b1-100% inorganic fertilizer, b2-100% organic fertilizer, b3-50% inorganic fertilizer and 50% organic fertilizer, b4-60% inorganic fertilizer and 40% organic fertilizer, b5-40% inorganic and 60% organic fertilizer. Analysis of variance revealed that the different combinations of organic and inorganic fertilizer applied did not produce significant effect on the computed yield and growth of the two sweet pepper cultivars tested. **(Author's abstract)**

**Keywords:** *Productivity, Sweet pepper, Balance fertilization strategy, Organic fertilizer, Agriculture*

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0093

**Profile analysis on the productivity of coconut (*Cocos nucifera* L.) for the four climate types in the Philippines**

*Christopher dela Cruz, Consorcia Reaño,, Christopher dela Cruz, Consorcia R*

Coconut is considered as one of the main drivers of the Philippine economy due its contribution in terms of export. However, coconut productivity is severely affected by changes in weather and climatic conditions and in the age of climate change and smart agriculture, it is important to understand the effect of varying climate and weather conditions on the productivity of coconut. Hence, this study aimed to compare the profiles of representative farms of the four climate types in terms of potential yield, tennis ball-sized nut, and button-sized nut count. Thirty palms from each selected farm representing the four climate types were selected. Nut production data were collected from 2015-2016 from each of the farm while the climate types were based on the modified Coronas classification. Moreover, profile of the farms representing the four climate types were analyzed in terms of potential yield, tennis ball-sized nut, and button-sized nut count. Test of parallelism, test of levels and test of flatness were performed using STATA version 12. Average potential yield for climate types I to IV are 38.94, 54.61, 73.05 and 46.34, respectively. On the other hand, average number of tennis ball-sized nuts for climate types I to IV are 5.51, 5.09, 7.27 and 4.64, respectively. Moreover, average number of button-sized nuts for climate types I to IV are 7.03, 7.76, 12.08 and 8.14, respectively. Profile analysis at  $\alpha=10\%$  showed that the profiles of the four climate types in terms of potential yield, tennis ball-sized nut and button-sized nut are parallel (p-value=0.1165). However, test of levels and flatness was significant at  $\alpha=10\%$  (p-value=0.0914 and 0.0000, respectively). Results of this study suggest that nut production profile in terms of potential yield, tennis ball-sized nut and button-sized nut of the four climate types are parallel, not coincident and not flat. Thus, they have different nut production and the differences may be due to the varying weather conditions among four climate types. Findings of this study may serve as preliminary analysis to investigate further and better understand the effect of varying weather conditions on the productivity of coconut. **(Author's abstract)**

**Keywords:** *Coconut, Profile analysis, Yield, Climate, Agriculture*

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0094

### **QTL by environment interaction analysis for grain zinc concentration in two recombinant inbred populations of rice (*Oryza sativa* L.)**

***Inabangan-Asilo, Mary Annie , Amparado, Amery , Hernandez, Jose E. , Altoveros, Nestor C. , Borromeo, Teresita H. , Calayugan, Mark Ian C., B.P. Mallikarjuna Sw***

Identification of environment-specific QTL and stable QTL having consistent genetic effects across a wide range of environments is of great importance in plant breeding. QTL by Environment Interaction (QEI) contributes to the effective use of marker-assisted selection (MAS) in breeding, and better understanding of the genetic architecture of important quantitative traits. In this study, QEI affecting grain zinc (Zn) concentrations in three seasons (2017 dry and wet season; 2018 dry season) were dissected using two recombinant inbred line population derived from IR14M141 x Jamir cross (P1) and IR14M141 x Kaliboro cross (P2) and SNP genotypic data. By using inclusive composite interval mapping, a total of 16 additive QEI effects QTLs for grain Zn were detected, which were distributed on chromosome 2, 3, 5, 6, 8, 10, 11 and 12. Most QTLs were relatively stable, whose LODA ranged from 1.68 to 44.33, and LODAE ranged from 0.04 to 3.45. Among QTLs, 10 (63%) QTLs were detected in both single and multiple environments.  $qZn_{5.2}$  were commonly identified in both populations. It is also the highest main-effect QTL underlying grain Zn with additive effects of 2.21 ppm in P1 and 1.25 ppm in P2 and explained phenotypic variance of 36.11 in P1 and 11.42 in P2. This region can be targeted in rice breeding for high grain Zn in rice through MAS. **(Author's abstract)**

**Keywords:** *Rice, QTL x environment interaction, Quantitative trait loci, Grain zinc, SNP markers, Agriculture*

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## Quantitative fruit characterization of the coconut (*Cocos nucifera* L.) CATD × (LAGT × WAT AN17) mapping population

Reaño, Consorcio E., Rivera, Ramon L., Rivera, Susan M., Canama, Alma O., Velasco, Raquel D., Manohar, Anand Noel C., Cardona, Don Emanuel M., Caro, Reina Esther S., Crisostomo, Spe

Various studies have been undertaken to boost the coconut industry through breeding of new varieties with high-yield and high-quality copra oil. A three-way cross of the LAGT and WAT and CATD coconut varieties were utilized in improving the coconut productivity and copra oil yield and quality. A total of 85 progenies from the CATD × (LAGT × WAT AN17) population and their parents were analyzed for horti-morphological characterization. Nut samples were collected in each progeny for the two periods: dry season (DS) and wet season (WS) from 2015–2017. The samples were evaluated for the following fruit components: whole nut, husked nut, husk, split nut, meat, shell, water and copra. Moreover, percent dry matter content and fruit quality value were also derived. The mean whole nut weight of the mapping population was 1089.10g, which is relatively comparable to its parents CATD (1,197.57g) and LAGT × WAT (1,451.25g). Among the progenies, 1912 had the highest whole nut weight with 1875.00g. Moreover, the meat, which remained the most economically important part of the coconut, varied differently in the two seasons. The mean meat weights were 376.71g and 322.67g for DS and WS, respectively. The copra weight during DS was heavier with a mean weight of 226.40g than that in WS with 215.47g. This study provides the phenotypic data for eventual analysis and identification of markers associated with coconut productivity and copra oil high yield and quality. (Author's abstract)

**Keywords:** Coconut, Three-way cross, Fruit component analysis, Agriculture

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## Response of cacao (*Theobroma cacao* L.) to biochars from bamboo and sugarcane bagasse, and biofertilizer

Jomao-as, Joshua G., Yecyec, Romualdo P., Aggangan, Ne

Amendment of biochar, vermicompost and inoculation with biofertilizers constitute a new approach in improving soil chemical properties that definitely result to a better plant growth. This study determined the response of cacao (*Theobroma cacao* L.) to amendment with biochar from bamboo (BB) and sugarcane bagasse (BSB), and biofertilizer MYKORICH® (mycorrhizal inoculant containing *Glomus*, *Gigaspora*, *Entrophospora* and *Acaulospora*). Aseptically germinated cacao seedlings were inoculated with biofertilizer and planted in oven sterilized red acidic soil mixed with vermicompost and applied with increasing (0, 3.75, 7.5 and 15%) concentration of BSB. In previous experiments, 30% BB level reduced growth of cacao. Experimental design was a two factor in RCBD with ten replicates under greenhouse conditions. Results showed that BB promoted better growth of cacao than BSB. Total dry weight of cacao ranged from 21-38 g plant<sup>-1</sup> in BB and from 20 to 24 g plant<sup>-1</sup> in BSB. Highest dry weight was obtained from those with 15%BB while the highest in BSB was with 7.5% and the lowest was in 15%BSB. Inoculation with MYKORICH in BB doubled plant dry weight with 114 to 399 mycorrhizal spores 10 g<sup>-1</sup> sample. On the other hand, spore count in BSB ranged from 42-116 spores 10 g<sup>-1</sup> sample and highest in 7.5%BSB and lowest in 15%BSB. Mycorrhizal root colonization was comparable in BB and BSB amended soil ranging from 64 to 88%. The results indicate that cacao seedlings grew better in BB and supported higher mycorrhizal spore production and root colonization than in BSB particularly when inoculated with MYKORICH® biofertilizer. Field trials should be conducted to verify the above results before its recommendation for adaption by farmers. (Author's abstract)

**Keywords:** Mycorrhiza spore count, Root infection, MYKORICH®, Agriculture

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## **Response of corn to biochar with herbicide and organic and inorganic fertilizers**

*Pangga, Gina , Salvacion,*

A 2×2×2 factorial pot experiment was conducted at Southern Luzon State University-Tiaong, Quezon, Philippines to determine the response of corn to biochar with herbicide and organic and inorganic fertilizer. Eight treatments replicated five times were arranged in completely randomized design. Biochar made from rice straw and organic fertilizer were applied at the rate of 15 tha<sup>-1</sup>. Glyphosate herbicide and inorganic fertilizers were applied following the recommendation from a corn production manual. Results showed that biochar and organic fertilizer increased the amount of organic carbon in the soil and its cation exchange capacity. Organic fertilizer also increased the amount of zinc in soil. Corn planted in soil amended with biochar had heavier plant biomass, biomass and length of roots, and longest corn ear. It would be better if the fertilizer used is organic with or without the application of herbicide. However, applying herbicide greatly impedes the increase in length and weight of corn roots. Such findings confirm the possible contribution of biochar in combination with organic fertilizer to corn production. It also contributes to the knowledge on the effect applying herbicide while using biochar and organic fertilizer. It is recommended to continuously evaluate the effect of applying biochar from different substrates, at different rates, with different organic fertilizers, and with herbicide affinity as affected by biochar and different fertilizers in corn production or in other crops. (**Author's abstract**)

**Keywords:** *Biochar, Organic fertilizer, Herbicide, Corn, Agriculture*

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## **Response of Kalinga's heirloom rice cultivars to different levels of organic fertilizer**

*Simon, Samuel R., Langngag,*

The study was conducted under wetland culture in Tabuk City, Kalinga province using two-factor experiment laid in Randomized Complete Block Design. Three replications were made with the following treatments: (1) Factor A - Heirloom rice cultivars, specifically Chong-ak (a<sub>1</sub>) and Ulikan Red (a<sub>2</sub>); (2) Factor B - Organic fertilizer, namely, no fertilizer as control [b<sub>1</sub>], 100% of the recommended rate of fertilizer (b<sub>2</sub>), 75% of the recommended rate of fertilizer (b<sub>3</sub>), 50% of the recommended rate of fertilizer (b<sub>4</sub>), and 25% of the recommended rate of fertilizer (b<sub>5</sub>). The study aimed to determine which of the different fertilizer treatments would give the best result in terms of agronomic characteristics and highest yield of Chong-ak and Ulikan Red cultivars. It also aimed to provide a benchmark data on the profitability of producing the two cultivars. Results revealed that different levels of organic fertilizer, as a single factor, did not significantly affect the yield of the two heirloom rice cultivars. A significant interaction effect between the two factors was obtained in terms of mean number of tillers, mean number of days to maturity, percent filled, and percent unfilled grains. Ulikan Red (a<sub>2</sub>) obtained significantly the highest mean on the following parameters: number of days to flowering, height at maturity, number of tillers, days to maturity, and computed yield in tons per hectare. Using Ulikan Red (a<sub>2</sub>) cultivar is recommended since it produced significantly higher yield than Chong-ak (a<sub>1</sub>) cultivar. Also, applying 25% of the recommended rate of organic fertilizer is recommended as it increased the number of tillers, which is a major determinant of yield in rice. (**Author's abstract**)

**Keywords:** *Heirloom rice cultivar, Chong-ak, Ulikan Red, Level of organic fertilizer, Agriculture*

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### Responses of 'carabao' mango to various ripening agents

Lacap, Angelyn T., Lubaton, Christine Diana S., Secretaria, Leizel B., Bayogan, Emma Ruth V., Joyce, Daryl C

Calcium carbide ( $\text{CaC}_2$ ) reacts with moisture in the air to produce acetylene ( $\text{C}_2\text{H}_2$ ) gas, an analog of ethylene ( $\text{C}_2\text{H}_4$ ). Commercial sources of  $\text{CaC}_2$  may be contaminated with arsenic and phosphorous, which are also released during a chemical reaction. This constitutes a potentially serious health risk to ripeners and may contaminate the product. Although banned in many countries,  $\text{CaC}_2$  is still used in the Philippines because equally inexpensive and effective alternatives are lacking. This study investigated the relative efficacy of alternatives for ripening 'Carabao' mango. Fruit harvested at 107 d after flower induction were treated with  $\text{CaC}_2$  (2.5, 5.0, or 7.5 g  $\text{kg}^{-1}$ ); ethephon (500, 1000, or 1500  $\mu\text{L L}^{-1}$ ); *Gliricidia sepium* leaves (20% w/w); or 'Cardava' banana fruit (10% w/w) for 72 h. Mangoes were then held under ambient room conditions [ $29.9 \pm 3.1^\circ\text{C}$ ,  $77.74 \pm 2.9\%$  relative humidity (RH)] for 7 d. Assessments of peel color, firmness, and total soluble solids showed that fruit treated with higher concentrations of ethephon (1000 or 1500  $\mu\text{L L}^{-1}$ ) exhibited similar ripening responses as those treated with  $\text{CaC}_2$ . Application of 500  $\mu\text{L L}^{-1}$  ethephon and the bioethylene sources *G. sepium* and 'Cardava' banana did not effectively ripen 'Carabao' mango as compared to the other treatments. The effectiveness of  $\text{CaC}_2$  did not vary between the concentrations tested. Just 2.5 g  $\text{kg}^{-1}$  was needed to ripen the fruit, which is considerably less than the commercial practice of using 10 g  $\text{kg}^{-1}$ . Weight loss was highest in mangoes treated with  $\text{CaC}_2$  or ethephon. Similar to  $\text{CaC}_2$ , ethephon treatment (1000 or 1500  $\mu\text{L L}^{-1}$ ) reduced the time to reach saleability to 3–4 d as compared to 6 d for untreated mangoes. Accordingly, 1000  $\mu\text{L L}^{-1}$  ethephon could be a relatively safer alternative to  $\text{CaC}_2$  in ripening 'Carabao' mango. Moreover, the benefits of using ethephon over conventional  $\text{CaC}_2$  include lower cost and higher profit. (**Author's abstract**)

**Keywords:** Bioethylene, Calcium carbide, Carabao mango, Ethephon, Ripening agent, Agriculture

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### Screening of SSR markers for marker-assisted selection of mungbean for drought-tolerance

Ocampo, Eureka Teresa, Adorada, Patricia Joyce, Reyes, Jose Ar

Mungbean (*Vigna radiata* (L.) Wilczek) is the top pulse crop grown in the tropics. However, drought has many morphological and physiological effects in mungbean that result in reduced yield. Marker-assisted selection makes it easier to select for and develop drought-tolerant mungbean varieties. This study aimed to screen mungbean-specific simple sequence repeats (SSR) markers for polymorphism in Philippine mungbean varieties. One hundred fifty-eight (158) SSR markers and corresponding primers were selected from the published literature and screened on the genomic DNA of ten mungbean genotypes. The Polymerase Chain Reaction (PCR) conditions were optimized for the SSR primers, and the PCR products were resolved on polyacrylamide gel electrophoresis. One hundred thirty-three (133) primer pairs amplified only one band of similar size (monomorphic), 15 primer pairs amplified two bands, and two primer pairs have amplified three bands per primer while one primer pair has amplified four bands. A total of 40 polymorphic bands were shown from 18 primer pairs. These 18 primers could be used in genetic diversity analysis, and in identifying genetically diverse mungbean genotypes. Identification of polymorphic markers is recommended to improve the selection process. (**Author's abstract**)

**Keywords:** Mungbean, Marker-assisted selection, SSR, Drought, Agriculture

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## Seed morphological characteristics, desiccation tolerance and seedling development of Pili (*Canarium ovatum* Engl.)

*Gentallan, Jr., Renerio P. , Altoveros, Nestor C. , Borromeo, Teresita H. , Timog, Emmanuel Bonifacio S., Endonela, Leah*

Pili (*Canarium ovatum* Engl.), an endemic genetic resource of the Philippines with great economic potential, is primarily cultivated through seeds. The study characterized the morphological characteristics, desiccation tolerance and germination pattern of pili seeds towards effective germplasm conservation and management. Seventy-two pili accessions from the National Plant Genetic Resources Laboratory-University of the Philippines Los Baños were used. Per accession, one hundred seeds at two replicates were morphologically characterized, germinated and observed for growth and developmental changes using the extended Biologische Bundesanstalt, Bundessortenamt and CHemical industry (BBCH) scale. One hundred seeds at three replicates were used to identify initial viability. Subsequently, the seeds were slow-dried to approximately 5% moisture content and retested for viability. At ~5% moisture content, pili seeds were characterized to have a hundred seed weight of  $889 \pm 162$  g, length of  $4.50 \pm 2.15$  g, width of  $1.97 \pm 0.86$  g and thickness of  $1.6 \pm 0.76$  g. Kernels had  $146 \pm 58$ g hundred-kernel weight,  $30.73 \pm 3.60$  mm length,  $12.87 \pm 1.35$  mm width and  $9.43 \pm 1.11$  mm thickness. Seven germination stages were documented and illustrated following the extended BBCH scale. Phanerocotylar epigeal with storage cotyledons type of germination was observed with characteristic radicle emergence at the stylar end. Initial viability of the seeds was 100% and seeds retained its viability at 95% after drying that indicates potential desiccation tolerance. **(Author's abstract)**

**Keywords:** *Canarium ovatum* Engl., Seed, Morphological characters,, Seedling development, Desiccation tolerance, Agriculture

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## Selection of water buffalo bulls by sperm nuclear shape and relationship to sperm in vitro fertility and computer assisted sperm analysis

*Duran, Peregrino G. , Venturina, Fe A. , Venturina, Emma V. , Peralta, Matt Daniel , Hufana-Duran, Danilda, Mamuad, Felomino V. , Venturina, Hernando V. , Parrish, John*

Laboratory methods to select high fertility and eliminate low fertility semen are needed in the water buffalo industry. Fourier harmonic analysis (FHA) was used to 31 buffalo bulls with known in vivo fertility to identify the top 32% (conception rates = 28 to 36%) and bottom 16% (conception rates = 19 to 13%) highest and lowest fertility, respectively. The model cutoff points were harmonic amplitude 1 values of  $<0.042 \mu\text{m}$  and  $>0.051 \mu\text{m}$  for high and low fertility bulls. Using the cutoff values, a new set of 44 bulls was classified and 12 high and 10 low fertility bulls identified. Five bulls from each fertility group were randomly selected and used to evaluate sperm in vitro fertility via fertilization of buffalo oocytes matured in vitro and sperm motility parameters via Computer Assisted Sperm Analysis (CASA). The formation of a male pronucleus was recorded as evidence of fertilization. CASA was evaluated on 201 to 1125 sperm per bull with a Hamilton-Thorne motion analysis. Significant difference in fertilization percentage of  $83 \pm 4.4$  vs  $70.0 \pm 4.4$  for the predicted high vs. low fertility bulls ( $p < 0.05$ ) was observed. The CASA measures of progressive motility ( $67.2 \pm 2.9$  vs.  $51.9 \pm 2.9\%$ ), straightness (STR) ( $85.4 \pm 0.7$  vs.  $81.3 \pm 0.7\%$ ) and linearity (LIN) ( $53.3 \pm 0.8$  vs.  $49.8 \pm 0.8\%$ ) were different for sperm from predicted high vs low fertility bulls ( $p < 0.05$ ). There was no effect on average path velocity, straight-line velocity, curvilinear velocity, lateral head displacement, or beat/cross-frequency in relationship to bull fertility group ( $p > 0.05$ ). The results suggest that buffalo bulls predicted to be of higher fertility have better in vitro fertility and sperm motion characteristics of progressive motility, STR and LIN. **(Author's abstract)**

**Keywords:** *FHA, Bulls, Sperm analysis, Sperm quality, CASA, Agriculture*

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## **Soil application of biochar as a resiliency measure in saltwater intrusion-affected agricultural areas**

*Mozo, Michael Jason L., Lacayanga, Jonathan E. , Villegas-Pangga, Gina , Valdez, Walter G*

Saltwater intrusions caused by sea level rise affect soil properties as it could develop saline or sodic behavior in soils. This type of soil condition adversely affects the growth of most crops and is susceptible to degradation. This study was conducted to assess the influence of biochar application on improving sodic soil properties and to examine its effects on plant growth. Series of pot experiments were conducted at the Agricultural Systems Institute-University of the Philippines Los Baños using corn (*Oryza sativa*) and water spinach (*Ipomoea aquatica*) as 1<sup>st</sup> crop and 2<sup>nd</sup> crop, respectively. Different types of biochars (i.e., mahogany tree [*Swietenia macrophylla*] flower receptacles, corn cobs, rice straws and rice hulls) were mixed with chemical and organic fertilizers as replicated treatments. Results showed that all treatments with added biochars produced higher corn biomass yield than treatments with fertilizers alone. Among these biochars, the rice hull biochar (RHB) + chemical fertilizer and RHB + organic fertilizer overyielded other treatments with 21.4% and 35.6% increase over chemical and organic fertilizers alone, respectively. Similar pattern was also observed on the 2<sup>nd</sup> cropping with 28.6% and 20.9% increase. Moreover, soil organic carbon was significantly higher in soils treated with biochars than with fertilizer alone, specifically the rice straw and water hyacinth biochars for both chemical and organic fertilizer mixes. Results such as these demonstrate the potential use of biochars in the preservation of vegetation and soil and water resources for an environmentally sustainable land use. Where control of salinity and sodicity is paramount, revegetation of high recharge areas and the paradigm shift on the use of biochars is of high priority. (Author's abstract)

**Keywords:** Biochar, Seawater intrusion, Resiliency, Sodic soils, Soil health, Agriculture

## **Soil erosion and soil carbon assessment of an adlay-based farming system**

*Paquit, Joseph C., Medina, Michael Arie P., Marin, R*

Soil erosion has become rampant in the upland and rolling areas which has led to land degradation, siltation to low lying areas, and pollution to water bodies. A number of communities are continuously cultivating the uplands with a variety of crops for livelihood. Some of these crops require various degree of cultivation to obtain sufficient yield. Crops that require minimal tillage such as adlay crop can be good options for planting in sloping areas. This study was conducted to assess the soil erosion rate and soil carbon stock of an adlay farming system at varying slope gradients. The study was carried for a 10-month period following the completely randomized design. The erosion rate was measured using an improvised erosion bar, the infiltration by an infiltrometer, and soil carbon was analysed through a laboratory facility. Findings revealed that erosion rates in the adlay farming system are far beyond the tolerable limit. The slope, with more than 20%, had an erosion rate of 66.49 tons ha<sup>-1</sup> yr<sup>-1</sup> while the gentler slope (less than 10%) had only 12.5 tons ha<sup>-1</sup> yr<sup>-1</sup>. Soil carbon stock of the area ranged from 1.684 tons ha<sup>-1</sup> to 2.2 tons ha<sup>-1</sup> across the slope gradients of the farm. The infiltration rate was also found to be higher in a gentler slope (less than 10%) at 106.67 mm hr<sup>-1</sup> as against 91.33 mm hr<sup>-1</sup> in steeper slope (more than 20%). Adlay crop may be planted along areas steeper than 10% slope but this requires minimal tillage to regulate soil erosion. The technologies for soil and water conservation measures need to be adopted by the farmers in steeper areas. (Author's abstract)

**Keywords:** Soil erosion, Soil carbon, Farming system, Agriculture

### ***Solanum biflorum* and *Lantana camara* as potential biopesticides against cabbage black rot (*Xanthomonas campestris* pv. *campestris*)**

*Marin, Mellprie B. , Bautista, Ceci*

A study was conducted at Victory, Lantapan, Bukidnon to evaluate the efficacy of different plant parts of *Solanum biflorum*, in combination with *Lantana camara* leaves, as biopesticides against cabbage black rot. Likewise, the study aimed to determine the effects of the different treatments on the yield performance of the crop. The study was laid out in Randomized Complete Block Design, with nine treatments and three replications. The treatments were T<sub>1</sub> (Kocide), T<sub>2</sub> (Distilled Water), T<sub>3</sub> (*S. biflorum* roots + *L. camara* leaves), T<sub>4</sub> (*S. biflorum* leaves + *L. camara* leaves), T<sub>5</sub> (*S. biflorum* fruits + *L. camara* leaves), T<sub>6</sub> (roots of *S. biflorum*), T<sub>7</sub> (leaves of *S. biflorum*), T<sub>8</sub> (fruits of *S. biflorum*), and T<sub>9</sub> (leaves of *L. camara*). T<sub>5</sub> had the least disease severity rating, which is comparable to that of T<sub>1</sub> at 14, 21, and 28 days after transplanting. Highly significant variations were also observed among means on the yield parameters. T<sub>1</sub> had the heaviest heads (average of 8.4 kg), and its mean weight was significantly different from those of the other treatments. This result can be attributed to the less number of infected leaves on T<sub>1</sub> compared with the other treatments with severe infection. On the adjusted yield per hectare, T<sub>1</sub> also had the highest yield of 16,800 kg ha<sup>-1</sup>. However, among the extracts, T<sub>5</sub> had the highest mean of 9,600 kg ha<sup>-1</sup>, which is comparable to T<sub>6</sub>, with 9,200 kg ha<sup>-1</sup>. Based on these results, the combination of fruits of *S. biflorum* and *L. camara* leaves proved effective in controlling cabbage bacterial rot. (**Author's abstract**)

**Keywords:** *Black rot, Extracts, Heads, Disease severity, Agriculture*

### **Spore production and growth rate of ten *Azolla* hybrids**

*San Valentin, Genaro O., Mondejar, Cielo*

Several studies had supported the effectiveness of *Azolla* as alternative or supplementary fertilizer in flooded rice cropping system. The vegetative means of multiplying *Azolla*, which was the main basis for selection of *Azolla* poses a great problem to farmers whenever they need to reinoculate. The hydrological condition in the paddies may change abruptly to the extent that it may threaten the survival of *Azolla* as hydrophyte. Evaluation and selection parameters to be regarded in order to make *Azolla* sp. coincide with the growth and development of irrigated lowland rice in two cropping cycles with dry fallow period between the two cropping cycles should include *Azolla* varieties that produce spores for at least 50% of the time within one year with sporulation index (SI) > 50% during the period of maximum spore production. When the SI value is below 50%, the megaspore (MGS) and microspore (MCS) count can be considered. The desired peak of sporulation is at least one month before the withdrawal of floodwater in rice paddies, i.e. two months before harvest date. Among the 10 *Azolla* UPLB hybrids evaluated, *Azolla microphylla* 4099, *Azolla microphylla* 4113, *Azolla microphylla* 4098, *Azolla mexicana* 2033 and *Azolla mexicana* 2030 are the varieties recommended with these parameters. (**Author's abstract**)

**Keywords:** *Azolla, Biofertilizer, Rice-azolla, Azolla spore, Azolla spore technology, Agriculture*

### **A study on the market potential of processed goat meat (chevon) products**

*Rustia, Jessica , Pestaño, Hannah Grace , Juvinal, Joel , Gantioque, Geraldine , Ganareal, Kathlene Claire , Castillo, Joan Marie , Antonino, Judith , De Leon, Alma, Villaruel, Joel , Maylem, Min*

Increased goat production is mainly driven by the sustained demand for chevon or goat meat. Parallel to the gaining popularity of chevon, there is a need to determine the market potential of processed chevon products that will cater to a wide variety of uses as well as satisfy demand for innovative local delicacies. The objectives of this study were to determine the market potential of the chevon products developed at the Central Luzon State University (instant papaitan, chevon jerky and chevon caldereta with rice “binalot”), to define the market, to determine the market strategy to reach the intended market. A descriptive survey was conducted (n=679) in 10 towns and cities in Nueva Ecija through self-administered questionnaires. Results showed that in terms of socio-economic status, 61.3% of the consumers were classified as the highest spending household (cluster 5-9) while 4.50% were under least spending household (cluster 1-4). Most consumers (81.6%) have tried tasting chevon. The processed chevon products have clear market potential since 61% of the consumers would probably buy the product. Less than half (41.4%) of the consumers were aware that the goat meat has lower cholesterol level compared to other meats while only 26.8% know that chevon was high in iron. Majority of consumers (78.6%) will eat more chevon after knowing its nutritional benefits. To encourage consumer patronage, goat meat should be positioned as a healthier choice compared to other type of meats. (**Author's abstract**)

**Keywords:** *Chevon, Descriptive survey, Instant papaitan, Chevon jerky, Binalot, Agriculture*

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### **Suitability assessment of major lowland soils in Ilocos Region for sustainable garlic production**

*Alibuyog, Nathaniel R. , Sagsagat, Franklin C. , Galacgac, Evangeline S. , Utrera, Rudel T. , Bucao, Dioni*

Garlic is considered as the white gold of Ilocos. Its productivity is driven by several factors such as day length, temperature, relative humidity, and topography. The area devoted to garlic production has been declining for the past 10 years due to climate variability. This study was conducted to assess major lowland soils in Ilocos Region to identify suitable areas for garlic production that can expand and sustain its production. Soil samples were gathered across the major lowland soils in Ilocos Region and were analyzed for their physical and chemical properties. Secondary data (e.g., climatic data, and water availability for irrigation) were gathered. Matching was done to determine the suitability rating of each land characteristics using the FAO-SYS framework. Variables were grouped into four factors and were assigned corresponding weights: climate (55%), soil properties (15%), water availability (15%), and topography (15%). Geographic information system tools were used to facilitate suitability analysis and mapping. Generally, climate in Ilocos Region is suitable for garlic production, but results revealed that Ilocos Norte has lower minimum temperature from December to February, with 20–21°C compared to the other three provinces that favor the growth and development of the crop. Most soils in the region have low organic matter content, slightly acidic to acidic, is very deep, have good drainage, and have slopes from 1–8%. Suitability analysis indicated that about 10,000 ha are highly suitable; 133,202 are moderately suitable and 214,821 ha in the region are marginally suitable for garlic production. Ilocos Norte shares about 98% and 41 % of the highly and moderately suitable areas for garlic production due to its more fertile soils and favorable climatic condition. Hence, expansion area should be focused in Ilocos Norte for a sustainable garlic production. (**Author's abstract**)

**Keywords:** *Suitability assessment, Garlic, Climatic variability, Geographic, Agriculture*

### **Suitability of water from Calumpang River for aquaponic system**

*Bay, Marineth Jillah , Miranda, Jessa , Mercado, Danica Marie , Abanilla, L*

The study tested the applicability of the Calumpang River water as a media-based Aquaponic System. As an aquaponics system, it utilized two cultures—fish culture (aquaculture) and vegetable production (hydroponics). The water sample was collected near Ferry Road, Brgy. Kumintang Ibaba. It was poured onto a grow bed made of clay pebbles called hydroton, where Pac choi (Pechay) plants were grown and where tilapia were cultured. The quality of the water from the river was tested using an API freshwater test kit that would determine if it could be applied to the system. Four parameters were considered, namely, pH, ammonia, nitrite, and nitrate contents. The changes on the levels of the parameters were recorded for seven days to determine the ability of the water to work on the system and to nitrify nitrite, and thus make it habitable for fishes and plants. River water was sampled on September 16, 2015 and was tested before and after it was applied on the aquaponic system. Data were recorded for analysis and the parameters tested were compared with those prescribed in FAO standards. Result showed that the system reduced the pH and nitrate levels of river water. Ammonia and nitrite content were converted to nitrate through using biological bacteria. Considering FAO standards, it can be said that the water quality of Calumpang River is suitable for aquaponic system. (**Author's abstract**)

**Keywords:** *Aquaponics, Hydroton, Nitrification, Agriculture*

### **Sustaining rice grains quality: the arsenic concentration of some rice (*Oryza sativa* L.) varieties in Mindanao**

*Ruflo, Honie S., Fernandez, Mathessa D., Jamago,*

The alarm has been raised on inorganic arsenic (As) content found in some rice-based foods and drinks intended for infants and children. The inorganic form is more toxic than the organic form and could become carcinogenic. Groundwater contamination of As in Bangladesh, China, Thailand, Taiwan, and Vietnam has already been reported. This study followed up on the investigation of Duldulao in 2012. We collected seed samples of some rice varieties available in Mindanao, and quantified them for arsenic (As) concentration. In December 2014 to February 2015, seed samples of upland rice varieties from Zamboanga del Sur (n=5), lowland rice varieties from Bukidnon (n=5), and imported rice (n=5) were sourced out, morphologically characterized for seed traits, and quantified for As concentration of rice grains at the Fast Laboratories in Cagayan de Oro City. China's standard is maximum of 0.15mg kg<sup>-1</sup> As. All 15 samples had safe As levels, which ranged from 0.0006µg g<sup>-1</sup> to 0.067µg g<sup>-1</sup>. However, Bukidnon varieties had numerically higher concentrations. Hence, from April to May 2016, seed samples (n=32) of recently harvested lowland rice varieties in four major rice-growing areas of Bukidnon were also morphologically phenotyped for seed traits before analysis for As concentration. All grain samples had safe levels of arsenic concentration. Mean values ranged from -0.580µg g<sup>-1</sup> (note: negative values accordingly cannot be accurately determined) to 0.070µg g<sup>-1</sup>. Numerically, those from Valencia City had the lowest concentration, whereas those from Maramag had the highest. Assessment of As concentration in rice grains for food consumption and for processed foods in the country must continue and Philippine standards on As concentration must be set for regulation. However, As analysis is expensive and the need for cheap, accurate, and efficient tests are prominent. (**Author's abstract**)

**Keywords:** *Arsenic, Toxicity, Rice, Oryza sativa, Bukidnon, Agriculture*

### Unfolding indigenous flower vegetables in the Philippines

*Endonela, Leah E. , Gentallan, Jr., Renerio P. , Aguilar, Catherine Hazel M. , Borromeo, Terresita H. ,  
Altoveros, Nestor C. , Barrion, Dan Carlo N. , Bautista, Nina Julia L. , dela Cruz, Norvie J. , de Chavez,  
Hidelisa D. , Robillos, Christian D., Sister, Lorna*

Flower vegetables, despite their ubiquity in Filipino diets, are not recognized as major food sources. This study was thus undertaken to document flower vegetables cultivated and consumed by rural households in the Philippines. Information on utilization of flower vegetables were obtained from community inventory, ocular, household and local market surveys in 10 provinces in the Philippines. Focus group discussions revealed seven species, namely, Kapas-kapas (*Telosma procumbens*), Alukon (*Broussonetia luzonica*), Katuray (*Sesbania grandiflora*), Sampaloc (*Tamarindus indica*), Kalabasa (*Cucurbita moschata*), Saging (*Musa* spp.), and Ampalaya (*Momordica charantia*). Among the more popular food preparations are *salad, dinengdeng, law-uy, ginataan, kinilaw, ginisa, atsara, paksiw, okoy, inihaw and torta*. It was also revealed that with the exception of *T. indica*, all the above mentioned flower vegetables are prepared as salads. Moreover, unique preparations of the male banana inflorescence as *okoy, inihaw* and *torta* were documented in Quezon while the utilization of *S. grandiflora* and *Musa* spp. as *atsara* and *kinilaw* was recorded in Iloilo and Capiz. Region-specific utilization of flower vegetables was noted for *B. luzonica* and *T. procumbens* which are popular vegetables in the Ilocos Region. Brought by migrating Ilocanos to South Cotabato, *B. luzonica* still remains as a hitherto undiscovered flower vegetable in these areas. Promotion of other indigenous vegetables for their flowers can increase diversity in vegetable preparation and conservation through sustainable use thus maintaining its potential to meet the needs of present and future generations. (Author's abstract)

**Keywords:** Flower vegetables, *Telosma procumbens*, *Broussonetia luzonica*, *Sesbania grandiflora*, *Momordica charantia*, *Tamarindus indica*, *Cucurbita moschata*, *Musa* spp., Agriculture

### Unveiling the identity of the emerging destructive stem canker in dragon fruit in the Philippines

*Pascual, Cecilia B., Tumolva, Jamie*

Dragon fruit has become increasingly popular in the Philippines due to its claimed health benefits and commercial value. However, this fruit faces different stresses, including biotic stress caused by various diseases. One destructive symptom observed in all of the dragon fruit farms visited by the researchers was the presence of stem and fruit canker, which eventually leads to stem and fruit rotting. This study aimed to identify the causal organism present in this destructive stem canker in dragon fruit and to characterize its life stages. Dragon fruit-growing areas in Silang, Cavite and in Los Baños, Laguna were surveyed for stem canker infection in cladode and fruits. Different symptomatology were observed and pure culture isolates were produced through tissue plating method on potato dextrose agar. Phenotypic characterization, molecular assay, and pathogenicity test were done. The pathogen was identified to be *Neoscytalidium dimidiatum*. Three common symptoms of stem canker, namely, orange lesions, black erumpent pycnidia, and black canker were inoculated on a healthy cladode. Pathogenicity test revealed that symptoms that present black pycnidia can initiate infection. Black necrotic canker was initially produced, followed by rotting of cladode. The outcome of the study will have significant implications on the development of proper control measures and timing of chemical control for stem canker disease on dragon fruit in the Philippines. (Author's abstract)

**Keywords:** *Dragon fruit, Stem canker, Hylocereus spp., Agriculture*

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0113

### **Utilization of common salt (NaCl) as component of fertilizer program for BR 25 and UF 18 Cacao (*Theobroma cacao* L.) clones**

*Valleser Vences C, Valleser, J*

In some crops, common salt (NaCl) is used to replace a certain rate of KCl fertilizer primarily due to the economic advantage of the former. Hence, this study was conducted to evaluate the growth of two cacao cultivars in response to varying K<sub>2</sub>O:NaCl rates and to determine the effects of varying K<sub>2</sub>O:NaCl ratios on cacao growth. The experiment was arranged in a 26 factorial in Randomized Complete Block Design with three replications. Cacao cultivars (BR 25 and UF 18) served as Factor A, whereas Factor B was composed of varying K<sub>2</sub>O:NaCl ratios (i.e., control, 100% K<sub>2</sub>O+0% NaCl, 75% K<sub>2</sub>O+25% NaCl, 50% K<sub>2</sub>O+50% NaCl, 75% K<sub>2</sub>O+25% NaCl, and 0% K<sub>2</sub>O+100% NaCl). BR 25 performed better than UF 18 cacao clone in terms of shoots developed at 8MAT and 12MAT and in terms of leaves and branches formed at 12MAT. The varying K<sub>2</sub>O:NaCl ratios failed to show significant effects on the growth of the two cacao clones. Moreover, no significant interaction effects were observed between cacao clone and K<sub>2</sub>O:NaCl ratio in all the plant growth parameters gathered. D-leaf tissue analysis revealed no significant differences in N, P, K, Ca, Mg, and Na uptake of plants amongst cacao clone, K<sub>2</sub>O:NaCl ratios, and their treatment combinations. However, in terms of Na<sup>+</sup>, UF 18 had higher uptake than the BR 25 cacao clone, although the results were not significant. In addition, there was an increasing Na<sup>+</sup> concentration in cacao plant as higher rate of NaCl was applied in UF 18 cacao clone. The study revealed that cacao clones have had different responses to NaCl fertilization. (**Author's abstract**)

**Keywords:** *Common salt, NaCl fertilizer, BR 25, UF 18, Cacao clones, Agriculture*

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0114

### **Utilization of mango pectin in processing of fruit-flavored soymilk and soy-based yogurt**

*Pariñas, Jelly, Hernandez, Rica Rose, Gragasín, Ma. Cristina, Galang, Madel, Rustia, J*

Consuming soy food products such as soy milk and soy yogurt provided many health benefits. However, innovations must be continuous to have soy-based products with optimum quality. The study focused on the utilization of mango pectin blend in processing fruit-flavoured soymilk and soy-based yogurt. Addition of pectin was done to stabilize the products and improve the texture. Blended mango pectin was also utilized as fat replacer to mimic the mouthfeel of lipids in these low calorie foods. Low cost maltodextrin was blended with pure mango pectin to reduce the cost of the stabilizer and to improve the characteristics and acceptability of the two products. Effects of fresh and canned pineapple juice and two levels of sugar on the sensory qualities of soymilk were determined after pasteurization. Physical and chemical properties of soy-based yogurt as affected by the type (citrus pectin and blended mango pectin) and levels of stabilizers (0.1% and 0.05%) were evaluated. Pineapple-flavoured soymilk has total soluble solids of 12-14%, pH of 7.0 and total titratable acidity of 0.30-0.36. The product also has a protein content of 2.44-2.84%. Soy-based yogurt has total soluble solids of 7.57-8.13, pH of 4.17-4.30 and titratable acidity of 0.35-0.44. Protein content of the yogurt ranged from 2.26-3.09%. Soymilk with 10% sugar is more acceptable to consumers. Fruit-flavoured soymilk samples with fresh pineapple juice were more acceptable in all the sensory parameters evaluated. Soy-based yogurt with 0.05% mango pectin blend has the highest mean overall acceptability. Sensory evaluation also revealed that this treatment was preferred by most consumers in all the evaluated attributes. (**Author's abstract**)



**Keywords:** *Mango pectin, Fruit-flavoured soymilk, Soy-based yogurt, Agriculture*

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0115

### **Utilization of NDVI and thermal imaging in detecting water-deficit stress in ten high-yielding sugarcane varieties**

*Santos, Primitivo Jose A. , Quillo, Erwin P. , Carpentero, Arvin S. , Renovales, Eunice M. , Maravilla, Ana Mikaela B., Delfin, Evelyn*

NDVI and Thermal Imaging are two aerial imaging processes that use images taken by specialized cameras attached to a plane or quadcopter. NDVI (Normalized Difference Vegetative Index) utilizes the amount of NIR and visible light reflected by the plant's leaves to estimate the health and density of vegetation while thermal imaging creates images based on the amount of heat reflected by the object being captured. These two processes were used in monitoring an experimental field of sugarcane plants which were subjected to drought stress. Ten HYVs developed by the Sugar Regulatory Administration (SRA) were subjected to drought at 3 months old (tillering stage). Watering was withheld for two months for the drought plots while control plots were regularly irrigated. Throughout the stress imposition, NDVI and canopy temperature, as well as chlorophyll content data were gathered on a weekly basis. At 5 months old, the sugarcane plants were recovered and grown until 12 months for harvesting. Statistical analysis showed significant varietal differences in NDVI values among varieties with Phil 2004-1011 having the highest NDVI value of 0.041667. Canopy temperature and chlorophyll content data significantly differentiated drought and control plots. NDVI data were also highly correlated to cane (TC/Ha) and sugar (LKG/Ha) yield which will be useful in the early assessment of yield. In this study, NDVI and Thermal Imaging have been found useful in differentiating moisture stressed from well-irrigated plants. This technology shows promise in the easy and rapid mass screening of crops grown over a large area, with precise and reliable data. **(Author's abstract)**

**Keywords:** *Sugarcane, NDVI, Thermal imaging, Drought, Agriculture*

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0116

### **Utilization of shrimp head into powder form**

*Peralta, Deserie , Montojo, Ulysses , Delos Santos, Virginia , Nebres, Vivian , Narida, Camille , Obinque, Ado*

Shrimp head discarded as waste in processing plants is a good source of marine protein and oils. When improperly disposed, however, it can contribute to environmental problems. This study developed a processing method of utilizing shrimp head into powder form using cabinet type drying. Developed powder was cooked for two hours at 90°C with moisture content of 51.46%. Drying temperature for cooked shrimp head was 70°C for 16-18 hours until moisture content and water activity reached <10% and <0.3, respectively. Dry-cooked shrimp head were pulverized and sieved using 212 µm mesh sieve. Physical characteristics, microbiological load, and chemical composition of the final product were analyzed in triplicates. The product had a percentage yield of approximately 20% final weight. Shrimp head powder was refined, orange brown in color, and had a strong flavor. Odor of the shrimp were evaluated as "like very much". The peroxide value of the samples was 4.36meq kg<sup>-1</sup>, which indicates the freshness of the product. Laminated aluminum pouch was used for packing the product with a shelf life of six months. **(Author's abstract)**

**Keywords:** *Shrimp head powder, Cabinet-type drying, Utilization of shrimp head, Agriculture*

### **Validation and comparative yield trial using nutrient expert for maize in corn production in the Philippines**

*Descalsota, Jesse , Santos, Primitivo Jose A. , delos Santos, Ernesto , Pampolino, Mirasol , Luar, Lovely , Ocampo, Apolonio M. , Ruazol, Aeron A. , Mateo, Nel Oliver B., Oberthur, Tho*

Nutrient Expert for Maize™ (NEM) is a software decision tool which generates a guideline for fertilizer management to increase yield and profit for traditional, open-pollinated, and hybrid varieties of corn in the Philippines based on the 4R principle: right source, right rate, right time and right place. The algorithm and decision rules of Nutrient Expert for developing fertilizer guides lie upon the use of existing information on related farming practices and site characteristics. Attainable yield goal, on the other hand, is determined by using information on yield responses evaluated through nutrient omission plot technique. In the absence of omission plot trials data, estimates are made by the software based on current yield, climatic environment and soil fertility. Attainable yield is determined by variety type and agro-ecological condition of the crop. Yield of hybrid corn is 8-10 t/ha, open-pollinated varieties, 5 t/ha, and traditional varieties, 3 t/ha. To test the efficacy of the estimates generated by the Nutrient Expert, these were considered as 4R prototypes and then subjected to field validation. A total of 190 farmer-cooperators in 16 regions throughout the country participated in this evaluation. Yields from Nutrient Expert-generated (NE) treatments and from the existing farmer's fertilizer practice in a location (FFP) were compared to determine the extent of efficiency of the software in increasing optimum yield of corn. Result showed that NE treatment gave a greater yield than FFP in 119 out of 124 farms (96%). Moreover, the NE treatments were also able to achieve the attainable yield in 57 out of 68 farms from the 8 regions (83.8 %). The use of NEM increased yield by an average of 1.2 t/ha and profit of Php 12,837 per ha/crop. With these results, the use of Nutrient Expert for Maize proves that yield and profit can be increased. **(Author's abstract)**

**Keywords:** *Nutrient Expert, FFP, Omission plot, Corn variety, 4R, Agriculture*

### **Variability in fruit characters of guava (*Psidium guajava* Linn.) accessions from Luzon, Philippines**

*Sison, Maria Luz J., Guevarra, Maria Luisa D., Bengoa, Jennelyn C*

Guava is a minor fruit crop in the country. Owing to its health benefits and processing potential, it faces a brighter prospect for increased utilization. It is usually consumed fresh, but is also utilized by the processing industry, particularly for juice cocktail and instant soup base. The Institute of Plant Breeding is developing guava varieties both for fresh consumption and for the processing industry. Just like in any crop improvement program, success largely depends on the available germplasm. Hence, collection was done to enhance existing germplasm, and fruit evaluation was performed to assess the different quantitative and qualitative fruit traits. A total of 55 guava accessions were collected for germplasm enhancement in the form of fruits, seeds, or grafted seedlings. Thirty-five accessions were evaluated for different fruit characteristics. The quantitative characters were very variable, with fruit weight ranging from 18.2–457.0g, equatorial diameter of 3.1–8.9 cm, longitudinal diameter of 3.7–10.5cm, flesh thickness of 0.5–2.1cm, and TSS of 5.2–13.5°B. Likewise, qualitative traits showed high variability. Flesh color varied from white, yellow, pink, red, to dark red/purple; and fruit color from greenish yellow, light yellow, dark yellow, to dark purple. Fruit shapes were high round, round, oblong, ovoid, to pyriform, while skin texture ranged from very rough to very smooth. The taste/flavor was recorded from very sour to very sweet, with mild to strong aroma.

Clustering analysis based on quantitative characters revealed four major groups. Twelve promising accessions were selected as potential parents for breeding activities. **(Author's abstract)**

**Keywords:** *Cluster analysis, Crop improvement, Germplasm, Guava, Agriculture*

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0119

### **Variability of fruit and nut endosperm characters of sugar palm (*Arenga pinnata* (Wurmb) Merr.)**

*Magsino, Analita dM. , Baltazar, Miriam D., Elumba, Monina Dyan R. , Ersando, Cherry A*

Sugar palm or Kaong (*Arenga pinnata* (Wurmb) Merr.) is a type of indigenous palm in the Philippines that has high economic importance. It is often used as desserts and sweets. Despite its economic potentials, this crop is considered under researched. This study evaluated the fruit and endosperm variability of sugar palm. About 2,500–4,000 samples were randomly collected from eight towns in Cavite. Four fruit characters and six endosperm characters were evaluated. Shannon-Weaver Diversity Index was used to determine fruit and nut diversity, while correlation coefficients of selected character combinations were computed following PROCC CORR (SAS System 1985). Results showed wide variability in the fruit length, fruit weight, fruit diameter, fruit color, number of endosperm, weight of endosperm, pH, and percent edible portion. Narrow variability was exhibited in the endosperm color, endosperm shape, and endosperm tenderness. Meanwhile, strong positive correlations were found between fruit weight and fruit diameter and between endosperm weight and percent edible portion. Results further showed that the eight towns showed differences in fruit and nut characters. For example, samples from Indang had higher fruit weight and fruit diameter, while those from Mendez were longer than those collected from the other locations. Furthermore, nut endosperm pH from Tagaytay City, Amadeo, and Silang were less acidic, while tenderness of nut endosperm and percent edible portion were superior in General Emilio Aguinaldo. The results of this study serve as benchmark information for sugar palm selection and future breeding activities. **(Author's abstract)**

**Keywords:** *Sugar palm, Variability, Cavite, Arenga pinnata, Agriculture*

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0120

### **Varietal evaluation of yellow corn hybrids, open-pollinated, and glutinous corn varieties in Ilocos Region, Philippines**

*Julian, Constante B. , Remolacio, Ma*

This study was conducted at the Mariano Marcos State University Experimental Farm from 2015 wet season to 2016 dry season under the San Manuel and San Fernando Soil Series. It aimed to (1) evaluate the performances of corn hybrids, open pollinated varieties (OPVs), and glutinous corn for yield and other agronomic characteristics and (2) recommend to the National Seed Industry Council (NSIC) the corn varieties for national and regional commercial releases. Results of the study revealed that most of the varieties performed well under the Ilocos condition. Significant variations were also observed on the agronomic and yield characteristics of the different entries evaluated. During the wet season trial, two yellow corn hybrids (i.e., KK 1616 and BIO 9780) outyielded the check varieties. On the other hand, during the dry season trial, six varieties (i.e., TCT 1709, PP 8107, P 3774R, PP 8301, PP 8101, and PP 8302) performed better than the check varieties. In terms of the white and yellow OPVs, MMSU Glut2 produced higher yield than the check variety did during the wet and dry season trials. Other varieties that performed better than the check varieties were IES Cn 7, USM NCH 35, USMARC TC 109, IES 10-04,

USMARC 1413, USMARC 308, TCT 159, and CVRC 15-10. All of the entries evaluated were resistant to corn borer and foliar diseases. Due to the good performance of these varieties, the Corn and Sorghum Technical Working Group recommended to the NSIC the varieties PP 8001 and PP 8102 for seed increase in Luzon, and PP 8107 for Luzon and Visayas. Other entries like TCT 1709, PP 8101, P 4097 R and P 3774 R were also recommended for commercial release in Luzon, whereas PP 8301 was recommended for Luzon and Visayas. MMSU Glut2 was also recommended for commercial release in Visayas and USMARC 1413 (a yellow OPV) was recommended for Visayas and Mindanao. (Author's abstract)

**Keywords:** *Glutinous corn, Hybrid corn, Open-pollinated corn varieties, Agriculture*

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0121

### **Varietal improvement of eggplant**

*Pascua, Miriam E., Lutap, Leticia A., Villarin, Alecsis G., Ramos, Jonat*

A study was conducted to improve the productivity of eggplant through the development of hybrids which can outperform the parental lines for wet season planting. It aimed to identify plant genotype with good superior, high yielding and eating quality specifically for culinary purposes after which pureline selection was done to produce stable lines from one generation to another. Results showed that based on farmer preference, acceptability rating, reaction to pest and yield components, three promising F<sub>1</sub> Hybrid eggplant were of good potential for wet season planting. These three promising F<sub>1</sub> eggplant hybrids were coded as: MMSU Eg-08, MMSU Eg-06 and MMSU Eg-02. The different MMSU F<sub>1</sub> eggplant hybrids outyielded the check varieties especially during wet season planting. Through series of selection from the F<sub>2</sub> progeny plants up to F<sub>5</sub> generations, eight promising lines potential for wet season planting were also identified and were coded as follows: MMSU Eg-08 GP, MMSU Eg-08 MP, MMSU Eg-02 LV, MMSU Eg-08 LS, MMSU Eg-06 LT, MMSU Eg-02 V, MMSU Eg-02 GV and MMSU Eg-02 G. When evaluated in farmers' field, the performance of the different varieties at different locations varies in terms of yield and reaction to pest using different fertilizer management scheme. The promising MMSU eggplant varieties gave a considerable yield and comparable to the check varieties, although, yield obtained was higher when planted in an inorganic farm as compared to farmers using organic and good agricultural practices. Cost and return analysis also shows that almost MMSU eggplant varieties obtained lowest unit cost of production as compared to the check varieties. (Author's abstract)

**Keywords:** *Hybrid eggplant, Wet season planting, Improved productivity, Pureline selection, Farmers field, Agriculture*

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0122

### **Can varmix system be an alternative technology for mitigating the effects of biotic and abiotic stresses**

*Francia, Fred Jan A., Pacada, Imeldalyn*

Anonang (*Cordia dichotoma* Forst) stem cuttings were rooted in five different soil media to determine survival and rooting performances. Significant differences among four rooting media came out. Treatment 4 (1:1:1 mixture of top soil, fine sand, and partly decomposed rice hull) had the highest mean survival of 47.5%. This was significantly higher than T2 (partly decomposed rice hull), T1 (top soil), and T3 (1:1 mixture of fine river sand and top soil) with a mean survival of 25%, 10%, and 5%, respectively. The results of the number of adventitious roots formed during the rooting period showed that there were no significant differences among the media used for rooting. Although T4 obtained the highest number of roots with a mean of 2.5, this was not significantly higher

than the rest of the media used for rooting. As regards rooting, Treatment 4 resulted in longest roots with a mean length of 15.92cm. This was significantly different from the results of T2, T1, and T2, which had a mean length of 5.46 cm, 4.43 cm, and 2.28 cm, respectively. Among the five rooting media used in propagating Anonang cuttings, T4 was found to be the best medium in rooting stem cuttings. **(Author's abstract)**

**Keywords:** *Anonang, Cordia dichotoma, Soil media, Agriculture*

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0123

### **Verification of the developed pest management products for vegetable production using different fertilizer management schemes**

*Ramos, Jonathan R., Villarin, Alecsis G., Lutap, Leticia*

Due to the increasing concern about the risk associated with chemical pesticides, development of alternative control methods for crop production such as the use of biopesticides against major pests of vegetable crops is a necessity. Mariano Marcos State University (MMSU) researchers were able to develop promising biopesticide products for the common insect pests of vegetable like tomato fruitworm, thrips and mites for pepper and epilachna beetles in eggplant. The different products were coded as MMSU Bio-In 3, MMSU Bio-In 6 and MMSU Bio-In 8. Using the formulated biopesticide products, the effectiveness was comparable to chemical pesticides in an organic farm. The effectiveness of the products was verified also in an inorganic and in combination of organic and inorganic farm. Results show that the effectiveness of the developed MMSU Biopesticide products was comparable with chemical pesticide regardless of different fertilizer management scheme. Lower pest incidence was noted and comparable to the chemical pesticide. Further, effectiveness of the biopesticide was enhanced when used as an alternate to chemical pesticide as indicated by the higher yield obtained in all the crops evaluated. Cost and return analysis also shows that the developed MMSU Biopesticide was comparable to chemical pesticide especially when used as an alternate to chemical pesticide. Based on the findings, the use of biopesticide presents a promising future for safer and lesser if not pesticide-free vegetables and less dependence of farmers on the use chemical pesticide. **(Author's abstract)**

**Keywords:** *Biopesticide, Efficacy, Pest and diseases, Organic, Inorganic, Combination, Agriculture*

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0124

### **Water quality and economic productivity of fish cage operation in Lumot Lake, Cavinti, Laguna**

*Arroyo, Keycelien E., Luna, Za*

This paper presents a baseline data of the economic productivity and water quality of Lumot Lake in Cavinti, Laguna. The economic productivity of fish cage operations in the research site was measured through a simple Cost Return Analysis. The yield of fish cage operators in the lake were computed through the data gathered from surveys and direct interview with the respondents. The data obtained from the fish cage operators showed high fish (Tilapia) production in the lake. Water quality parameters (i.e., temperature, transparency, pH, dissolved oxygen, salinity) were measured using specific instrument, while water hardness and nitrogenous compound (i.e., phosphate and nitrate) were brought to the laboratory for further analysis. The study further showed that the Lumot Lake's water quality was within the standards set by the Environmental Management Bureau of the Department of Environment and Natural Resources. The above water quality parameters were also analyzed and compared

with the water quality requirements of tilapia. Results showed that all of these were within the required limits for the growth and survival of this fish species. **(Author's abstract)**

**Keywords:** *Fish cage productivity, Water quality, Physico-chemical, Parameters, Economic productivity, Agriculture*

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0125

### **Are we food insecure? A community-based agricultural systems assessment tool for food security**

*Dayo, Maria Helen F. Tamisin, Leonardo L. Jr., Pangga, Gina V., Wagan, Ampa*

With the current threats to food security, it is of high importance at this time to look at agriculture based on the four dimensions of food security: availability, stability, access and nutrition-sensitivity/food safety. The aim is to provide information that may serve as basis for planning, developing and implementing agricultural interventions to ensure that foods are available at all times, inspite the natural and anthropogenic disruptions, able to supply the nutritional requirement and food safety standards are followed, enhances capability to obtain variety of food sources through agricultural livelihood. Measurable indicators were determined for each food security dimension and indicator values are obtained using the Likert scale. Availability indicators focused on the production of staple crops, diversity of the crop production systems including the presence of alternative food crops. Temporal availability of foods are considered critical. Stability indicators focused on the condition of the natural and socioeconomic resource base that will affect food production. Food access emphasized physical and economic access to food. Capability to supply the basic nutrients and to comply with food safety standards completed the indicators. Results can be plotted in a radar graph to clearly illustrate weaknesses and strength of the production system from which RDE and policy recommendations can be formulated to ensure that the production system addresses food security. A test of the methodology was done in a diversified farming system in in Lucban Quezon. The tool provides an easy to understand, easy to follow procedure and the results can be easily translated into actions and policies at the local level. **(Author's abstract)**

**Keywords:** *Food security, Agricultural systems, Availability, Stability, Nutrition-sensitivity, Food safety, Agriculture*

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0126

### **Year-round performance of inbred and hybrid rice varieties as affected by different locations and planting dates**

*Astejada, Maribelle P. , Dela Cruz, Quirino D. , Agustin, Mario B., Domingo, Florida A. , Cinense, Veronica*

The study was undertaken to evaluate the agro-morphological and identify suitable inbred and hybrid rice varieties under different locations, as well as the best planting time to plant that will give higher yield for each particular location. Four hybrids (Bigante, LP 937, Pioneer, SL8 H) and four inbred (NSIC Rc 130, NSIC Rc 160, NSIC Rc 216 and NSIC Rc 222) were grown from May 2016 to April 2018 in four provinces (Aurora, Nueva Ecija, Tarlac and Zambales) of Central Luzon, Philippines. The varieties were laid-out following the Randomized Complete Block Design (RCBD) were the four provinces or locations were assigned as the blockings/replications. Results indicate that Aurora and Nueva Ecija provinces obtained longer growing period, taller plants, higher number of productive tillers, higher seed setting as compared to Tarlac and Zambales provinces. With respect to yield, Aurora (3.60-5.04 t/ha) and Nueva Ecija (2.66-4.08 t/ha) showed a better yield performance over the two provinces,

Tarlac (2.43-3.56 t/ha) and Zambales (2.83-3.77 t/ha). Higher yield was noted from Bigante hybrid which ranged from 3.42-5.04 t/ha while no significant differences were noted from the inbred varieties. After varietal testing and evaluation on a year round monthly planting, Aurora can produce better yield following the months of planting in December, January and February for hybrid as well as inbred while Nueva Ecija and Tarlac can follow planting during the months of November, December, February, May, June and July for inbred and hybrid. Zambales province can follow months of planting during the months of December, January, June and July for inbred and hybrid. **(Author's abstract)**

**Keywords:** *Rice (Oryza sativa L.), Agro-morphological, Inbred, Hybrid, Agriculture*

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## ANTHROPOLOGY

0127

### **Accessibility to and utilization of healthcare services pre- and post-typhoon Yolanda as perceived by senior citizens in a rural area in the Philippines**

*Silvano, Arnul*

The problems of accessibility to and utilization of healthcare services are fundamental and constant issues in every country's healthcare system especially among the senior citizens. The study investigated the accessibility to and utilization of healthcare services among senior citizens in the Province of Leyte as determined by the predisposing, enabling, and need factors. The sample consisted of 496 60 years old and above senior citizens from randomly selected barangays of Districts 1 and 2 of Leyte Province. An interview schedule was designed to gather data through structured interviews. The data were analyzed using descriptive statistics to determine the level of accessibility and utilization, Point-biserial and Pearson product-moment correlation coefficient (Pearson's *r*) and eta correlation to check significant relationships among variables, and multiple linear regression to identify predictors of accessibility and utilization. Findings revealed that sex, occupation, primary source of income, health status, medical condition, and disability had weak correlations with accessibility and utilization during pre-typhoon and post-typhoon. Lastly, medical conditions and health status were the best predictors of accessibility and utilization during pre-typhoon and post-typhoon. These findings lead to the development of a local model on the accessibility to and utilization of healthcare services that are ore reflective for senior citizens in rural areas in the Philippines. More research is needed to replicate these results to substantiate the significance of addressing the healthcare needs of the senior citizens in rural areas. **(Author's Abstract)**

**Keywords:** *healthcare, accessibility, utilization, senior citizens, rural Philippines, Anthropology*

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0128

### **Association of topography with demographic and socioeconomic factors to the compliance and non-compliance of mothers to reproductive health Services**

*Gadong, Joshua Vincent Y. , Dofitas, Adrian Bernard A. , Bordon, Jenn Margarette B. , Brazas, Jodelyn M. , Azarraga, Alyssa Faye N. , Gestuveo, Rommel J. , Arbizo, Joseph L. , Padilla, Phillip Ian P. , Sumayo, Marilyn S., Matinong, Kathleen Erica D. , Paguidopon, Cyril L. , Tabañar, Bianca Ysobel S. , Tantuan, Liza Beth F. , Temelo, Jason Andrei C. , Ynzon, Samue*

In order to alleviate the reproductive health status of mothers in the Philippines, there should be a better understanding of the factors influencing their compliance to reproductive health services. The study examined the association of topography with demographic and socioeconomic characteristics on the compliance of reproductive health services. This study analyzed survey data collected in 2017 among mothers in the rural community of Maasin, Iloilo, Philippines. The statistical tools Chi-square, T-test and logistic regression were used to determine the factors associated with the likelihood of mothers to comply with prenatal care, family planning and delivery care services. There is no significant difference in the number of mothers who comply with prenatal care services and family planning services between lowland and highland barangays. However, mothers from the highland barangays are more likely to have non facility-based delivery (NFBD). Only educational attainment was found to be significantly associated for prenatal services. Only parity was significantly associated with compliance to family planning services. Age, parity, educational attainment and occupation were significantly associated with compliance to delivery care service. The odds of NFBD in the highland area is 2.44 (95% CI: 1.40 to 4.23) times higher as compared to the mothers residing in the lowland area. The odds of NFBD also increases by 7% (95% CI: 3% to 11%) per year increase in age. There is a great need to restructure the delivery of reproductive health services to accommodate mothers from highland barangays who still opt for NFBD. Topography, demographic and socioeconomic factors should be considered in developing strategies and implementation of reproductive health care services in the Philippines. Furthermore, the researchers recommend to include in future studies other reproductive health services such as postnatal care in order to fully grasp the reproductive health in the country. **(Author's Abstract)**

**Keywords:** *family planning, prenatal care, facility-based delivery (FBD), reproductive health services, topography, demographic and socioeconomic characteristics, Anthropology*

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0129

## **A comparison of job satisfaction among Filipino nurses employed in the Philippines and overseas**

***Legaspi, Ruth Sha***

The shortage of nurses has led to increasing competition in the recruitment and retention of nurses globally. According to literature, retention of nurses is correlated with job satisfaction, making it an important topic for research. This study compared the level of general, intrinsic, and extrinsic job satisfaction of Filipino nurses employed locally and overseas. It identified the major motivators and problems that affect their job satisfaction. Eighty-four nurses were surveyed using the Minnesota Satisfaction Questionnaire. Fifty-five were locally-employed, while 29 were overseas Filipino nurses. The Mann-Whitney U Test was used to determine the significant difference in the level of satisfaction among the two groups. Answers on the open-ended questions were used to validate the quantitative data. The results showed that Filipino nurses employed both locally and overseas have an average level of general satisfaction. Both groups also showed a high degree of intrinsic satisfaction and an average degree of extrinsic satisfaction. There is no significant difference found in the level of general, intrinsic, and extrinsic job satisfaction of locally and overseas employed Filipino nurses. The study found that social service, an intrinsic factor, is the major motivating force of job satisfaction. Workload, an extrinsic factor, is the most common problem encountered for both groups of nurses. Salary serves as one of the factors that keeps Filipino nurses overseas satisfied, while it is one of the factors that causes dissatisfaction among locally-employed nurses. **(Author's Abstract)**

**Keywords:** *job satisfaction, nurses, overseas Filipino nurses, Anthropology*

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## Factors associated with unmet need for family planning among young women in the Philippines

*Latorre, Angelica A*

The sociodemographic shift in sexual initiation, low contraceptive and family planning use pose threat in the reproductive health and well-being of young people. Despite the rise in sexual activity among young people before reaching the age of 18, prevalence of contraceptive use remains low while unmet need for family planning among married and sexually active women is consistently highest among women 15-19 years old compared to any other age group. The observed trend in the reproductive health practices of young people, as well as the paucity of literature on adolescent reproductive health, warrant the need for studies that focus on family planning and sexual behavior of young people. This study aims to determine the factors associated with unmet need for family planning among sexually active women aged 15-19 years in the Philippines. This study used the data from the National Demographic Health Survey 2017. The analysis included only the fecund and sexually active women aged 15-19 years old. Logistic regression was performed in order to determine the significant predictors of unmet need for family planning among young women. Sixty-eight percent of women reported secondary education as the highest level of education attended. Knowledge on modern family planning method is high at 99% while the proportion of women with knowledge of ovulatory cycle, and knowledge on possibility of getting pregnant after giving birth and before the return of menstrual cycle are 21% and 61%, respectively. The proportion of women who responded that their husbands/partners desire the same number of children is 68%. Multiple logistic regression and stepwise selection procedure showed that husband's fertility preference is a significant predictor of having unmet need. Addressing the issue on low family planning and contraceptive use among young women in the Philippines requires concerted efforts that aim to cater to the needs of both men and women in this age group. The consistently low family planning practice among young people despite the overall improvement in the proportion of family planning users among women indicates the need for variability in strategies that target young and older age groups. Further research should be conducted in order to gain better understanding of the determinants of unmet need for family planning among young people. (**Author's Abstract**)

**Keywords:** *unmet need for family planning, young women, adolescent reproductive health, teenage contraceptive use, family planning services, Anthropology*

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## Temporary international labor migration and quantum fertility: evidence from the Philippines

*Del Mundo, Jocelyn C., Del Mundo, Michael Domi*

This paper examines the impact of temporary international labor migration on completed marital fertility using the 2010 Census of Population data from the Philippines. The case of the Philippines is investigated because it is uniquely a major source of male and female labor migrants to over 100 countries in the world. The study was conducted to identify the trends in male and female Filipino migrants to various destinations and to quantify the impact of international labor migration on completed marital fertility in the Philippines. A Two Stage Residual Inclusion Censored Poisson model was used to handle problems of endogeneity and observation censoring. The results provide strong evidence for the negative impact of international labor migration on completed fertility that can be similarly observed for married women with Overseas Filipino Worker spouses and married women who are Overseas Filipino Workers themselves. These women who are exposed to labor migration exhibit approximately 60 percent lower completed fertility compared to women not exposed to labor migration. The negative impact can be attributed to the long and cyclical spousal separations that disrupt couple childbearing and the assimilation and adaptation of destination country low fertility norms. The findings of the paper contribute to the sparse demographic literature on the effect of migration on fertility in sending regions and countries. (**Author's Abstract**)

**Keywords:** *migration, fertility, Philippines, sending country, Anthropology*

## **Type and severity of intimate partner violence and formal help-seeking among women in the Philippines**

*De Guzman, Ma. Lourdes Rossana E., Bermudez, Amiel Nazer C., Co, Kim Carme*

In the Philippines, 25% of ever-married women reported experiencing some form of violence from their partner, but only 10% of them actually sought medical or legal help (NDHS, 2013). The objective of this study was to describe the type and severity of intimate partner violence experienced, and its association with formal help-seeking, among women aged 15-49 years in the Philippines.

The cross-sectional data used for this study came from the National Demographic and Health Survey of women ages 15-49 years old conducted in 2013. To estimate the association of interest, confounders were identified using the change-in-estimate criterion and were controlled by multiple logistic regression modelling.

Among women aged 15-49 years who experienced intimate partner violence, those who experienced all types of abuse had the highest proportion of formal help-seeking (7.3%), while women who experienced only sexual abuse had the lowest (0 out of 67). Controlling for the effect of other variables, women who experienced severe physical abuse were more likely to seek medical or legal assistance compared to those who experienced moderate physical abuse (OR=4.77; 95% Confidence Interval: 1.96–11.62).

Formal help-seeking rates were low among victims of intimate partner violence in the Philippines. Severity of abuse experienced is likely an important factor in seeking medical and legal help. These systems should thus be capable of handling severe cases of abuse in order to address the needs of women who seek help. Efforts should be made to increase formal help-seeking among all victims of domestic violence. (**Author's Abstract**)

**Keywords:** *intimate partner violence, domestic violence, physical violence, help-seeking, formal help-seeking, Anthropology*

## **BIOLOGY**

## **Age-based growth variation of green-blotched parrotfish *Scarus quoyi* in the Southern Philippine Seas**

*Abpi, Muhammad Monzer, Nañola, Cleto L. Jr., Mata, May Anne E., Elumba, Merl*

Age structures of *Scarus quoyi* populations among three different bays (Davao Gulf, Pujada Bay, and Sarangani Bay) within a spanning distance of ~300 km in the southern Philippine seas were estimated by analyzing sagittal otoliths of 264 individuals. Growth from each study location was fitted using von Bertalanffy growth functions (VBGF) and the derived size-at-age trajectories for the three populations were compared. The 95% confidence interval ellipses around least squares estimate of  $K$  and  $L_{\infty}$  showed non-overlapping regions, indicating strong differences among the examined populations. The difference in growths among Davao Gulf ( $K=1.00941$ ), Pujada Bay ( $K=1.35561$ ), and Sarangani Bay ( $K=0.98114$ ) populations are statistically significant. The Davao Gulf population achieved larger mean asymptotic size than populations from Pujada Bay and Sarangani Bay. These variations could possibly suggest that growth rate differences are related to monsoon-driven seasonal changes, level of nutrient load and food availability, and habitat structure—including the type of substrate on the reef. (**Author's abstract**)

**Keywords:** Age, Growth, Otolith, Parrotfish, *Scarus quoyi*, Southern Philippines, von Bertalanffy equation, Biology

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0134

### **Angti-fatigue effects of glutinous rice (*Oryza sativa* L. var. *Glutinosa* (Lour.) Körn) in white mice (*Mus musculus domesticus* L.)**

***Leoveraz, Ma. Elizabeth , Mojica, Jennifer , Francia, Fre***

This study evaluated the anti-fatigue effects of glutinous rice in white mice by determining levels of blood lactate dehydrogenase (LDH), blood urea nitrogen (BUN), and hemoglobin after weight-loaded forced swim test (WFST). The increase in blood lactic acid is one of the reasons for fatigue during physical exercise, which is also true for urea nitrogen (Wei et Al. 2010; Wang et al. 2008). Three different dosages of glutinous rice were tested (T1=3.75 g, T2=2.62 g, T3=4.82 g, control [regular feeds]=3.75 g) per 100 g body weight. The mice were fed with pelleted glutinous rice for seven days and subjected to a WFST prior to the last day of feeding. After the swim test, the mice were allowed to rest for 30 minutes before composite blood samples were withdrawn. Results revealed that different dosages of glutinous rice showed significant anti-fatigue effects in mice. High dosage (T3) of glutinous rice prolonged swimming time up to 117 minutes compared to 48 minutes for the control. Meanwhile, normal dosage (T1) lowered blood LDH levels (240.27 U L<sup>-1</sup>; control=399.90 U L<sup>-1</sup>,  $p<.05$ ) and at the same time reduced BUN levels (10.5 mg dL<sup>-1</sup>; control=22.8 mg dL<sup>-1</sup>,  $p<.05$ ). Furthermore, higher blood hemoglobin content (164.67 g L<sup>-1</sup>; control=137 g L<sup>-1</sup>) was observed in mice under low dosage (T2). **(Author's abstract)**

**Keywords:** Anti-fatigue, Glutinous rice, Weight-loaded forced swim test, Blood test, Mice, Biology

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NP

0135

### **Anti-angiogenic activity of coral plant (*Jatropha multifida* Linn.) crude leaf extraction on duck (*Anas platyrhynchos*) eggs using Chorioallantoic Membrane (CAM) assay**

***Domingo, Doreen , Luna, Keith , Sagsagat, Karizma Joy , Delos Reyes, Mitch Joe , Casimiro,***

The aimed to investigate the anti-angiogenic activity of the leaf crude extract of Coral plant (*J. multifida*) using Chorioallantoic Membrane (CAM) Assay of duck eggs (*A. platyrhynchos*). A group of experimental ducks treated with 10 ug/ml, 50 ug/ml, and 100 ug/ml of *J. multifida* extracts, dexamethasone (positive control), PBS (negative control) and an untreated control were considered. Data gathered focused on the number of branching points, diameter of blood vessels, angular spectrum, and 3D image analysis. Results showed that in the 100 µg/ml treatment, 62.67% blood vessel inhibition was observed on the first day observation while 91.42% on the second day of observation. Image analysis using 3-D view of the CAM and angular spectrum revealed a parallel result with the % inhibition of blood vessels. Diameter of the blood vessels was directly proportional on the concentrations of the plant extract. Significant differences in the percent inhibition in the 50 µg/ml and 100 µg/ml treatments were observed compared to the negative and untreated controls. No significant differences were shown among the treatments in terms of diameter of the blood vessel. It can be concluded that *J. multifida* leaf crude extract has anti-angiogenic potential which can be further explored for medicinal purposes like in the inhibition of tumor metastasis.. **(Author's abstract)**

**Keywords:** Chorioallantoic membrane, Antiangiogenesis, Vascularization, Inhibition, Blood vessel diameter, Biology

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### **Antifungal susceptibility and virulence of *Aspergillus fumigatus* environmental strains from a public tertiary hospital in Metro Manila, Philippines**

*Bungay, Alice Alma C., Ablola, Ferri*

The increase in the number of invasive *Aspergillus* infections has been observed among immunocompromised and hospitalized patients. In the Philippines to date, there is no published data that focused on the prevalence of *Aspergillus* species or any other thermotolerant fungal species in a hospital environment. This research served as a primary study to characterize the antifungal susceptibility of environmental strains of *Aspergillus fumigatus* from a hospital facility against three antifungal agents and to determine the virulence of these isolates on BALB/c mice using an animal survival assay.

Ten environmental strains of *A. fumigatus* were isolated from three air conditioned wards in a medical facility using Andersen Air Sampler. The antifungal susceptibility profile of the isolates were determined against voriconazole, amphotericin B and caspofungin. The virulence of these isolates were also tested on BALB/c mice using an animal survival assay. Moreover, the lung tissues of infected BALB/c mice were subjected to histopathological analyses using Gomori Methenamine Silver stain (GMS) and Hematoxylin & Eosin (H&E) stains.

Etest result for antifungal susceptibility testing showed that two of the ten isolates were resistant to amphotericin B (AF2-A and AF3-A); one isolate resistant to voriconazole (AF2-A) and an isolate that manifested nonsusceptibility to caspofungin m(AF2-A). Epidemiological cut-off values were determined for each antifungal following the M38-A2 CLSI guidelines. BALB/c mice median survival analysis revealed that the isolate with the highest Minimum Inhibitory Concentration (MIC= 4.89µg/ml) for voriconazole resulted to the most number of mortality with the least number of observation days. GMS AND H&E histopathology slides showed fungal elements embedded on left lung lobe of mice.

This study showed that there were strains of *Aspergillus fumigatus* from a hospital indoor air which were considered as resistant strains to voriconazole, amphotericin B and caspofungin (AF2-A and AF3-A). Lung tissues of infected mice showed characteristics of bronchopneumonia. (**Author's Abstract**)

**Keywords:** antifungal susceptibility, survival analysis, environmental isolates, Etest, Gomori Methenamine Silver Stain, Biology

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### **Antimicrobial coumarin derivative from *Delonix regia***

*Hofilena, Joy G., Ragasa, Consolac*

The dichloromethane extract of the air-dried leaves of *Delonix regia* afforded scopoletin (1) by silica gel chromatography. The structure of 1 was determined by spectroscopic methods and confirmed by comparison of its <sup>1</sup>H NMR data with those reported in the literature for scopoletin. Compound 1 exhibited antifungal activity against *Candida albicans* and antibacterial activity against *Pseudomonas aeruginosa*, *Escherichia coli*, *Staphylococcus aureus*, and *Bacillus subtilis*. It was inactive against the fungi, *Aspergillus niger* and *Trichophyton mentagrophytes*. (**Author's abstract**)

**Keywords:** *Delonix regia*, Leguminosae, Scopoletin, Antimicrobial, Biology

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**Antimicrobial flavonoid from *Hibiscus rosa-sinensis* Linn.**  
*Rufino, Leslie Ann A., Ragasa, Consolac*

The air-dried flowers of *Hibiscus rosa-sinensis* Linn., commonly known as gumamela afforded 5,7,4'-trihydroxyflavanone (1), also known as naringenin, and a mixture of hydrocarbons and squalene. The structure of 1 was elucidated by extensive 1D and 2D NMR analyses. Antimicrobial tests on 1 indicated low activity against the bacterium, *S. aureus* and fungi, *C. albicans* and *T. mentagrophytes*. Compound 1 did not exhibit cytotoxicity against a human lung non-small cell adenocarcinoma (A549) cell line and a normal Chinese hamster ovarian (AA8) cell line. (**Author's abstract**)

**Keywords:** *Hibiscus rosa-sinensis*, *Malvaceae*, 5,7,4'-trihydroxyflavanone, Naringenin, Antimicrobial, Biology

**Antimicrobial susceptibility pattern of *Escherichia* and *Salmonella* spp. isolated from street-vended food in Manila**

*Ganzon, Samantha Jane P., Shinotsuka, Riona Shelly C., Alawiya, Zohair M., Paraoan, Cielo E*

Street vended foods on R. Papa Street, Manila, colloquially known as "hepalane", are displayed under unhygienic conditions and are exposed to insects, polluted air, and contaminated water, which could influence the outbreak of foodborne diseases. Using culture detection technique, the presence of common foodborne pathogen, such as *Escherichia coli* and *Salmonella* spp., were detected on 25 samples of quail eggs, chicken intestines, pork dumplings, calamari, and fried hotdogs. A total of eighteen *E. coli* and eight *Salmonella* isolates were confirmed positive through polymerase chain reaction amplifying the uidA and invA gene, and were subjected to Kirby-Bauer disk diffusion to determine their antimicrobial resistance using 10 different antibiotics. Remarkably, 88.46% of the isolates were multidrug resistant (MDR) and were mostly resistant to tetracycline and penicillin group. In addition, 88.89% of the *E. coli* isolates exhibited an antimicrobial pattern of CIP-AUG-LEV-DXT-MN-AP-AK while 11.11% were resistant only to AK. For *Salmonella* spp., no prominent pattern was observed. It can be concluded that street vended food at the "hepalane" are hazardous to the health of the consumers as the presence of MDR foodborne pathogen were observed. (**Author's abstract**)

**Keywords:** *Antimicrobial resistance, Foodborne pathogen, Multidrug resistance, Polymerase chain reaction, Biology*

**Assessment of marine macrofouling communities in naval base Heracleo Alano, Cavite City**

*Ramos, Gliceria B., Sia Su, Glenn L., Lim, Brian M., Mangulaban, Jezzah R., Ocampo, Melody A*

The naval base Heracleo Alano in Cavite City is a potential habitat of non-indigenous foulers. It is surrounded by Manila Bay and Canacao Bay. The study determined the presence of macrofouling communities in the base's pier. Foul collector design was adapted from the North Pacific Marine Sciences Organization (PICES). Collectors were deployed and retrieved after submersion periods of 39 days and 86 days. A total of 6,203 organisms belonging to eight phyla and nine classes were collected. Common macrofoulers were bivalves, polychaetes, decapods, amphipods, and barnacles. Shannon-Wiener index values ( $H^1=1.7346$ ;  $H^2=1.5392$ ;  $H^3=1.6199$ ;  $H^4=1.7602$ ) as well as species evenness ( $E^1=0.5611$ ;  $E^2=0.6001$ ;  $E^3=0.5605$ ;  $E^4=0.7000$ ) were relatively consistent. Values of the Simpson's index ( $D^1=0.7744$ ;  $D^2=0.7436$ ;  $D^3=0.7376$ ;  $D^4=0.7980$ ) indicated the presence of a dominant species, which is *Balanus* sp. The Kruskal-Wallis test showed no significant differences across the sampling sites. The macrofouling community had seven non-indigenous species (*Mytella charruana*, *Brachidontes* sp., *Mytilopsis sallei*, *Hydroides* sp., *Stylochus* sp., *Sabella* sp., and *Membranipora membranacea*). The macrofouling organisms present in the area may cause financial losses because of damage to submerged equipment. More importantly, the non-indigenous species may also be potential threats to the local ecosystem. Two species (*M. sallei* and *Brachidontes* sp.) are known to be invasive, although their abundance shows otherwise. There is a need to monitor these invasive species as *M. sallei* (origin: Caribbean) has been reported to be in huge numbers in the Indo- West Pacific region, particularly in Singapore, Hongkong, Thailand, India, Taiwan, China, Malaysia, Japan, and Australia while *Brachidontes* sp. (origin: Indo-Pacific) has spread to the Mediterranean and the Red Sea. (Author's abstract)

**Keywords:** Macrofouling, Aquatic, Diversity, Non-indigenous, Invasive, Biology

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 NP

0141

## **Bacterial community structure of aquaculture and non-aquaculture sediments of Taal Lake (Philippines) using PCR-DGGE of 16S rDNA**

*Cailao, Maria Victoria T., Dalmacio, Leslie Michelle M., Balolong, Marilen P., Tria, Ma. Cecilia D., Hallare, Arno*

Microorganisms, including bacteria, serve as major players in various processes affecting both the quality of aquatic sediment as well as the fate of pollutants released into such matrix. In this study, we evaluated the similarity in bacterial community structure between sediments collected from aquaculture and non-aquaculture sites of a tropical lake. Describing and comparing the bacterial community present in each site may provide clues on the impact of aquaculture practices on aquatic ecosystems.

Microbial DNA was extracted using PowerSoil® DNA Isolation Kit for all sediment samples. DNA isolates were used as template in the analysis of the hypervariable region of 16S rDNA through nested polymerase chain reaction (PCR) and denaturing gradient gel electrophoresis (DGGE). Excised representative 16S rDNA DGGE bands were sequenced and identified through BLAST analysis.

Based on the generated mean Dice similarity coefficient of 57.77%, the bacterial community structure between aquaculture and non-aquaculture sediments was highly similar but certain taxa were found unique for each site. Bacteria belonging to *Proteobacteria* and *Firmicutes* dominated the aquaculture sediments while *Proteobacteria*, *Firmicutes*, and *Chloroflexi* dominated the non-aquaculture sediments. Certain physicochemical parameters operating in the two sites may have influenced the shift in representative microbes. *Shewanella baltica* and *Trichococcus* sp. were found only in aquaculture sediment owing to their ability to tolerate quantities of ammonia and high organic matter from their environment.

This study describes the applicability of 16S rDNA PCR-DGGE as a culture-independent technique for describing and comparing the similarity between bacterial communities in sediment. Based on the generated similarity index, the bacterial community between aquaculture and non-aquaculture sediments of Taal Lake was highly similar but interestingly, harbored unique bacterial populations as seen in the DGGE profiles. The shift in dominant taxa and unique representatives per site may have been influenced by certain differences between each site's physicochemical parameters. (Author's Abstract)

**Keywords:** sediment bacterial community, aquaculture, 16S rDNA, Dice coefficient, Biology

**Bacteriological analysis of complementary sauces of street-vended food**  
*Sta. Cruz, Kristian T. , Mangaya, Demy Q. , Samia, Frances Rowena M., Sumbillo, Mark Lloyd*

Street-vended food, especially in the Philippines are being sold together with complementary sauces – either sweet or spicy based on the preference of the customers. Since food borne diseases are being linked to these types of products, this study aimed to detect the presence of fecal coliforms in complementary sauces of street-vended food. Specifically, the study aimed to identify the bacteria present in the samples and the possible harm they may cause. Standard tests were used in determining bacterial growth from tubes and plates and in identifying possible bacteria present. The microbial quantity of collected samples exceeded the standard MPN value of <1.1. The biochemical tests showed that the samples may contain coliform organisms like *Citrobacter species*, *Proteus vulgaris*, *Klebsiella*, *Providencia*, *Serratia*, *Enterobacte*, *Escherichia coli* and non-coliform organisms like *Salmonella* and *Shigella*, are present in the samples. It is suggested that the food handling practices of street vendors should be observed and further investigation should be conducted to possibly identify other sources of contamination. **(Author's abstract)**

**Keywords:** *Bacteria, Food borne diseases, Complementary sauces, Street-vended food, Contamination, Biology*

**Biochemical characterization of marine pigmented bacterial isolates from the mucus of soft coral *Clavularia* sp.**  
*Franco, Prima Fe R. , Gaoat, Cec*

Pigmented bacteria have awakened the interest of many researchers because of their industrial applications. The isolation of pigmented bacteria could be one of a new safe and effective way to produce natural colorants. A total of 11 pigmented bacterial isolates with varying colors were obtained in this study, and these were morphologically and biochemically characterized. Isolates exhibited almost all forms of the colony types. Most of the isolates were cocci, while the others were bacilli. Some of the isolates were positive for protease, starch, and hemolysin tests. They were considered as halophiles because of their high salt tolerance. The bacterial isolates were neutrophiles as to the pH tolerance, and mesophiles as to their maximum tolerance to temperature. Almost all of the isolates secreted their pigments in the liquid media. The predominating pigment produced by these isolates was carotenoids. One pigment secreting isolate was subjected through Vitek 2 system and 16S rRNA sequence analysis. The result of the first identification system used identified the bacteria as *Vibrio alginolyticus* while the 16S rRNA identified the isolate as *Vibrio* sp. The isolated pigmented bacteria from the mucus of *Clavularia* sp. have the potential as pigment producers; as a result, they could be explored further as colorant sources in industry. **(Author's abstract)**

**Keywords:** *Pigmented bacteria, Mucus, Clavularia sp., Biology*

**Bioefficacy of *Tasmannia piperita* (Hook.f.) miers leaf extracts against late blight  
(*Phytophthora infestans*) (Mont) de bary of tomato**

*Mendez, Rainear A. , Bautista, Cecilia V. , Pescadero, Iris R. , Lituañas, Chris Rey M. , Acma, Florfe M. ,  
Amoroso, Victor B., Villalobos, Annabelle P.*

This research evaluated the bioefficacy of *Tasmannia piperita*, an indigenous plant in the Philippines belonging to the Winteraceae family, against a causative pathogen of late blight of tomato, *Phytophthora infestans*. Results from the study using leaf extracts of *T. piperita* against *P. infestans* by the in vitro poison food technique showed that 1:100,000 dilution was most effective in inhibiting mycelial growth of *P. infestans* on the 3<sup>rd</sup>, and 6<sup>th</sup>–9<sup>th</sup> day after treatment application. Data from this study therefore indicates that aqueous extracts of *T. piperita* leaves is a potential fungicide against *P. infestans*. Utilizing fresh leaf extracts is recommended with the advantage that the leaves can easily be harvested and would require minimal amount of material for effectivity as a fungicide. (Author's abstract)

**Keywords:** *Indigenous plants, Phytophthora infestans, Poison food technique, Winteraceae, Biology*

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2018/07,  
(Filipiniana Analytics)  
NP

**Biological activities and mineral composition analysis of *Enhalus acoroides* (L.F.) Royle  
seeds and flowers**

*Quiao, Maria Alma, Dela Peña, GERALYN , Kokoska, Ladis*

*Enhalus acoroides*' substantial utility not just for environmental purposes but also in a variety of uses, such as medicine and food, leads to the need to investigate its biological activity and nutritive value. The ethanol extracts of the plant's flowers and seeds collected from Laguindingan, Misamis Oriental were analyzed for its antimicrobial and antioxidant activities. Both extracts were active against *Staphylococcus aureus* (MIC at 512 µg mL<sup>-1</sup>) and showed significant antioxidant property (IC<sub>50</sub> at 212.80 ± 21.73 and 229.41 ± 15.99 µg mL<sup>-1</sup>) with DPPH radical scavenging assay. Analysis of its mineral composition using inductively coupled plasma optical emission spectrometer (ICP-OES) showed significant concentrations of macro- and microelements for nutrition. Potassium (2729.52 ± 78.14 mg per 100 g DM) content was high in the seeds whereas sodium (5947.16 ± 598.68 mg per 100 g DM) content was high in the flowers. Most of the minerals were at concentrations satisfactory in providing recommended dietary allowances. Toxic elements were also detected but were within food standards. These findings established the inherent value-added minerals in *E. acoroides* flowers and seeds, which is a safe and vital food resource. (Author's abstract)

**Keywords:** *Antioxidant activity, Enhalus acoroides, in vitro antimicrobial, Minerals, Seagrass, Biology*

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NP

**Bioremediation of irrigation water and generation of bio-energy using enriched  
consortia in a dual-chambered microbial fuel cell**

*Undan, Jerwin R. , Pineda, Rence Marrion M. , Lorida, Marry Lorraine F. , Afable, Eriza M. , Natividad,  
Alessandra D., Gaban, Paula Blanca , Aquino, John Dav*



Microbial Fuel Cells (MFCs) are gaining research interests due to bioenergy generation and wastewater remediation capacity at the same time. The present study developed a low-cost, eco-friendly and simplified dual-chamber MFC set-up mainly using recycled materials. The bio-electricity generation capacity of the constructed MFC template using irrigation water with naturally-inhabiting microbial consortia enriched with *Citrobacter koseri*, *Bacillus flexus*, *Shimwella blattae* and *Kosakonia sacchari* was investigated. Generated voltage (millivolts) and current (milliamperes) every 3 days in its 30-day operation were recorded using a digital multimeter. Power (watts), power density ( $\text{W/m}^2$ ) and current density ( $\text{A/m}^2$ ) were computed. Water pre/post analysis and phytotoxicity assay were also carried out. The profile generated by the MFC set-up enriched with *Citrobacter koseri* (Ck-MFC) clearly demonstrates its potential for stable and reliable voltage, current and power production at an average of 336 mV, 64 mA and 31 W in its 30-day operation which are within the MFC output thresholds (300-500 mV, 2 mA and 25 W). Ck-MFC also generated higher power and current densities at  $130.15 \text{ W/m}^2$  and  $0.27 \text{ A/m}^2$ , respectively, than *Shewanella putrefaciens* (positive control) while exhibiting 87% lead biosorption and no phytotoxicity. Overall, this study has shown that the constructed MFC set-up can serve as a potential bio-electricity generation system which could benefit electricity-deprived remote areas and financially-challenged households. **(Author's abstract)**

**Keywords:** Bio-electricity, Microbial fuel cell, *Citrobacter koseri*, Biology

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0147

## **Biosorption of nickel by *Bacillus cereus* and *Stenotrophomonas maltophilia* isolated from Bayto River, Zambales**

*Ilagan, Yolanda A., Baldomero, John*

Heavy metal contamination of water systems is a global environmental concern and biosorption of these heavy metals using bacteria offers a more potent and cost-effective solution compared to conventional methods. In this study, 139 nickel-resistant isolates were obtained from the water samples collected from Bayto river. The metal resistance profiles of the isolates were determined using the Kirby-Bauer disc diffusion method. Sixteen isolates were able to tolerate the highest concentration of nickel and were subjected to multimetal resistance assays. Out of the 16 most Ni-resistant isolates, only four were able to tolerate 7,500 parts per million (ppm) of copper, and 10,000 ppm chromium and lead. These isolates (S2Q1, S1I2, S3Z1, S2P1) were subjected to biosorption assay. Biosorption of nickel by these isolates was done by adding 10 mL of inoculated Nutrient broth (NB) (16-hour culture) to 90 mL of NB supplemented with 1,000 ppm nickel. The metal-microbe suspensions were incubated at room temperature in a rotary shaker at 150 rpm for 24 hours. Afterwards, the NB from each setup was centrifuged and the supernatants were analyzed using atomic absorption spectrophotometry (AAS). Furthermore, the four isolates were identified via 16S rRNA sequencing. The S1I2 exhibited the highest biosorption percentage at 92.27%, followed by S3Z1 (91.67%), then S2Q1 (91.36%) and S2P1 (89.78%). S2Q1 and S1I2 were identified as *Stenotrophomonas maltophilia* while S3Z1 and S2P1 as *Bacillus cereus*. S1I2 exhibited the highest biosorption percentage at 92.27%. **(Author's abstract)**

**Keywords:** Biosorption, Nickel, Heavy metals, *Bacillus cereus*, *Stenotrophomonas maltophilia*, Biology

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0148

## **Characterization and evaluation of phosphate-solubilizing bacteria from corn (*Zea mays* L.) and sugod-sugod (*Momordica cochinchinensis* Spreng.) rhizospheres**

*Blanco, Ma.Tereza A. , Bucao, Dionisio S. , Adina, Prince Ke*

Phosphate-solubilizing bacteria (PSB) play an important role in the phosphorous nutrition of plants; it solubilizes bound phosphate in soil, thereby enhancing its availability. This study focused on three phases that encompassed all the objectives. Phase I was conducted to answer the primary aim, which was to isolate PSB from the rhizospheres of corn and sugod-sugod, and characterize the isolates through morphological and biological tests. Phase II involved evaluating the isolates in terms of their solubilization, efficiency, pH, and tricalcium phosphate tolerance through laboratory scale experiments. Phase III was performed to evaluate the actual performance of the isolates on phosphate solubilization by inoculating the isolates on test plants, namely, corn and tomato. Percent seed germination, plant height, shoot, root, and total biomass were measured. Seven PSB were isolated from the rhizospheres of corn and sugod-sugod. Results showed that there was a significant solubilization efficiency of isolates both from agar and broth assays. Further, the tolerance test revealed that two isolates were tolerant at pH 4, and one isolate was tolerant at pH 8. Meanwhile, the isolates had a significant inhibitory effect on seed germination of corn and tomato. The isolates also had a significant effect on the height of the corn plant, but not on the height of tomato. The biomass was not significant in corn, but was significant in tomato, although it was limited to some factors. **(Author's abstract)**

**Keywords:** *Solubilization, Rhizosphere, Phosphate, Tolerance, PSB, Biology*

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(Filipiniana Analytics)  
NP

0149

### **Characterization of Pili (*Canarium ovatum* Engl.) kernel shape variation using elliptic fourier analysis**

*Reaño, Consorcia E. , Lalusin, Antonio G. , Hay, Fiona R. , Endonela, Leah E. , Borromeo, Teresita H. , Altoveros, Nestor C. , Gentallan, Jr., Renerio, Yoshioka, Yos*

Shape is often characterized through subjective means. This research attempts to systematically characterize pili kernel shape variation using elliptic Fourier analysis. Images of 53 pili accessions from the National Plant Genetic Resources Laboratory (NPGRL)-University of the Philippines Los Baños were acquired using VideometerLab 3. Shapes outlines were characterized using elliptic Fourier coefficients calculated from SHAPE software. Principal component analysis and cluster analysis were used to elucidate shape variations among accessions which was subsequently visualized through R's shape on r package. With the first component accounting for the 92.94% of the total variation, principal component analysis revealed that 98.62% of the total variance is explained by the first three components. The first principal component accounts for the variation in length to width ratio; whereas, the second and third principal components explains the variation in the location of the widest portion and the truncation of the apex and base of the kernel, respectively. Cluster analysis separated the different accessions into 6 distinct clusters at 0.04 Euclidian distance. Accessions belonging to cluster 3, 1 and 5 represent the elliptical series of shapes-narrowly elliptic, elliptic, and widely elliptic. Whereas, accessions belonging to cluster 2, 4 and 6 represent the ovate-shaped variants-ovate, obovate and lance-ovate. The systematic characterization can be used to objectively elucidate the shape variations of all parts of the plant of all crop species. **(Author's abstract)**

**Keywords:** *Canarium ovatum, Kernel shape, Elliptic Fourier analysis, Image analysis, Phenotyping, Biology*

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NP

0150

### **Chelating effects of siderophore in reducing organ dysfunction caused by iron overload in ICR mice**

*Panelo, Isabella R., Salunga, Thucydides L., Cornista, Joel*

Iron is an essential element that plays a vital role in a wide variety of cellular processes but when present in excess concentration in organs it may increase the risk for liver disease, heart failure, and diabetes. Recently, siderophores which are iron-chelating agents produced by microorganisms have attracted tremendous attention because of its strong binding and high selectivity to the ferric form of iron. Thus, the use of siderophore in sequestering excess iron in the body as a form of therapy is very attractive. This study determined the effects of commercially available siderophore in sequestering excess iron in organs such as liver, heart, and pancreas under excess iron conditions.

First, iron-overload was induced by injecting iron dextran (20mg) into male ICR mice for three consecutive days. The effects of iron to the liver, heart, and pancreas and the possible sequestration by siderophore were determined by scoring histological sections. The liver iron concentration was also assessed by atomic absorption spectroscopy (AAS).

The study showed that iron-overloaded mice exhibited skin hyperpigmentation and hemosiderosis in liver, heart, and pancreas. Significant changes in the liver include hepatomegaly and development of tumor. Iron-overloaded mice had 2,935% increase in liver iron content compared to the salinetreated mice. However, when iron-overloaded mice were treated with either 100 µg or 200 µg siderophore, there was a 77% and 84% decrease in liver iron content, respectively. Moreover, the treatment of ironoverloaded mice with siderophore prevented the development of hemosiderosis, tumor, and structural changes in the tissues studied. The results showed that siderophore can effectively reduce excess iron and organ damage in iron-overloaded mice and can be potentially employed in chelation therapy of iron-overload diseases. Further studies on the possible mechanisms of siderophore aside from decreasing iron excess and lowering organ dysfunction are recommended. (Author's Abstract)

**Keywords:** siderophore, iron overload, iron chelating agents, hemosiderosis, hepatomagaly, hepatoprotection, Biology

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2019/12,  
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0151

### **Chloroplast and nuclear DNA exchange among *Begonia* Section *Baryandra* Species (Begoniaceae) from Palawan Island, Philippines and descriptions of five new species** *Blanc, Patrick, Hughes, Mark, Chung, Kuo-Fang, Lin, Che-Wei, Rubite, Rosario Rivera, Peng, Ching-*

The Philippine island of Palawan is highly biodiverse. During fieldwork in 2011 and 2014, five unknown species in the large genus *Begonia* were discovered. The species were similar in their rhizomatous stems, four-petaled flowers, inferior two- or three-locular ovaries with bilamellate placentas, and were assignable to *Begonia* sect. *Baryandra*. Studies of relevant literature, herbarium specimens, and living plants support the recognition of the five new species endemic to Palawan: *B. elnidoensis*, *B. gironellae*, *B. quinquealata*, *B. tabonensis*, and *B. tenuibracteata* which are described here. The five new species were added to phylogenies-based Bayesian analysis of nrDNA (ITS) and chloroplast DNA (*ndhA*, *ndhF-rpl32*, *rpl32-trnL*, *trnC-trnD*), along with 45 other allied ingroup species. A majority of the species show incongruent positions in the two phylogenies, with evidence of prevalent chloroplast capture. Models show chloroplast capture is more likely in plant populations with high levels of inbreeding following a reduction in selfing rate after hybridization. We suggest that this is a possible explanation for the massive amount of chloroplast exchange seen in our phylogeny, as *Begonia* species often exist as small isolated populations and may be prone to inbreeding depression. Our data also indicate a level of nuclear genetic exchange between species. The high prevalence of hybrid events in *Begonia* is potentially an important factor in driving genomic change and species evolution in this mega-diverse genus. (Author's abstract)

**Keywords:** Chloroplast capture, Hybridization, Taxonomy, Phylogenetics, Biodiversity hotspot, Biology

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 183  
2018/07,  
(Filipiniana Analytics)  
NP

### **Classification of the single nucleotide polymorphisms (SNPs) identified by genotyping-by-sequencing of "carabao" mango (*Mangifera indica* L.) accessions**

*Lachica, John Albert, Ocampo, Eureka Teresa, Santos, Maura Me*

Understanding the genetic background of agronomically important crops is essential in the conservation of favorable traits. Genotyping-bysequencing (GBS) is a sequencing technique for reduced or filtered genomes; it identifies the genotypes of individuals through their single nucleotide polymorphisms. Single nucleotide polymorphisms (SNPs) can be associated with important traits and may be used as genetic markers. In this study, 341 mango accessions from different locations in the Philippines were genotyped by sequencing. The GBS generated 31,208 SNPs, which was imputed to 15,604 sequences. Homologs of these sequences were identified through the Basic Local Alignment Search Tool. The results collected were classified into different groups based on plant families, protein function, and whether the sequence codes for genes that govern significant mango traits of interest. Initial findings showed the presence of genes that confer carrier proteins, disease resistance proteins, structural proteins, and various enzymes. Primarily, SNPs for desired mango traits for resistance to anthracnose, red blush color expression, and thick peel will be validated on at least 100 genotypes. **(Author's abstract)**

**Keywords:** *Carabao mango, Genotyping-by-sequencing, Single nucleotide polymorphism, Biology*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 130  
2018/07,  
(Filipiniana Analytics)  
NP

### **Co-amendment of bamboo biochar, vermicompost, and biofertilizer improved growth, nutrients status, and soil biological components of cacao (*Theobroma cacao* L.)**

*Aggangan, Nelly S., Sabino, Noel G., Mendoza, Bernadette C., Jomao-as, Jos*

The extensive use of farm soils coupled with heavy usage of chemical fertilizers has led to various deleterious effects on the agricultural system. Soil conditioners such as bamboo biochar (BB), vermicompost, and biofertilizers may help alleviate the stress that can possibly result to successful soil restoration and improved crop productivity. This study determined the influence of BB, vermicompost, and biofertilizers on growth, nutrient status and soil biological components of cacao (*Theobroma cacao* L.). The experiment was conducted inside a screen house following a two factor in Randomized Complete Block Design (RCBD) with five replicates. The arbuscular mycorrhizal fungi (AMF) soil inoculant consisted of 12 species belonging to the genera *Glomus*, *Gigaspora*, *Acaulospora*, and *Entrophospora* while nitrogen-fixing bacteria (NFB) inoculant contained *Azosporillum* spp. Results revealed that cacao amended with 15% BB inoculated with NFB and AMF alone gave the highest total dry weight which could be attributed to a better N and P uptake. Moreover, cacao inoculated with NFB alone at 15% BB gave the highest NFB population. Meanwhile, the highest AMF spore density was observed in cacao seedlings treated with AMF alone at 15% BB. Acetylene reduction assay and 16S rDNA methods verified the NFB colonies in nitrogen free medium. Scanning electron microscopy not only revealed the size of the BB but also the association of BB, AMF and NFB. In conclusion, cacao seedlings amended with 15% concentration of BB showed an overall better outcome in terms of plant dry weight, nutrient status, soil NFB and AMF spore density as compared to the use of 0% and 30% BB. **(Author's abstract)**

**Keywords:** *Acetylene reduction assay, Nitrogen free medium, Root infection, Scanning electron microscope, 16s rDNA, Biology*

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Transactions of the National Academy of Science and Technology, Volume No. 41 Issue No. 1, 9  
2019 July,  
(Filipiniana Analytics)  
NP

### **Coral reefs assessment within and outside the marine protected areas in Lanuza Bay**

*Seronay, Romell A., Calagui, Laurence B., Masangcay, Shirlamaine Irina*

Currently, there are 19 marine protected areas (MPAs) that can be found in the five coastal municipalities (Carrascal, Cantilan, Cortes, Lanuza and Tandag) in Lanuza Bay. Increasing management effectiveness of MPAs and MPA Networks (MPAN) and enhancing fisheries management definitely contributes food security in Lanuza Bay. Thus, this study is very significant in assessing the conditions and effectivity of these MPAs based on their coral reefs. Coral reef within and outside MPAs were surveyed using the digital fixed photo-transect method where 50 photo frames consisted of five points of coral life-forms were identified using the standard coral life-form code. A total of three replicated transects with 50 m length were established per monitoring stations. Highest and lowest percentages of Hard Coral Cover (HCC) within and outside MPAs are present in Carrascal, with 65.59% and 73.32% in Adlay, 14.41% and 31.19% in Caglayag, respectively. Diverse coral reef benthic life-forms at different depths are present in Lanuza Bay such as massive, branching, foliose and soft corals. Most of the coral reefs in Lanuza Bay are in good to excellent conditions (14.41 - 73.32%), these are indications that proper and strict implementations and good managements on MPAs were observed. Threats such as siltation, natural disasters and other human activities have affected the coral reef conditions in Lanuza Bay. (Author's abstract)

**Keywords:** *Coral reefs, Marine Protected Areas, Biology*

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Transactions of the National Academy of Science and Technology, Volume No. 41 Issue No. 1, 164  
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NP

### **Cytochrome C oxidase subunit 1 (COI) profile of the Philippine Helicostylinae (Gastropoda: Stylommatophora: Camaenidae)**

*de Chavez, Emmanuel Ryan C. , Masanga, Anna Regina L. , Itong, Tyrill Adolf B. , Que, Gerard Clinton L. , Batomalaque, Gizelle A., Fontanilla, Ian Kendrick C*

The Philippines is the center of radiation of the land snail subfamily Helicostylinae, with around 253 recognized species. Despite their morphological diversity, research on their biology and taxonomy is lacking. We present here the first mitochondrial COI profiles of 32 species of Philippine helicostyline land snails. With the addition of sequences downloaded from GenBank, we tested the utility of the COI for species identification. Relative distributions of intraspecific and interspecific distances overlapped; hence, no barcoding gap was observed. However, 90% of uncorrected interspecific comparisons can distinguish species at 14% genetic distance or lower. Furthermore, the COI barcodes could not discriminate several co-distributed species that have similar conchological features, which should be flagged for taxonomic re-evaluation. (Author's abstract)

**Keywords:** *DNA barcoding, Helicostylinae, mitochondrial COI, Philippine land snails, Biology*

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Philippine Journal of Science, Volume No. 148 Issue No. S1, 1-13  
2019/10,  
(Filipiniana Analytics)  
NP

### **Cytotoxic and angiostatic potentials of *Zehneria japonica* (Thunb. ex Murray) S.K. Chen (Cucurbitaceae) crude leaf extracts**

*Castillo, Agnes , Tsai, Yun-Chieh , Chin, Ting-Yu , Roldan, Marri Jmelou, Villaflores, Oliver*

*Zehneria japonica* belongs to the Cucurbitaceae family which is one of the most important plant families. It is commonly known as "Pipinong-gubat," widely distributed in Central Luzon regions and in areas along streams and clearings at low and medium altitudes in the Philippines. This study aimed to evaluate the potential cytotoxic and angiostimulatory properties of *Zehneria japonica* (Thunb. ex Murray) S.K. Chen (Cucurbitaceae) leaf extracts.

The *Z. japonica* semi-crude extracts were obtained by sequential extraction using hexane, ethyl acetate, and n-butanol. A modified duck egg chorioallantoic membrane (CAM) assay was aided by AngioQuant, a digital imaging software used to evaluate angiogenic activity. Inhibition of angiogenesis was evaluated by percent increase or decrease in mean length of blood vessels, mean size of blood vessels, and total number of blood vessel junctions. Moreover, the cytotoxic effects of the extracts were determined through MTT Assay. Osteosarcoma (U2Os) and hepatocellular carcinoma (HepG2) cells were used as cancer representatives while human umbilical vein endothelial cells (HUVEC) were used as the normal cell control.

Analysis with AngioQuant revealed that treatment of the duck egg CAM with *Z. japonica* semi-crude extracts suppressed angiogenesis with IC<sub>50</sub> values of 1,810.00µg/mL, 192.50µg/mL, and 147.70µg/mL for hexane, ethyl acetate, and n-butanol, respectively, with Celecoxib (20µg/mL) as the positive control. For MTT assay, *Z. japonica* extracts exhibited strong cytotoxic effect against U2Os with an IC<sub>50</sub> values of 19.65µg/mL, 9.89µg/mL, and 31.04µg/mL for the hexane, ethyl acetate, and n-butanol extracts, and no cytotoxic effects against HepG2 with IC<sub>50</sub> values of 770.90µg/mL, 130.10µg/mL and 231.60µg/mL for the hexane, ethyl acetate, and n-butanol extracts. Doxorubicin (0.544µg/mL) was used as the positive control. The extracts also inhibited the growth of the normal cells, with IC<sub>50</sub> values of 69.46µg/mL, 42.23µg/mL and 63.44µg/mL for the hexane, ethyl acetate, and n-butanol extracts. There were no mortality and toxic symptoms observed for 14 days after the administration of the crude butanolic extract of *Z. japonica* in six female Sprague-Dawley rats.

*Z. japonica* crude leaf extracts exhibited angio-suppressive activity through CAM assay. In MTT assay, the extracts exhibited strong cytotoxicity in U2Os (IC<sub>50</sub> ≤20µg/mL), no cytotoxic effect in HepG2 (IC<sub>50</sub> >100µg/mL) cells, and mild cytotoxic effect in HUVEC (IC<sub>50</sub> 40-60µg/mL). Phytochemical screening through TLC revealed that the extracts contain alkaloids, anthrones, flavonoids, and sterols. (**Author's Abstract**)

**Keywords:** *Zehneria japonica* (Thunb. ex Murray) S.K. Chen, Cucurbitaceae, cytotoxic, MTT assay, angiostimulatory, CAM assay, Biology

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Philippine Journal of Health Research and Development, Volume No. 22 Issue No. 2, 43-52  
2018/06,  
(Filipiniana Analytics)

0157

## **Demonstration of microbial biotechnology mediated forest park in Caliraya Springs, Cavinti, Laguna**

*Anarna, Julieta A., Aggangan, Nelly S., Yecyec, Romualdo P.*

Many tourists visit the Caliraya Springs for leisure purposes, particularly sports. The area had been scraped and the soil is a sub-soil which is very hard to work on. Growth of plants previously planted by the developer did not survive. Experiments were established along the road in an open area covered with creeping grasses to demonstrate a biotechnology-mediated forest park in Caliraya Springs, Cavinti, Laguna using plant growth-promoting microbes, such as mycorrhizal fungi and nitrogen-fixing bacteria, inoculated into indigenous and endangered tree species in the Philippines. The experiment was an excellent demonstration of the effectiveness of nitrogen-fixing bacteria and mycorrhizal fungi on narra (*Pterocarpus indicus*), bani (*Pongamia pinnata*), ipil (*Intsia bijuga*), and batino (*Alstonia macrophylla*). Results after five years showed that, narra, ipil, bani, and batino grew very well in the area. Mycorrhizal inoculants coded as M6, Surigao (from mine tailing in Surigao, Mindanao) isolate and MYKOVAM® (BIOTECH-UPLB's biofertilizer) promoted the biggest stem diameter for bani, G49 for batino, and M6 for ipil. Seedling mortality in ipil (control) was 67% compared with 40–57% in their mycorrhizal counterparts. Sporulation in the rhizosphere of narra and bani was highest if inoculated with MYKOVAM® (100 and 131 spores per 20g soil, respectively), whereas in batino, those inoculated with M6, Surigao gave the highest (131 spores per 20g soil) spore count. The results imply the importance of selecting the best microbial inoculants that can adapt and reproduce in a particular environment. Microbial biofertilizers-inoculated narra, bani, and batino can be recommended in the rehabilitation of the red acidic soil in Cavinti, Laguna. (**Author's abstract**)

**Keywords:** Arbuscular mycorrhizal fungi, MYKOVAM®, Narra, Bani, Ipil, Batino, Mycorrhizal root colonization and sporulation, Biology

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2018/07,  
(Filipiniana Analytics)  
NP

0158

### **Detection and variation of putative effector six genes of *Fusarium oxysporum* f. sp. *cubense* Philippines isolates**

*Molina, Agustin, Silva, Fatima Florie May, Dalisay, Teresita, Dela Cueva, F*

The soil-borne fungus *Fusarium oxysporum* f. sp. *cubense* (Foc) is an important pathogen of banana (*Musa* ssp.). The pathogen can be classified based on pathogenicity in specific varieties corresponding to physiological races and vegetative compatibility grouping (VCG). Studies have revealed that the same VCG could belong to different races. This led to the development of molecular diagnostic tools, such as the use of molecular loci to distinguish Foc isolates. Among the molecular loci used, a prospective result was observed using putative effector genes, known as SIX (secreted in xylem) genes. To further understand the pathogenicity of Foc isolates, a correlation of races and VCGs was done. Furthermore, SIX genes were used to differentiate Foc isolates representing different races and VCGs. Sequencing of PCR products and sequence analysis were done and phylogenetic relationships of the different isolates were determined. The results showed that sequence differences exist among and between isolates. Furthermore, results indicated that SIX genes can be used to differentiate race 4 from race 1. (**Author's abstract**)

**Keywords:** Pathogenicity, Race, vcg, SIX genes, Biology

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 184  
2018/07,  
(Filipiniana Analytics)  
NP

0159

### **Detection of extended-spectrum $\beta$ -Lactamase-producing *Klebsiella pneumoniae* isolated from four provincial hospitals in Luzon and genotyping of $\beta$ -Lactamase (*bla*CTX-M, *bla*TEM, *bla*SHV**

*Balolong, Marilen P., Sanchez, Helen Juvy A., Cuña, Anna Margarita D., Cornista, J*

Extended-spectrum  $\beta$ -lactamase (ESBL)-producing *Klebsiella pneumoniae* is one of the most common cause of nosocomial infections. One hundred isolates of *K. pneumoniae* were obtained from four different provincial hospitals in Luzon. The strains following purification and standard bacteriological testing were then initially screened for antimicrobial susceptibility against five 3rd generation cephalosporins and monobactam. Twenty-three isolates (23%) were initially found to be resistant to all or at least three antibiotics tested. To prove ESBL-production, the phenotypic confirmatory disk diffusion test (PCDDT) was conducted confirming 18 out of the 23 (78.3%) isolates to be ESBL producers. The identity of the isolates was confirmed as *K. pneumoniae* by the amplification and sequencing of the 16S *rRNA* gene through polymerase chain reaction (PCR). To determine the type of the  $\beta$ -lactamase genes carried by the ESBL-producing *K. pneumoniae* isolates, the *bla*CTX-M, *bla*OXA-1, *bla*SHV, and *bla*TEM were amplified and sequenced. This study showed that *bla*CTX-M and *bla*TEM were detected in 10 out of 18 ESBL-positive isolates (56%), while *bla*SHV was found in 15 out of 18 isolates (83.3%). Interestingly, the *bla*OXA-1 gene was detected in all phenotypically confirmed ESBL isolates suggesting that it was the most predominant  $\beta$ -lactamase gene among the samples. Eight of the isolates harbored at least three genes; four of these isolates have *bla*CTX-M, *bla*OXA-1, and *bla*SHV; three of the isolates have *bla*TEM, *bla*OXA-1, and *bla*SHV; and one with *bla*CTX-M, *bla*OXA-1, and *bla*TEM. Lastly, five isolates harbored all the four genes tested – suggesting that these isolates pose a serious threat in the healthcare industry because of its resistance to a

wider range of antibiotics. Because of the occurrence of multiple  $\beta$ -lactamase genes in *K. pneumoniae*, there is therefore an urgent need to develop a rapid and accurate method of ESBL genotyping. (Author's abstract)

**Keywords:** 16S rRNA gene, blaCTX-M, blaOXA-1, blaSHV, blaTEM, Extended-spectrum #946-lactamase (ESBL), *Klebsiella pneumoniae*, Biology

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2019/06,  
(Filipiniana Analytics)  
NP

0160

### **Detection of multidrug-resistant shiga toxin-producing *Escherichia coli* in Philippine native swine from Quezon Province, Philippines** *Opulencia, Rina B., Nagpala, Michael Jos*

The spread of antibiotic resistance among bacterial pathogens, such as the Shiga toxin-producing *Escherichia coli* (STEC), is a major public health concern worldwide. Swine are considered as reservoir of antibiotic-resistant STEC and multiple outbreaks of STEC have been attributed to both domestic swine and wild boar. Therefore, the introduction of Philippine native swine (PNS) to a large market should be coupled with pathogen detection to ensure public safety. Fecal samples from 57 Philippine native swine (PNS) housed in 29 farms located in ten municipalities of Quezon province were obtained for the isolation of *E. coli*. The isolates were confirmed to be STEC by amplifying the *stx* gene. Fifty-three (93%) of the fifty-seven PNS were found to be positive for the presence of STEC. Antibiotic resistance profiles were obtained by testing 12 antibiotic classes using the disc diffusion method. Relatively high resistance rates to tetracycline (73.58%), ampicillin (37.74%), trimethoprim/sulfamethoxazole (32.08%), streptomycin (32.08%), and chloramphenicol (22.64%) were found among the STEC isolates. Seventeen (32%) STEC isolates were found to have the multidrug resistance (MDR) phenotype. The detection of MDR-STEC in the study poses a public health risk, especially when the post-antibiotic era is nearing. Therefore, changes in farming practices that would minimize the persistence of the pathogen at the farm level were implemented. (Author's abstract)

**Keywords:** Philippine native swine (PNS), Shiga toxin-producing *Escherichia coli* (STEC), Multidrug resistance (MDR), Biology

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Transactions of the National Academy of Science and Technology, Volume No. 41 Issue No. 1, 174  
2019 July,  
(Filipiniana Analytics)  
NP

0161

### **Development of multiplex polymerase chain reaction method for simultaneous detection of Abaca Bunchy Top Virus (ABTV) and Banana Bunchy Top Virus (BBTV) genome fragments**

*Aquino, Vermando, Barbosa, Cris Francis, Koh, Rhosener Bhea, Galvez*

A polymerase chain reaction (PCR) method that uses one primer set to amplify a region of target viral DNA is currently being used to detect Abaca Bunchy top Virus (ABTV) and Banana Bunchy top Virus (BBTV), two of the most destructive viruses infecting abaca. Efficiency and accuracy of diagnosis of these viruses, however, is reduced by the limited diagnostic capacity of the PCR method resulting in false negative detection. A multiplex PCR technique, a variant of PCR that uses several primer sets in one reaction, was developed to simultaneously detect several genome fragments of bunchy top viruses in one reaction. Primers targeting the coat protein (CP) and cell cycle link protein (C-link) genome fragments of ABTV and the CP and replication initiation protein (Rep) of BBTV were designed and optimized for multiplex PCR reaction. An annealing temperature at 61.9°C resulted in simultaneous amplification of ABTV (CP and C-link) and BBTV (CP and Rep), with the product sizes of 590 bp, 401 bp, 506 bp, and 876 bp, respectively. Results showed heterogeneous detection of the viral genome fragments in each virus. This could have resulted from the multipartite and multicomponent nature of their



genome, which is asymmetrically distributed in the host. The developed method allows the detection of several viral genome fragments in one reaction, ensuring stringency and preventing false negative detection. (**Author's abstract**)

**Keywords:** *Musa textilis* Nee, Babuvirus, Virus detection, Biology

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 71  
2018/07,  
(Filipiniana Analytics)  
NP

0162

### **Dietry fiber content and anti-lipidemic activity of Arrowroot (*Maranta* sp.) food products**

*Salvador-Membreve, Daile Meek C., Baldo, Edward Diomerl, Revale, Ida Fran*

Food with dietary fiber high content of has shown to have health benefits. In this study, the amount of dietary fiber and lipid-lowering activity of locally-grown arrowroot plant and its bakery products (flour, starch, and cookies) were tested. The total dietary fiber, insoluble dietary fiber, and soluble dietary fiber of arrowroot and its bakery products were measured using the enzyme-gravimetric method as described in AOAC 991.43. To investigate lipid-lowering activity, six groups of ICR mice were fed with cholesterol for six weeks and were treated with the products for two weeks, with distilled water serving as the negative control and simvastatin as the positive control. Body weights were recorded before and after cholesterol induction and after arrowroot treatments. Serum lipid profile (total cholesterol, HDL, LDL, VLDL, triglycerides) was measured and livers were dissected and evaluated for histological changes. Results showed that the total dietary fiber content of arrowroot bakery products ranged from 2.46–23.15% with the arrowroot flour having the highest fiber content. The products were shown to contain high insoluble dietary fiber. Among the treatments, arrowroot starch lowered the total cholesterol in serum and reduced the ballooning of hepatocytes, lipid inclusion, and portal inflammation in the liver induced by high cholesterol feeding, suggesting the lipid-lowering activity of arrowroot starch. (**Author's abstract**)

**Keywords:** *Arrowroot, Arrowroot food products, Maranta* sp., Anti-lipidemic, Hypercholesterolemia, Biology

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 202  
2018 July,  
(Filipiniana Analytics)  
NP

0163

### **Differential expression analysis in high-yielding and low-yielding Philippine coconut through transcriptome sequencing**

*Saloma, Cynthia, Rivera, Susan, Bautista, Ma. Anita, Emmanuel, Ernesto, Rivera, Ramon, Punzalan, Ma. Regina, Cabria, Gamaliel Lysande*

The demand for coconut oil (CNO) continues to rise in the global market. This puts pressure for coconut-producing countries such as the Philippines to increase CNO and *copra* production. Baybay Tall (BAYT) is known to have the highest *copra* yield among the tall coconut varieties in the Philippines. However, traditional breeding techniques that rely on the use of morphological markers are very limited, laborious, and time-consuming. In order to improve breeding strategies for increased *copra* production, differential gene expression analysis was performed on coconut shell and kernel of high-yielding and low-yielding palms. High-quality RNA was isolated from the endosperm (ES or kernel) and endocarp (EC or shell) of nut tissues followed by transcriptome sequencing using Illumina HiSeq2000. *De novo* transcriptome assembly was performed using Trinity. Read abundance was estimated using Corset and differentially expressed genes were identified using edgeR. In total, 1,945 genes were found to be differentially expressed (FDR < 0.05) from the nut tissues. Annotation of the transcripts revealed that only 82 of the differentially expressed genes have significant annotation. Potential gene-targeted markers (GTMs)

were designed for 64 candidate genes, which can be further validated for possible use in the marker-assisted selection of high-yielding palms. Microsatellite (SSR) sequences were identified in 19,147 unigenes in the EC and 17,394 in the ES. However, only two SSRs were found among differentially expressed genes in the EC and only one in the ES. Functional analysis revealed that high nut yield could arise from concerted actions of several transcription activators and regulatory proteins leading to increased cell division, secondary cell wall formation, enhanced energy metabolism, and activated stress response. Taken together, these processes contribute to increased kernel volume and thus increase in *copra* yield. Identified genes in this study can be used as potential targets in improving productivity in the Philippine coconut. (**Author's abstract**)

**Keywords:** coconut oil, copra, differential expression, molecular markers, nut yield, RNA-seq, Biology

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2019/10,

(Filipiniana Analytics)

NP

0164

### **Dinoflagellate cyst distribution along the coasts of Tacloban City in inner San Pedro Bay, Leyte, Philippines**

*Abia, Chelsea Mae S., Tan, Irene L., Alonzo, Coleen O., Yap-Dejeto*

A baseline study of the abundance of dinoflagellate cysts in surface sediments of inner San Pedro Bay that included San Juanico Strait in Leyte, Philippines is presented in this paper. Sediment samples were collected from 11 stations in the study area on March 2015. Dinoflagellate cyst densities were determined and expressed as cysts per gram of dry weight (cysts g-1DW). Dinoflagellate cyst taxa were sparse with relatively low occurrence and were sporadically distributed in relatively low densities in all sampling stations of the study area. A total of six cyst species from six stations were found and identified to be members of three dinoflagellate groups: Gonyaulacoid, Gymnodinoid, and Protoperidinoid. No cysts of *P. bahamense* var. *compressum* were detected. Cell density only had an average of >1 cysts g-1. Factors, such as organic content, dry bulk density of sediments, depth-affected cyst distribution, and density in Inner San Pedro Bay, Leyte were also determined. (**Author's abstract**)

**Keywords:** Dinoflagellate cysts, Gonyaulacios, Gymnodinoid, Protoperidinoid, Inner San Pedro Bay, Biology

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 178

2018/07,

(Filipiniana Analytics)

NP

0165

### **Disentangling multiple stressors and highlighting the importance of freshwater protected area in highly urbanized watersheds in the Philippines**

*Okuda, Noboru, Briones, Jonathan Carlo, Peralta, Elfrizson, Magbanua, Francis, Papa, Rey Donne*

Urban lotic ecosystems are impacted by multiple environmental stressors due to social-economic activities in the catchment. To aid in mitigation, global expansion of protected areas aquatic environments was recently set based on the Convention of Biological Diversity Aichi Target 11. As such, this study aims to disentangle the overlaying effects of deforestation and nutrient pollution on benthic macroinvertebrate communities (BMC) and assess the recent protection efforts in the watersheds of Laguna de Bay. Study sites in Silang-Santa Rosa Subwatershed (13) and Marikina Watershed (16) were sampled for BMC and surveyed for environmental factors such as land use patterns, human population density (HPD), and physicochemistry. Multivariate and regression analyses on taxa assemblages and environmental variables efficiently delineated study sites according to the degree of human impact and status of protection. Canopy openness, HPD, dissolved oxygen, and total phosphorus appeared to be the most important variables in predicting BMC. Also, the recent establishment of Upper Marikina River Basin

Protected Landscape inside Marikina Watershed was successfully used to timely show how freshwater protected areas are effective in combating stream habitat destruction and biodiversity loss. **(Author's abstract)**

**Keywords:** *Human population density, Freshwater protected area, Biology*

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(Filipiniana Analytics)  
NP

0166

### **Distribution and diversity of *Gracilaria* spp. in the Philippines**

**Mondragon, Josefino S., Nacido, Ma. Christi B., Moises, Minerva T., Gomez, Rosalie N., Ferrer, Ma. Salvac**

*Gracilaria* is one of the economically important seaweeds in the world because of its “agar” content and varied applications. But the concern on proper identification must be addressed due to high variability in the morphology and rampant phenotypic plasticity in many species under this genus. DNA barcoding using cytochrome oxidase subunit I (COI) as marker was used to discriminate and determine the phylogenetic relationships of the samples analyzed. The *Gracilaria* samples were collected from 107 coastal barangays nationwide. A total 249 COI-5P sequences were verified and categorized into 16 different species under the two genera: *Gracilaria* and *Gracilariopsis*. The species considered dominant in terms of distribution are *Gracilaria edulis*, *G. salicornia*, and *Gracilariopsis heteroclada*. The species that were confirmed up to the species level with intraspecific divergence of 0-1.72% are *G. changii*, *G. eucheumatoides*, *G. fisheri*, *Gp. heteroclada*, *G. manilaensis*, and *G. salicornia*. Haplotype analysis revealed new records for seven species of the 16 species identified in this study. **(Author's abstract)**

**Keywords:** *DNA barcoding, COI-5P, Morphology, Phylogenetic tree, Distribution, Biology*

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2019 July,  
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NP

0167

### **Diversity and echolocation calls of bats in Mt. Guiting-guiting Natural Park, Sibuyan Island**

**Alvarez, Jam**

Insect-eating bats emit high-frequency sounds which they use to navigate and locate their insect prey. These calls are typically species-specific and can be used to identify species. This study determined the diversity of echolocating insect bats in Mt. Guiting-Guiting Natural Park, a protected area in the center of Sibuyan Island in Romblon province. In October-November 2016 and May-June 2017, bats were collected using mist nets and harp traps. Captured bats were then released in a tent to record their respective echolocation calls using a Pettersson M500 bat detector. A total of 87 bats were recorded, representing 11 species: *Hipposideros antricola*, *H. obscurus*, *Kerivoula whiteheadi*, *Murina cyclotis*, *Myotis muricola* A, *M. muricola* B, *Pipistrellus javanicus*, *P. tenuis*, *Rhinolophus arcuatus*, *R. virgo*, and *Scotophilus kuhlii*. On the basis of echolocation call, two different types of *M. muricola* (A [maximum frequency=107 kHz, peak frequency= 7 kHz] and B [maximum frequency=67 kHz, peak frequency=50 kHz]). *K. whiteheadi* also represents a new record for Sibuyan Island. Species identification was based on the current taxonomy of groups but further taxonomic studies may result in a split of species complexes (i.e., *R. arcuatus* group) into several distinct species. **(Author's abstract)**

**Keywords:** *Bats, Sibuyan, Echolocation, Biology*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 163  
2018/07,

## **Diversity and status of bats in selected watershed areas in Lake Mainit, Surigao Del Norte, Philippines**

*Seronay, Romell A., Lador, Richie P., Bongosia, Ana*

Bats are known to be effective pollinators and seed dispersers that aid in shaping forest ecosystems. This study was conducted to assess the diversity and status of bat species in selected watershed areas (Camp Edward, Alegria, Surigao del Norte; Sitio Canticol, Tubay, Agusan del Norte) in Lake Mainit as input to protected area suitability assessment. Sampling was done using mist netting method with the use of 40 x12-meter mist nets to determine species diversity of bats in two sampling sites. The external metrics of captured bats were immediately recorded after retrieval from the nets. There were 260 bats captured, representing 13 species belonging to three families (Pteropodidae, Hipposideridae, and Rhinolophidae). Of these, 54% were endemic species while 46% were resident species. *Megaerops wetmorei* are listed in the IUCN Red List as vulnerable and *Eonycteris robusta* as near threatened while the other species are listed as of least concern. The presence of vulnerable and near threatened species indicates that the watershed areas of Lake Mainit varied in terms of availability of food and other environmental attributes useful in determining an area's potential for conservation and protection. To validate the existence of other bat species, it is suggested that additional sampling and persistent monitoring of the watershed areas in Lake Mainit, Mainit Surigao del Norte, Philippines. (**Author's abstract**)

**Keywords:** *Bats, Endemic, Resident, Ecological importance, Biology*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 164  
2018/07,  
(Filipiniana Analytics)  
NP

## **Diversity of amphibians and reptiles in Agusan Del Sur State College of Agriculture and Technology**

*Limbasan, Grace M. , Monson, Brian Miguel F., Baldo, Ronald R*

Amphibians and reptiles (herpetofauna) are an abundant and diverse component of many terrestrial and freshwater ecosystems contributing to a diverse range of ecological functions. This study, which rapidly assessed the amphibians and reptiles present in the area, was conducted during the summer class of academic year 2016-2017 for two nights along a 1-km transect walk (ground distance) in the river area of ASSCAT campus. Collected specimens were picked by hand and pitfall trapping was established close to feeding grounds and possible pathways so that surfaceactive reptiles would fall into the trap in the ground. The study revealed a total of seven species belonging to six genera and four families, five of which were amphibians and two were reptiles. Results of the assessment showed one vulnerable species (*Cuora amboinensis* Riche in Daudin, 1801), one data-deficient species (*Fejervarya moodiei* Taylor, 1920), and five species of least concern (*Fejervarya vittigera* Wiegmann, 1835; *Lithobates catesbeianus* Shaw, 1802; *Limnonectes leytensis* Boettger, 1893; *Polypedates leucomystax* Gravenhorst 1829; and *Eutropis* sp.). (**Author's abstract**)

**Keywords:** *Species richness, Amphibians, Reptiles, Assessment, Biology*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 175  
2018/07,  
(Filipiniana Analytics)  
NP

## Diversity of birds in Mt. Malindang Range Natural Park-Hoyohoy Site, Tangub City

*Manapsal, Mark Anthony, Hingco, Jonas, Villantes, Y*

Mt. Malindang Range Natural Park (MMRNP) serves as a watershed supporting various life forms and providing sanctuary to numerous and unique wildlife species. However, Mt. Malindang is threatened by anthropogenic activities, hence Mt. Malindang needs maximum protection. This study assessed the diversity of birds in the MMRNP-Hoyohoy Site in Tangub City. line transect count and mist-netting were used to record and collect birds. A total of 47 species of birds belonging to 12 orders and 31 families were recorded in the site. Passeriformes had the most number represented by nine families. Of the species observed, 46.5% endemism was recorded. Certain bird species, such as *Otus gurneyi* and *Buceros hydrocorax* are listed as vulnerable species. These two species of birds need to be given high conservation priority along with other forest endemics. The value for species diversity was  $H' = 3.499$  and evenness was  $e' = 0.7875$ . Results of this study can be used to come up with better strategies for conservation as well as in the development of information, education and communication (IEC) for behavior change materials that would contribute toward the protection of Mt. Malindang. (**Author's abstract**)

**Keywords:** *Conservation, Endemism, Threatened, Passeriformes, Biology*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 165  
2018/07,  
(Filipiniana Analytics)  
NP

## Diversity of epiphytic macrolichens of the three montane forests of Mindanao, Philippines

*Cuario, Marlo A. , Cababan, Mc Arthur L. , Migalang, Gilden Maecah M. , Anud, Edgar , Baino, Mariza , Gonzales, Maricel , Nuezca, Arman P. , Suldano, Melanie P. , Bacol, Nelmar T. , Pequero, Rudeno B. , Montecillo, Roselynn Grace G. , Sariana, Lalaine G. , Azuelo, Andrea G. , Magday, Ehlich Ray J., Valiente, Exequiel*

Floristic studies of macrolichen flora of the three montane forests of Mindanao namely: Mt. Kitanglad, Mt. Lumot and Mt. Malambo. Transect walk was employed by recording all the species within the montane sites. Six sample plots with a 20x20 m quadrat was also established and ecological habitats was used for further species identification. Floristic data revealed a total lichen taxa of 294 species belonging to 27 genera, 16 families and 86 species in Mt. Lumot; A total of 111 species belonging to 31 genera, and 14 families in Mt. Kitanglad; and a total of 97 species belonging to 30 genera, 13 families and 97 species in Mt. Malambo. The most lichen species distribution was represented by Parmeliaceae family and the least belongs to family Malmidiaceae. Mt. Lumot obtained the highest diversity index. While species richness was noted in Mt. Malambo. Cladogram analysis on lichen species indicate that Mt. Malambo and Mt. Kitanglad appeared species similarity. The combination of systematics with floristics studies reflect an increased understanding of the dynamics of lichens species. (**Author's abstract**)

**Keywords:** *Cladogram analysis, Floristic, Montane, Species richness, Biology*

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Transactions of the National Academy of Science and Technology, Volume No. 41 Issue No. 1, 124  
2019 July,  
(Filipiniana Analytics)  
NP

## DNA barcodes of *Caulerpa* species (Caulerpaceae, Chlorophyta) from the Northern Philippines

*Balucanag, Maria Pia Sarah B., Dulalia, Allissa Rose T., Alcoriza, Ver Angelo M., Aguinaldo, Zae-Zae A., Dumilag, Richard V., Sayasa, Arnel*

Species discrimination in *Caulerpa*—a seaweed genus of economic importance—can be difficult because its members are often morphologically variable, occasionally with some morphological overlap between species. One of the most common approaches to circumvent this challenge is the integration of phenotypic data with information gained from short reference DNA sequences or DNA barcodes. Previous investigations based on this approach have incorporated only a limited number of specimens of *Caulerpa* from the Philippines. The present study aimed to identify *Caulerpa* collections from the northern Philippines aided with DNA barcodes. *tufA* gene sequence data of recent intertidal and shallow subtidal collections confirmed the presence of seven genetically recognized *Caulerpa* species in the northern Philippines, namely *C. chemnitzia*, *C. cupressoides*, *C. elongata*, *C. oligophylla*, *C. racemosa*, *C. serrulata*, and *C. sertularioides*. *Caulerpa elongata* and *C. oligophylla* were confirmed occurring in the area for the first time. With the addition of species recorded previously but not found during the present study, this brings the total number of *Caulerpa* species in the region to 15 species. (**Author's abstract**)

**Keywords:** *Caulerpa elongata*, *Caulerpa oligophylla*, DNA barcoding, Taxonomy, *tufA* gene, Biology

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Philippine Journal of Science, Volume No. 148 Issue No. 2, 337-347

2019/06,

(Filipiniana Analytics)

NP

0173

### **DNA barcodes reveal high genetic diversity in Philippine fruit bats**

*Ong, Perry S., Duya, Mariano Roy M., Roño, John Gregor A., Luczon, Adrian U., Ampo, Sofia Anne Marie M., Fontanilla, Ian Kendrick*

Fruit bats of the family Pteropodidae is the third largest family in the order Chiroptera. There are 26 recorded species in the Philippines, 17 of which are endemic to the country. However, the number of species in the archipelago may still be underestimated. With the growing threats to biodiversity and dwindling number of taxonomists, DNA barcodes can assist with the problem by providing an accurate, rapid, and effective method of species recognition. To contribute to the barcoding endeavor and determine the diversity of Philippine fruit bats, a 542-base-pair portion of the cytochrome c oxidase subunit 1 (COI) gene was sequenced from 111 individuals belonging to 19 pteropodid species. A neighbor-joining (NJ) and maximum likelihood (ML) tree was generated using the sequences in this study and other available sequences in Genbank and Barcode of Life Data Systems (BOLD). DNA barcodes were effective in delineating Philippine species. Closer inspection of the NJ tree revealed distinct [ $> 6\%$  mean Kimura-2-parameter (K2P) distance] Philippine lineages for *Macroglossus minimus*, *Rousettus amplexicaudatus*, *Megaerops wetmorei*, and *Cynopterus brachyotis* relative to conspecifics from Southeast Asia. Between-island differentiation was also observed for the Philippine endemic *Haplonycteris fischeri* ( $>7\%$  mean between-island K2P distance). From this study, these species may be flagged for taxonomic reevaluation. (**Author's abstract**)

**Keywords:** *COI* gene, cryptic species, DNA barcoding, Pteropodidae, Biology

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Philippine Journal of Science, Volume No. 148 Issue No. S1, 133-140

2019/10,

(Filipiniana Analytics)

NP

0174

### **DNA barcoding as a tool for accurate species identification**

*Ventolero, Minerva Fatimae H., Santos, Mudjekeewis D., Dela Peña, John T., Poniente, Jenni*

Because an important component of combating illegal trade of aquatic species is the ability to accurately identify species in whatever form they are traded, DNA barcoding offers an effective identification tool that has proven to be useful in the fight against illegal trade. Here we present the results of the project FishCODES highlighting four studies that use DNA barcoding for species identification in collaboration with other government agencies. It was found that dried seahorse from a sack confiscated by the Philippine Coast Guard was actually *Hippocampus comes*, commonly known as the tiger tail seahorse, which is listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna (CITES) and assessed as vulnerable (VU A2bd+4bd) in the IUCN Red List. Another is the identification of shark's fin confiscated by the National Bureau of Investigation as *Carcharhinus falciformis*, which is listed as near threatened in the IUCN Red List. Another is the discovery of the identity of an assumed "mameng" species as *Bolbometopon muricatum*, known as green humphead parrotfish. Finally the project was able to refine the identification of a stranded carcass of a marine mammal in the island of Dinagat in Surigao del Norte as *Physeter catodon* or sperm whale. (Author's abstract)

**Keywords:** DNA barcoding, *Hippocampus comes*, *Carcharhinus falciformis*, *Bolbometopon muricatum*, Biology

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 185  
2018/07,  
(Filipiniana Analytics)  
NP

0175

### **DNA barcoding of commercial fishery products for export in the Philippines**

*Santos, Mudjekeewis D., Ventolero, Minerva Fatimae H., Pereda, Jacqueline Marjorie R., Mangonon, Verinna Charisse B., Pol, Rose Tifanny A.*

The demand for more accurate and responsible identification and labeling as a precautionary measure to ensure health safety in fish and fishery products consumption is taken seriously in global trade operations, which necessitates that exported products of the country be at par with international standards. To assess species identity and authenticity, this study tested the utility of DNA barcoding as one way to address issues of species identification and authenticity testing and as a baseline approach to illegal, unreported, and unregulated fishing. Samples were collected from participating BFAR-accredited export companies in three project sites: Manila, Cebu, and General Santos City. DNA barcoding results of 179 samples showed that 96% of the initial identification information indicated in the product label were correct based on clustering analysis conducted on the retrieved DNA sequences of the samples. These results revealed that most of the frozen, dried, and fillet products exported are authentic and comply with international standards on correct species labeling. Furthermore, the results provide an initial reference on the actual species of the fishery commodities being exported by the country. (Author's abstract)

**Keywords:** DNA barcoding, IUU yellow card, Labeling, Biology

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 186  
2018/07,  
(Filipiniana Analytics)  
NP

0176

### **DNA barcoding of commercially cultivated *Coffea* species in the Philippines**

*Baltazara, Miriam D., Alejandro, Grecebio Jonathan*

Accurate identification of the commercially cultivated *Coffea* species is necessary since the cup quality may be attributed to the kind of species. Morphological identification may lead to inconsistent data due to limited variation within species of the same genus and affected by the environment. To complement the traditional method, DNA barcoding using *nuclear ribosomal internal transcribed spacer (nrITS)* and *maturase K (matK)* regions was performed. Genomic DNA was extracted, amplified and purified from twenty-four *Coffea* samples cultivated in the Philippines. Both markers had 100% amplification

and sequencing success rates. The Wilcoxon two sample test showed that the interspecific distances of *nrITS*, *matK*, and *ITS + matK* combination were significantly higher than their intraspecific distances, respectively. *MatK* had a higher percentage of resolved monophyletic taxa. The results showed that *matK* is an efficient barcode over *nrITS* for commercially cultivated *Coffea* species by generating the highest rate of both universality and discriminating power. The result of this study is essential baseline information to authenticate *Coffea* planting materials at juvenile stage. Identity of coffee seedlings being sold by nursery owners can be assessed using *matK* barcode. This method of authentication will benefit the coffee growers for large-scale plantations. **(Author's abstract)**

**Keywords:** *Coffea*, DNA barcoding, Nuclear ribosomal internal transcribe spacer (*nrITS*), Maturase K (*matK*), Biology

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2019 July,  
(Filipiniana Analytics)  
NP

0177

### **DNA fingerprinting of beneficial organisms for the rice environment**

**Dela Cruz, Arlen, Tabudlong, Belen, Cruz, Jayvee, Duque, Ma. Johna, Aguilar, Ronel, Fernando, Trinidad, Ordonio, Reynante**

The Philippine Rice Research Institute (PhilRice) tests and safeguards the efficacy and purity of promising organisms in the formulations of bioinoculants intended for soil and plant health enhancement (bacteria) and control of rice pests and diseases (fungi). The usual procedure in their production involves identification and mass culture of effective organisms. However, the handling and processing of bioinoculants can affect their purity. *Nostoc commune*, a blue-green algae common to rice paddies, is also being propagated in PhilRice. Accordingly, the institute aims to ensure that only *N. commune* strains that are safe (nuerotoxin-free) for use as food or feed are cultivated. DNA extraction, gene amplification, and DNA sequencing were initially done on the available specimens. In bacteria, the 16S rRNA primer combination 8F and 1492R revealed the true identity of 3R2S-*Bacillus cibi* (previously identified by Biolog) as *Alcaligenes faecalis*, with 99% similarity to *B. cibi*. Moreover, BLAST analysis showed that the putative specimens *Streptomyces mutabilis* and *Bacillus* sp. were 99% matched with their respective references. Initial phylogenetic analysis of *N. commune* using 27F and 1492R primers showed considerable difference among specimens collected from the hills and rice paddies in Ilocos Norte, whereas those collected from rice paddies in Adams and Pasuquin, Ilocos Norte were found to be 100% similar. Using the specific 28S rRNA primers for *Beauveria bassiana* and *Metarhizium anisopliae* revealed 99% similarity to their respective references based on BLAST analysis. With the advent of molecular markers, some limitations of morphological analyses can be solved using DNA fingerprinting technique to effectively determine their identity. Results of this study will be useful in decision making, especially in identifying the most suitable strain of *N. commune* for large-scale on-farm production. Also, this will help to ensure that only effective organisms of true identity will get incorporated in bioinoculant products. **(Author's abstract)**

**Keywords:** *N. commune*, Bacteria, Fungi, Bioinoculant, DNA fingerprinting, Biology

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 64  
2018/07,  
(Filipiniana Analytics)  
NP

0178

### **Documented pupal eye color of Mediterranean fruit fly as a tool for radiation sterilization**

**Resilva, Sotero S., Barnes, Brian N., Obra, Glenda B**



Pupal age is critical when sterilizing pupae of a different strain of Mediterranean fruit fly, *Ceratitis capitata* (Wiedemann), for a sterile insect technique (SIT) program. Pupal age is usually determined using pupal eye color, which is optimally dark brown for *C. capitata* prior to sterilization. This color is achieved at 9 days of pupal age, 2 days before adult emergence, and upon maturity at 25°C. However, it is often necessary to use different pupal holding temperatures in order to manipulate pupal development, especially when unforeseen problems occur during the *C. capitata* rearing procedure. Holding pupae at lower temperatures delays pupal development and slows down the progression of eye color changes; at higher temperatures, the opposite occurs. The pupal eye color of *C. capitata* was documented at different ages at different holding temperatures. When maturing pupae at 17, 20, 25 (standard holding temperature), and 28°C, the developmental duration of pupae was 28, 17, 11, and 9 days, respectively. Using this eye color as the reference guide for timing the irradiation of pupae, the optimum pupal age for irradiation when held at 17, 19, and 28°C was 23–26, 14–15, and 8 days old, respectively. Documented and close-up photographs of pupal eye color for different pupal holding temperatures are presented here can be used as a reference guide to determine the best time for the irradiation of pupae in an SIT program. (Author's abstract)

**Keywords:** *Ceratitis capitata*, Mediterranean fruit fly, Pupal development, Pupal eye color, Sterile insect technique, Biology

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Philippine Journal of Science, Volume No. 148 Issue No. 1, 87-93  
2019/03,  
(Filipiniana Analytics)  
NP

0179

### **Draft genome sequences of *Ralstonia solanacearum* isolated from banana and tomato in the Philippines**

*Villegas, Lucille C., Llamas, Jo-Hannah S., Sabban, Emilia Andrea V., Bautista, Ma. An*

*Ralstonia solanacearum* causes bacterial wilt of several plant species, including banana and tomato. With limited options for control, understanding the molecular mechanism of pathogenicity is warranted. Herein, we report the draft genome sequences of two *R. solanacearum* isolates from the Philippines infecting banana and tomato. *R. solanacearum* 10314 was isolated from banana while *R. solanacearum* 10154 was isolated from tomato. Pathogenicity tests indicated that 10314 can infect both banana and tomato while 10154 can only infect tomato. In an effort to investigate the molecular basis of virulence and differential host-specificity of the isolates, whole genome sequencing was performed using the Ion Torrent Proton platform. Draft assemblies were generated using three assemblers, and the quality was evaluated using assembly metrics. Standard genome annotation was performed allowing for identification of important virulence- and host-specificity-related genes for the bacterial isolates, which provided clues underlying their differential capacity to infect banana and tomato. The availability of these data in public repositories will complement the existing data from several *R. solanacearum* strains, including those isolated from the Philippines; thus, it can provide essential platforms for studying *R. solanacearum* pathogenicity and help in the control of bacterial wilt. (Author's abstract)

**Keywords:** host specificity, pathogenicity, *Ralstonia solanacearum*, virulence genes, whole-genome sequencing, Biology

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Philippine Journal of Science, Volume No. 148 Issue No. S1, 115-126  
2019/10,  
(Filipiniana Analytics)  
NP

0180

### **Ecology of reptilian fauna in Andanan Watershed Forest Reserve, Caraga Region, Philippines**

*Cuadrado, Jerry T., Gamalinda, Eve*

This study was carried out to assess the basic ecology of reptilian fauna in Andanan Watershed Forest Reserve, Caraga, Philippines employing the transect walk and extensive opportunistic sampling method. Environmental variables were gathered, and the association of reptiles between these variables was performed using Canonical Correspondence Analysis. Diet composition of *Eutropis multifasciata* and *Eutropis multicaudata*, and the socio-economic importance of reptiles were also assessed. A total of 216 individuals of reptiles belonging to nine families, 23 genera and 27 species were recorded, of which 77.77% are considered least concern species. Eighteen significant record of Philippine and Mindanao endemics were also accounted in the area. Species richness was highest in Brgy. San Juan (S=19), and high species abundance was recorded in Brgy. Calaitan (N=73). Dietary compositions of *E. multifasciata* and *E. multicaudata* were mainly insects particularly Orthopterans and Odonata. Platyhelminthes was the only endoparasite observed in the stomachs of *E. multifasciata*. Moreover, nine environmental variables were strongly associated with the abundance of reptiles. The reptilian fauna utilized aquatic, arboreal, and terrestrial microhabitat types and highly preferred forest habitats. However, reptiles are threatened not only because they are consumed, sold and used in traditional medicine, the destruction and degradation of the habitats in the area also elevated the threats to reptilian faunal diversity. Monitoring, protection and conservation of the forests of the Andanan Watershed are essential to safeguard the reptiles and other biodiversity of the watershed. **(Author's abstract)**

**Keywords:** Diet analysis, Microhabitat, Philippine endemic, Socio-economic importance, Threats, Biology

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Transactions of the National Academy of Science and Technology, Volume No. 41 Issue No. 1, 145  
2019 July,  
(Filipiniana Analytics)  
NP

0181

### **Effects of mycorrhizal inoculation and other soil amendments on growth, nutrient status, and rhizosphere microbes of *Acacia mangium* and *Eucalyptus urophylla***

*Aggangan, Nelly S., Victoria, Kristel S., Jomao-as, Joshua*

*Acacia mangium* and *Eucalyptus urophylla* are popular species for forest plantation and both known for their rehabilitation capability on heavy metal sites. These species can survive in such environment due to their association with beneficial microbes like arbuscular mycorrhizal fungi (AMF) and nitrogen fixing bacteria (NFB). The experiment was conducted to determine the growth, nutrient status, and microbial population due to AMF and/or NFB and other soil amendments. Treated seedlings were raised at the screenhouse and planted in mine tailing site of Mogpog, Marinduque. The seedlings were inoculated with AMF from Surigao, Mindanao mine tailing (coded as Sur) and from marginal site (*Glomus macrocarpum*, coded as *Gmacro*), with or without NFB. After one year, both species grew very well in the area with 96% survival. Mycorrhiza inoculated *A. mangium* grew healthy with green leaves and a meter taller than the control. On the other hand, stem diameter of *E. urophylla* increased by two times when inoculated with *Gmacro* alone. P concentration in the youngest fully expanded leaves of *A. mangium* was highest (1,504 ppm) when inoculated *Gmacro* alone, while N concentration was 2.5% in NFB inoculated plants. Lastly, the rhizosphere soil population of culturable fungi in *A. mangium* was highest in NFB+Surigao inoculated seedlings while the highest NFB and AMF spore count was observed in NFB and Sur inoculated counterpart, respectively. The lowest microbial count was observed in the control counterpart. The results can be used to encourage adoption of the technology for both species in mined-out areas. Microbial biofertilizers inoculated species can also be recommended in the rehabilitation of other mine tailing sites. **(Author's abstract)**

**Keywords:** Biofertilizer, *Glomus macrocarpum*, Nutrient accumulation, Mixed inoculant, Biology

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Transactions of the National Academy of Science and Technology, Volume No. 41 Issue No. 1, 131  
2019 July,  
(Filipiniana Analytics)  
NP

## Estimation of biomass and carbon sequestration by forest tree species in response to microbial biofertilizers in a mined-out area in Mogpog, Marinduque

Algabre, Iris Ashley C., Racelis, Ma. Elenita L., Aggangan, Nelly

Climate change is presently the most important issue facing our generation. Estimation of plant biomass is one of the developed methods to determine the amount of carbon stored and carbon dioxide (CO<sub>2</sub>) that can be released into the atmosphere, which can help reduce environmental degradation and mitigate climate change. This study assessed the carbon sequestration and storage by three reforestation species: *Pterocarpus indicus*, *Acacia mangium*, and *Eucalyptus urophylla*, as influenced by microbial biofertilizers [mycorrhiza with or without nitrogen fixing bacteria (NFB)]. Inoculation was done during pricking while lime and compost were applied to all seedlings during field planting. Allometric equation developed by Martines-Yrizar *et al.* (1992) was used to determine biomass density using diameter at breast height (dbh) and total height of the tree. Representative trees were excavated 27 months after field planting. Results showed that *A. mangium* inoculated with mycorrhiza+NFB gave a 73.54% increase of accumulated biomass and CO<sub>2</sub> compared with its control counterpart. In *E. urophylla*, 70% biomass increase was observed by those inoculated with mycorrhiza alone. In *P. indicus*, mycorrhiza+NFB inoculated plants gave a 19.10% increase relative to the uninoculated ones. The results suggest that plant biomass and CO<sub>2</sub> sequestration due to microbial inoculation and other soil amendments vary depending on tree species. In conclusion, *A. mangium* generated higher plant biomass, that likewise, gave higher amount of stored or sequestered CO<sub>2</sub> than *E. urophylla* and the lowest was *P. indicus*. Studies should be conducted in other mined-out areas in the country to verify the results. (Author's abstract)

**Keywords:** Climate change, Inoculation, Allometry, Mycorrhiza, Biology

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Transactions of the National Academy of Science and Technology, Volume No. 41 Issue No. 1, 130  
2019 July,  
(Filipiniana Analytics)  
NP

## Evaluation of anti-angiogenic property of *Senna alata* (L.) ethanolic extract in duck (*Anas platyrhynchos*)

Jumawan, Joycelyn C., Abuan, Maric

Angiogenesis, as a vital process of embryonic development, is the formation of new blood vessels from preexisting vessels. It plays a key role in cell migration, tube formation, and proliferation. This study determined the anti-angiogenic property of ethanolic extract of *Senna alata* (L.), which is a medicinal plant in duck (*Anas platyrhynchos*) embryos. Obtained ethanolic extracts from *Senna alata* were treated to the duck eggs on the 10th day of incubation. The setups were composed of retinoic acid as positive control, distilled water as negative control, and *Senna alata* extracts in 1 mg mL<sup>-1</sup>, 5 mg mL<sup>-1</sup>, and 10 mg mL<sup>-1</sup> concentrations. Morphometric evaluations and vasculature densities from CAM assay were analyzed using univariate analysis of PAST software. Results showed that branching of capillaries was irregular and that veins were thin in the treated samples. Ethanolic extract of *Senna alata* inhibited greater angiogenesis at 5 mg mL<sup>-1</sup> than in 1 mg mL<sup>-1</sup>, and 10 mg mL<sup>-1</sup> concentrations. There was a significant difference in crown-rump length in the control and treated samples. The findings of the study indicate that *Senna alata* extract might have a promising antiangiogenic potential. However, further in-depth study is required to reveal specific details involved in angiogenesis inhibition. (Author's abstract)

**Keywords:** *Anas platyrhynchos*, Angiogenesis, CAM assay, *Senna alata*, Biology

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 122  
2018/07,  
(Filipiniana Analytics)  
NP

### **Evaluation of the presence of beta lactamase (BLA) gene in *E. coli* isolated and identified from cage-cultured tilapia (*Oreochromis Niloticus*) from Laguna Lake, Philippines**

*Awingan, Joan S., Cayetano, Mylene G., Carpio, Marinette Rose M., Bathan, Kim Jana S., Lacap, Ka*

Inland fish and fisheries play important roles in ensuring global food security providing a critical source of animal protein for local communities in developing countries. Laguna Lake, the largest inland freshwater system in the Philippines is largely used for aquaculture purposes. However, its location at the center of domestic and industrial activities makes it vulnerable to pollution by human, animal and industrial wastes. This study aimed to: (a) investigate the presence of *E. coli* from the skin mucus, gills and gut of adult cage-cultured tilapia obtained from Pila and Biñan stations of Laguna Lake and (b) detect for the presence of Bla (beta-lactamase) genes in *E. coli* isolated from the fish samples. Tilapia were randomly sampled over a three-month period from January 2018 until March 2018. The skin mucus, gills and gut were sampled for bacterial isolation. All bacterial isolates were subjected to morphological and biochemical tests and were all found positive for the presence of *E. coli*. Conventional Polymerase Chain Reaction (PCR) analyses showed that the samples were all negative for the presence of the Bla gene. However, the presence of *E. coli* in the fish samples is recognized as a reliable indicator of fecal contamination and therefore water pollution and may represent a risk to the consumers and therefore could be a basis for further study. (**Author's abstract**)

**Keywords:** *Bla gene, PCR analysis, E. coli, Aquaculture, Fecal contamination, Biology*

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NP

### **Expression of the recombinant precursor and putative mature forms of human interleukin-37 isoform b (IL-37b) in *E. coli* expression system**

*Lim, Ciara Christianne Y., Stacey, M*

IL-37b is a cytokine that may exist in several forms including a full-length precursor protein and its putative mature forms (IL-37b cleaved at E21, V46, and K53, respectively). In recent years, the role of IL-37b has been associated with the regulation of inflammation and inflammatory diseases. Previous studies focused on the intracellular activity of the cytokine, while the bioactivities of its variants when introduced in the extracellular environment has been limited and require further investigation. To enable this, the study produced precursor and truncated forms of IL-37b in an *E. coli* expression system. Recombinant proteins of the full-length (FL) and shorter forms (E21, V46, and K53) of IL-37b were produced in IPTG-induced *E. coli* BL21-CodonPlus(DE3)-RIPL strain and subsequently purified using Ni<sup>2+</sup>-NTA affinity, ion exchange, and size exclusion chromatography. The identity of the proteins was confirmed through western blotting and LC-MS. Findings show that the masses of the expressed proteins correspond to their respective theoretical masses with 24,134.75 0.04 Da for FL, 21,919.63 0.80 Da for E21, 19,298.57 0.04 Da for V46, and 18,551.21 0.04 Da for K53 at 90-95% purity. This confirms that the correct proteins have been produced and at high purity. Further, the tendency of FL to homodimerize was observed in this study, which may have implications in the extracellular processing and bioactivity of FL. This study describes the successful expression and purification of recombinant precursor and putative mature forms of IL-37b in *E. coli*, which can be utilized for downstream characterization. (**Author's Abstract**)

**Keywords:** *interleukin-27, mature interleukin-37, IL-37b recombinant expression, Biology*

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Philippine Journal of Health Research and Development, Volume No. 22 Issue No. 1, 12-18  
2018/03,  
(Filipiniana Analytics)

### **Filipino DNA variation at 36 Y-chromosomal short tandem repeat (STR) marker units**

*Delfin, Frederick C. , Honrado, Maria Lourdes D. , Agmata, Altair B. , Rodriguez, Jae Joseph Russell B. , Carandang, Lindsay Clare D.L. , Salvador, Jazelyn M., De Ungria, Maria Corazon*

Y-chromosomal short tandem repeat (Y-STR) markers are used in deficient paternity testing cases, in the detection of male DNA in vaginal smears/swabs collected during investigations of sexual assault cases, and in the identification of missing persons and disaster victims. The increasing relevance of Y-STR DNA typing to forensic practice necessitates evaluation of new markers with high gene diversity and mutation rates in the population. This study presents the work done for the Philippine population. Y-STR haplotypes composed of 36 Y-STR marker units were analyzed in a Filipino population sample of 299 individuals using the PowerPlex® Y23 (PPY23) system and protocols of the International RM Y-STR Study Group that target a set of 13 Rapidly Mutating Y-STR (RM Y-STR) comprising 15 Y-STR marker units. Concordant results were observed at two RM Y-STR marker units, namely DYS570 and DYS576, that are included in both assays. Allele frequency and gene diversity were estimated for each Y-STR marker unit, while haplotype frequency and haplotype diversity were estimated for several combinations of Y-STR marker units. The inclusion of 15 RM Y-STR marker units increased the power of the Filipino Y-STR database to differentiate paternally related males. Comparison of the Filipino Y-STR haplotype data at 36 Y-STR marker units with other populations showed the same level of substructuring for the 21 slow and moderately mutating Y-STR marker units based on geographic locations. This highlights the importance of using an appropriate population database in forensic casework. In addition, the observed high diversity of RM Y-STR haplotypes supports the need for studying diverse group of populations to characterize the extent of RM Y-STR haplotype variation. The Filipino Y-STR haplotype database reported in this study would be of great use for reliable estimation of haplotype frequency for statistical evaluation of forensic caseworks in the Philippines. (**Author's abstract**)

**Keywords:** *Filipino, Population genetics, Rapidly mutating (RM) Y-STRs, Short tandem repeats (STRs), Chromosome, Y-STR marker units, Biology*

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Philippine Journal of Science, Volume No. 148 Issue No. S1, 43-52  
2019/10,  
(Filipiniana Analytics)  
NP

### **Finding stress genes: gene expression analysis of the resistant lesion mimic and early senescence rice (*Oryza sativa* L.) mutant**

*Terauchi, Ryohei, McCouch, Susan, Arbelaez, Juan David, Maron, Lyza, Undan, Jer*

Differential gene expression analysis in lesion mimic and early senescence mutant (*lms*) in rice (*Oryza sativa* L.) was conducted to identify genes that are up- and down-regulated relative to wild type. Pooled RNA from 20 biological samples grown for 21 days in 1.5 in diameter and 8 in depth containing soil were used. The cDNA libraries were sequenced using HiSeq 2,500 (100-bp reads). Reads alignment was done using TopHat (v2.1.1) while downstream quantification of expression was done using Cuffdiff software (v2.2.1). There were 126 genes that showed up-regulation and 737 genes were down-regulated. Up-regulated genes are involved in terpene synthase, serine-type endopeptidase activity, and protein kinase activity while down-regulated genes are involved in biosynthetic, peptide biosynthetic process, and RNA metabolic process. Mutation in *lms* mutant affects the different genes involved in many biological and molecular processes. The *lms* mutant in this study is a very important material to decipher other mechanisms in plants that respond to environmental cues affecting plant growth. (**Author's abstract**)

**Keywords:** *Stress genes, lms mutant, RNA-seq, Biotic stress, Abiotic stress, Biology*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 187  
2018/07,  
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NP

### Foodborne disease outbreaks in the Philippines (2005–2018)

*Garcia, Nadine Kristel A. , Feliciano, Rodney J. , Estilo, Emil Emmanuel C. , Dollete, Una Grace M. , Membrebe, Bernard Niño Q. , Sanchez, Rowena Grace R. , Azanza, Maria Patri*

The study detailed 209 reported Philippine foodborne disease outbreaks (FBDOs) for the period 2005 –Jun 2018. Multiple implicated foods were associated in majority of the studied outbreaks. Meat-containing dishes were the most common causative foods in the evaluated outbreaks with defined food vehicles. Food service eating facilities and households were found more prone to outbreak occurrences. Although there were reported outbreaks with unidentified causative agents, *Salmonella* spp., *Henipavirus*, *Entamoeba histolytica*, and *Vibrio parahaemolyticus* were cited as primary causes of infections. Human intoxications involved staphylococcal enterotoxins, carbamate toxin, and paralytic shellfish poisoning (PSP) toxin. Impact of the study on the implementation of national food safety controls of the Philippines was also cited. (Author's abstract)

**Keywords:** Foodborne diseases, Foodborne outbreaks, Food safety, Philippines, Biology

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Philippine Journal of Science, Volume No. 148 Issue No. 2, 317-336

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(Filipiniana Analytics)

NP

### Genetic diversity analysis of Philippine "carabao" mango (*Mangifera indica* L.) accessions based on single nucleotide polymorphisms

*Lachica, John Albert, Vilela, Julianne , Ocampo, Eureka Teres*

Genetic diversity of the Philippine Carabao mango (*Mangifera indica* L. cv. "Carabao") is important in identifying possible genetic groups as source of important genes for varietal improvement and breeding. Genotype-by-sequencing was used to obtain 31,208 single nucleotide polymorphisms (SNPs) imputed to 15,604 sequences from 341 mango accessions from different regions in the Philippines, including 14 varieties from the National Seed Industry Council (NSIC). Principal component analysis using the correlation of variances of the SNPs was performed to provide genetic clustering of individuals. Principal component analysis showed eight clusters based on "Carabao" phenotype, peel color, and origin of tree based on the 30% of SNP variations. Non-"Carabao" NSIC varieties clustered with other non-"Carabao" genotypes in cluster 1, while NSIC varieties Sweet Elena and Guimaras Super clustered with most "Carabao" accessions in Cluster 6. Cluster 7 consisted of individuals with red blush, such as NSIC Corcino and foreign cultivars Kensington and Tommy Atkins, while other NSIC varieties were found isolated in Cluster 8. Clustering of individuals provided information for breeding intra-clustered individuals of physiologically important traits. Despite the high density of individuals and SNPs, consistent clustering of the "Carabao" and non-"Carabao" accessions was not observed among the genetic groups. Instead, a gradient of the phenotype was observed, which indicate close relatedness among individuals and possible cross-breeding of hybrids. (Author's abstract)

**Keywords:** Carabao, Mango, Principal component analysis, SNPs, GBS, Biology

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2018/07,

(Filipiniana Analytics)

NP

### Genetic diversity of the HSP70 gene in native chicken (*Gallus gallus domesticus* L.) breeds of the Philippines

Valdez, Jr., Marcos B. , Santiago, Rene C. , Thomas, Jr., Rey C. , Daljog, Charmaine S. , Romero, Rose  
Glendelyn T. , Castillo, Raymond Vinc

Heat stress leads to high mortality and low productivity in chicken livestock industry. This study elucidated the genetic diversity of the HSP70 gene in 7 native chicken breeds of the Philippines based on molecular techniques. The HSP70 gene was amplified using primers designed from red-jungle fowl HSP70 gene sequence (J02579). The 5'UTR and partial exon fragment was cloned in puc19 vector prior to DNA sequencing. A total of 39 single nucleotide polymorphisms (SNPs) were identified. There were 14 observed haplotypes; 9 are breed-specific and 5 are shared between chicken breeds. The native chickens are characterized by low nucleotide diversity ( $\pi=0.003475$ ) and high haplotype diversity ( $h=0.796$ ). Haplotype distribution indicates unique haplotypes prevalent in breeds from the Southern Philippines. Analysis of molecular variance showed strong yet statistically insignificant differentiation between breeds ( $F_{st}=0.22738$ ,  $p>0.05$ ). Lastly, the heat stress tolerant genotype A258A was detected in 4 out of 7 native chicken breeds of the Philippines. Thus, these native breeds might be a potential source population in developing heat stress tolerant chickens. Significantly, findings from this study will provide crucial baseline information regarding the molecular characteristics of the HSP70 gene of the Philippine native chickens. **(Author's abstract)**

**Keywords:** Philippine native chicken, HSP70 gene, Single nucleotide polymorphism, Haplotype, Biology

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0191

### **Glycerol-3-phosphate dehydrogenase cDNA of Pili (*Canarium ovatum* Engl.) exhibits high similarity with other dicot species**

*Mulig, Justine Christian H., Garcia, Roberta*

Glycerol-3-phosphate dehydrogenase (GPDH) converts dihydroxyacetone phosphate (DHAP) and NADH (reduced form of nicotinamide adenine dinucleotide) into glycerol-3-phosphate (G3P) and NAD<sup>+</sup> (oxidized form of nicotinamide adenine dinucleotide). G3P serves as the backbone for triacylglycerol synthesis. In this study, GPDH gene was isolated and characterized to investigate its role in designing modern biotechnology strategies for pili pulp oil as an alternative fuel source. The gene sequence was generated by polymerase chain reaction using pulp complementary DNA (cDNA) followed by nucleotide sequencing. It was then analyzed using different bioinformatics tools. A 983 base pair *GPDH* cDNA was obtained which corresponded to a 327 amino acid-polypeptide that shows 95% homology with cytosolic GPDH sequences from *Citrus clementina*, *Citrus unshiu* and *Hevea brasiliensis*. The deduced protein was a homodimer consisting of the N-terminal NAD-binding domain and the C-terminal DHAP-binding domain that are both critical in the interconversion of DHAP and G3P. The two domains were connected by a short three-residue loop Asn219-Gly220-Asp221. Phylogenetic analysis revealed that the *C. ovatum* GPDH grouped with the cytosolic GPDH in dicots. This observation indicated that the isolated GPDH is homologous to the cytosolic isoform of the enzyme. **(Author's abstract)**

**Keywords:** Glycerol-3-phosphate dehydrogenase, Triacylglycerol synthesis, *Canarium ovatum*, Complementary DNA, Biology

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NP

0192

### **Heavy metals absorption by three reforestation species inoculated with microbial biofertilizers in a mined-out area in Mogpog, Marinduque**

*Aggangan, Nelly S., Morong, Lea*

Heavy metals are defined as metallic elements with relatively high density and are toxic at low concentrations. Such substances, although naturally present in soil, in mined-out areas, concentrations are harmful to all living organisms including human. The use of both microorganisms and plants as a bioremediation method to treat heavy metal contaminated soils is of high interest since it is cost effective. The experiment was conducted to demonstrate the effect of microbial inoculation on the absorption of heavy metals by narra (*Pterocarpus indicus*), *Acacia mangium* and *Eucalyptus urophylla*. Four month old treated seedlings were outplanted in June 2016 in a mine tailing in Barangay Capayang, Mogpog, Marinduque following RCBD with ten seedlings in a row per block per treatment. All data were subjected to ANOVA of RCBD and treatment means were compared using Tukey's. Twenty-seven months after field planting, the accumulation of elements in the tissues of all three forest species has been in the following order: Cu>Pb>Cd. In all three species, roots contained the highest amount of Cd and Cu while the stem highly accrued Pb. Narra inoculated with mycorrhizal fungi and nitrogen fixing bacteria (NFB) absorbed significantly higher amounts of Cd and Cu (3.34 ppm and 2,799 ppm, respectively) among the three species. *E. urophylla* inoculated with mycorrhiza alone accumulated greater amount of Pb than *A. mangium* (9.66 ppm and 12.49 ppm, respectively). In conclusion, the amount of heavy metals absorbed by plants varied depending on the tree species and microbes used. Mycorrhiza+NFB inoculated narra absorbed the highest Cu and Cd while *E. urophylla* inoculated with mycorrhiza alone absorbed the highest Pb. Tree species studied can be used to clean up Cd, Cu and Pb laden soils. **(Author's abstract)**

**Keywords:** *Acacia mangium*, *Eucalyptus urophylla*, Narra, *Pterocarpus indicus*, Biology

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0193

### **Ichthyofauna of Lumbo Creek, Valencia City, Bukidnon, Philippines** *Amoroso, Victor, Opiso, Einstine, Cudal, Maricris, Salolog, Mary Cor, Quimpang, Vi*

This study was conducted in Lumbo Creek in Mt. Musuan, Bukidnon, which is one of the Long-term Ecological Research (LTER) sites in Mindanao. For two years (2013-2015), seasonal samplings were done along the creek length (upstream, midstream, and downstream). Lumbo Creek is a tributary of Pulangui River, which is part of the longest river in Mindanao. Land cultivation has caused soil erosion, which has led to the deterioration of stream water quality and siltation. This study assessed the fish fauna species in Lumbo Creek. Fish collection using electric fishing and seining yielded a total of 549 adult and juvenile individuals representing 11 species from eight families. The fishes were generally small in size and no endemic species were found. The most commonly collected (38%) species was the native line spotted-barb (*Puntius binotatus*) (38%) from Cyprinidae, whose population was dense in the upstream area. This was followed by an introduced species of guppy (*Poecilia reticulata*) (24%) from Poeciliidae, which was commonly distributed in upstream and downstream areas. Other species collected were *Clarias gariepinus* (16%), *Trichogaster trichopterus* (1.5%), *Pterygoplichthys disjunctivus* (0.36%), *Cyprinus carpio carpio* (0.36%), *Oreochromis aureus* (0.36%), *Anabas testudineus* (0.36%), *Channa striata* (0.36%), *Clarias* sp. (0.18%), and *Chagunius chagunio* (0.18%). The wide distribution of introduced fishes and the occurrence of the invasive janitor fish may indicate the disturbed state of the creek although these fish species have shown resilience to the adverse environment brought about by land cultivation. **(Author's abstract)**

**Keywords:** *Ichthyofauna*, Resilience, Long-term ecological research site, Biology

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NP

0194

### **Identification of microbulbifer agarilyticus from mucus of soft coral *Clavularia* sp. using 16SrRNA** *Franco, Prima Fe R., Gaoat Cecile*



The coral mucus is known to be inhabited by diverse bacterial populations. Many bacteria associated with corals particularly those in mucus layer have been found to possess antimicrobial property and bioactive secondary metabolites. This study is focused on the isolation, characterization and identification of pigmented bacteria from *Clavularia* sp. A mucus sample was plated in sterile Marine Agar and incubated at 28°C for 24 to 48 hours. Results show that only one pigmented bacterium was able to grow and survive in the medium used. The isolate is Gram negative coccus and its colony form is irregular, elevation is umbonate and margin is undulate. The growth under slant growth type is arborescent and with all over liquid growth type. Isolate is positive for protease and hemolysin tests. It is also considered as halophile tolerating up to 42% salt. The isolate is observed to grows at pH 5 up to pH 11 and pigment secretion is observed from pH 8 to 11. It can also grow and secrete its pigments at 24°C up to 37°C temperature at certain pH used. The isolate was identified as *Microbulbifer agarilyticus* using 16S rRNA. This is known to be an agar degrading bacterium, *Microbulbifer* is a genus of *Proteobacteria* that is found in high-salt environments. Results indicate the possibility for it to be further explored for its biotechnological and industrial applications. (Author's abstract)

**Keywords:** Pigmented bacteria, *Microbulbifer agarilyticus*, 16S rRNA, Biology

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0195

### **Insecticidal activity of crude ethanolic extracts of selected Philippine plants against diamondback moth, *Plutella xylostella* Linnaeus**

*Ocampo, Virginia R., Ceballo, Flor A., Javier, Pio A., Javier, Abigaile*

The use of plant extracts could be an alternative method to the conventional insecticides for pest control. The potential of ethanolic extracts from *Lantana camara* Linnaeus, *Coleus amboinicus* Loureiro, *Alpinia pyramidata* Blume, *Curcuma longa* Linn., and *Catharanthus roseus* Linn. as insecticide against second larval instar diamondback moth–*Plutella xylostella* Linn.–was evaluated in the laboratory through contact and residual toxicities, antifeedant activity, repellency, and growth regulator activity. Among the five plants, *L. camara* was the most toxic against *P. xylostella* through topical application (LD50=99.17µg/g larva) and showed the highest antifeedant activity at 125µg/mL acetone. As demonstrated using leaf residue film method, *Cu. longa* was the most toxic against *P. xylostella* (LC50=206.22µg/mL) and also showed the highest repellency at 125µg/mL. *Cu. longa* and *Ca. roseus* exhibited high antifeedant activity at 500µg/mL. *L. camara* and *A. pyramidata* showed remarkable insect growth regulatory activities against *P. xylostella*. *L. camara* showed high larval and pupal mortalities, while *A. pyramidata* showed the highest number of abnormal adults produced. Among the ethanolic extracts, *L. camara* was the most promising because it consistently showed high contact toxicity plus antifeedant and remarkable insect growth regulatory activities against *P. xylostella*. Moreover, *L. camara* provided the highest ethanolic recovery (2.645%) among the test plants. In view of overall insecticidal potential of *L. camara*, can be exploited as a possible source of alternative insecticide against *P. xylostella*. (Author's abstract)

**Keywords:** *Alpinia pyramidata*, Antifeedant, Botanical insecticide, *Catharanthus roseus*, *Curcuma longa*, *Lantana camara*, Repellency, Biology

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NP

0196

### **Integrated vulnerable assessment of water-energy-food security nexus in Waras-lalo Subwatershed, Bicol River Basin, Philippines**

*Rodriguez, Mary Gra*

The usual vulnerability assessment is often sectoral- and hazard-specific approach. With the nexus approach on water, energy and food (WEF), it is recognized that these three sectors have interactions and synergies/trade-offs in their activities. *Security* has five dimensions namely: availability, accessibility, affordability, accessability, quality and sustainability. This paper discusses how a developed conceptual framework on *integrated vulnerability assessment* (IVA) and methodology of WEF security nexus was applied to a watershed. The framework considered the watershed with three systems of ecological, energy and food, interacting with water as the common element. The same concept of vulnerability assessment was used for IVA, a function of exposure, sensitivity and adaptive capacity. IVA was done by identifying parameters among WEF and inclusion of sectoral variables related to the various dimensions of security. The overall concept is to attain sustainable development if recommended measures will be done. Based on the identified relationships and parameters, IVA of WEF nexus was applied to the Waras-Lalo Subwatershed. The results show that the parameters were responsive to the assessment. Furthermore, the IVA of the study area had a result of being highly vulnerable to climate change related factors such as typhoons, rainfall change, drought and temperature rise. The recommendations for the study are: 1. Indicator responsiveness—the indicators used were responsive and replicating these to other sites can be recommended; 2. Data improvement—indicators used in this study were not strictly to be used in IVA of WEF nexus security in other study sites, there can be some data that can still be included if available; 3. Framework recommendation - concept of IVA is highly relevant not only for the study area but for the whole country with increasing population consuming water, energy and food. The developed IVA framework for WEF nexus security can be recommended in other study sites for a holistic and comprehensive assessment of the limited resources on water, energy and food. **(Author's abstract)**

**Keywords:** *Sustainability, Watershed, Climate change, Biology*

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 NP

0197

## **Intertidal seagrass distribution and soil structure in the protected seascape of Sarangani Bay, Philippines**

*Afon, Anna Mae R., Jumawan, Jess*

Seagrasses are unique angiosperms that thrive in marine environments. Transect-quadrat sampling was conducted in the intertidal zones of protected seascape of Sarangani Bay (Maasim, Alabel and Maasim provinces). In each site, there were 10 quadrats per transect with a total of 6 transects (100 meters apart) installed perpendicularly from the shoreline. A total of 11 species were accounted in the intertidal zone with two species noted outside the sampling transects. Species richness, abundance, percent cover and Shannon diversity was highest at Maasim site, dominance index at Alabel site and evenness at Glan site. Two way Anova revealed highly significant difference in vegetation-soil factors ( $p < 0.0001$ ), significant ( $p = 0.0448$ ) in sites factor and highly significant ( $p < 0.0001$ ) for the interaction of factors. Post hoc analysis revealed significant difference between Alabel and Maasim sites ( $p < 0.05$ ) while no significant difference in Maasim vs Glan and Alabel vs Glan sites. This pattern was similarly depicted in non-metric multidimensional scaling (stress value  $< 0.05$ ). Soil structure in the 3 sites was composed largely of silt to medium sand. Principal component analysis gave 89.66% variances of two principal components with abundance, dominance and medium sand influencing PC1 while species richness, silt and very coarse sand in PC2. The analysis revealed that abundance and species richness is correlated by silt and medium sand while biodiversity attributes gets lower indices as soil structure becomes coarse sand, very coarse sand and gravel. This insight would be helpful for management of intertidal seagrass in protected seascape in Sarangani Bay, Philippines. **(Author's abstract)**

**Keywords:** *Intertidal seagrass, Principal component analysis, Sarangani Bay, Non-metric multidimensional scaling, Biology*

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## Inventory of locally traded stony corals (Phylum Cnidaria, Order Scleractinia) in the Cartimar Shopping Center, Pasay City

Uy, Benjamin O., Licuanan, Wilfredo Y

The Philippines is known for its high marine biodiversity and for the high risk to that diversity. Of the human activities implicated in the degradation of coral reefs, collection of organisms for the aquarium trade is probably the most controversial. As a first step in determining the local impact of this trade and how, if possible, it can be managed, this paper presents an inventory of the corals being sold in Cartimar Shopping Center, the center of the pet trade in Metro Manila. A total of 29 species in nine families were found, with pocilloporids and *Acropora* being the best-selling. Euphylliids and gonioporids were also common in the shops, probably because these corals survive well in tanks. Ten of the species identified were categorized as near threatened, and another six were categorized as vulnerable in the IUCN Red List of Threatened Species. Therefore, corals in both categories should not be in the trade. Suggestions on how the aquarium trade could be made self-regulating are presented in this work. (Author's abstract)

**Keywords:** *Scleractinia, Coral species, Aquarium trade, Biology*

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Manila Journal of Science, Volume No. 8 Issue No. 2, 1-6  
2013,  
(Filipiniana Analytics)  
NP

## Isolation of fungi in indoor air environment of selected air-conditioned and non-air-conditioned wards in a public tertiary hospital in Metro Manila, Philippines

Bungay, Alice Alma C., Ablola, Feri

The hospital as health care facility has also become a source of infection that provides a place for different microbiological agents such as fungi. Exposure to these organisms is specifically detrimental to highly immunocompromised in-house patients. This study aimed to 1) detect the presence of fungi in a public tertiary hospital in Metro Manila; 2) determine the dominating fungal organism; and 3) describe the environmental conditions and physical factors affecting the proliferation of fungal organisms. Eight sampling sites were selected for this study. The hospital main lobby was the comparison site for the three non-air-conditioned surgery wards (NACWs) while the fourth level nurse station is the comparison site for the air-conditioned wards (ACWs). Meteorologic conditions such as environmental temperature and relative humidity were also determined. Andersen air sampler was utilized to conduct the environmental indoor air sampling. A total of 98 malt extract agar supplemented with chloramphenicol (0.01%) plates were utilized for the duplicate sampling in eight sites. After three to five days of incubation at 37°C, the isolated fungal organisms were culturally and morphologically characterized. Seven fungal organisms were isolated from the indoor air sampling conducted namely: *Aspergillus fumigatus*, *Aspergillus flavus*, *Aspergillus niger*, *Curvularia* sp., *Penicillium* sp., *Alternaria* sp. and *Rhizopus* sp.). The most dominant fungal species among the NACWs was *A. niger*. On the other hand, *A. fumigatus* was the most observed isolate among the ACWs. The air-conditioned wards showed a higher number of fungal isolates. In particular, *A. fumigatus* and *A. flavus* colonies in the ACWs were evidently higher than in the NACWs. The ubiquitous nature of the *Aspergillus* species and slow settling rate due to small spore size make it the most dominant fungal organism retrieved in the air sampling conducted. No strict numerical guidelines were available for the spore counts of *Aspergillus* species to assess contamination rate. However, according to the Health Protection Surveillance Centre, 2018, the values of CFU/m<sup>3</sup> of most of the isolates not only by *Aspergillus* species showed non-compliance with the threshold level documented. (Author's Abstract)

**Keywords:** *indoor air sampling, ventilation type, nosocomial, Andersen air sampler, relative humidity, temperature, Biology*

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Philippine Journal of Health Research and Development, Volume No. 24 Issue No. 1, 27-38

**Larvicidal activity of *Calophyllum inophyllum* (Bitaog) leaf extract against dengue vector *Aedes aegypti***

*Santos, Irmalyn V. , Elazegui, Erwin P. , Buag, Judy Ann M. , Oquina, Jul*

Insecticides of botanical origin have been reported as useful for control of mosquitoes since synthetic insecticides have caused adverse environmental effects and high operational cost. This study aimed to determine the larvicidal activity of *Calophyllum inophyllum* (Bitaog) leaf extract against dengue vector *Aedes aegypti*. The Bitaog plant extract was subjected to phytochemical analysis and results indicated the presence of alkaloids, tannins, saponins, terpenoids, flavonoids, phenols and sterols. For the larvicidal bioassay, the 3rd instar larvae were tested by different concentrations (0.25%, 0.5%, 1%, 2%, 3%, 4% and 5%). The mean percentage of larval mortality was 68% for 0.25% v/v and 97% after 24 h. After 48 hours of treatment, the lowest concentration was 85.2% and the highest shows 100% mortality. Positive control (mosquito pellets) showed 35.56% and 74.07% mortality percentage after 24 hours and 48 hours respectively. The negative control (methanol) showed 0% mortality both after 24 and 48 hours. The LC<sub>50</sub> and LC<sub>90</sub> after 24 hours were 0.1407 and 1.8387, while after 48 hours, LC 50 and LC 90 were 0.0055 and 0.4232. Results showed that Bitaog leaf extract was found effective in controlling *Aedes aegypti* larvae under laboratory conditions. **(Author's abstract)**

**Keywords:** Larvicidal activity, Bitaog plant, Phytochemical analysis, LC 50, LC 90, Biology

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**The lizards (Squamata: Scincidae: Gekkonidae: Agamidae) in selected areas of Andanan Watershed Forest Reserve, Bayugan City, Philippines**

*Japitana, Rowena A. , Fernandez- Gamalinda, Eve V. , Salde, Kathyleen , Sularte, Rai*

Lizards are highly diverse with high percentage of endemism in the Philippines particularly in the island of Mindanao. However, there is few existing account documenting the lizard communities of this unique forest reserve area. The study aimed to assess the distribution of Lizards (Squamata: Scincidae: Gekkonidae: Agamidae) in selected areas of Andanan Watershed Forest Reserve using line transect and intensive opportunistic sampling method. Specimens were identified *in situ* and were recorded by photographic documentation. Ten species of lizards belonging to one order and three families were captured and recorded in the sampling sites. Five were categorized as Philippine endemic, two Mindanao Faunal Region endemic and three of least concern lizards. Endemicity in lower elevations reached 80% for lizards communities. Two lizard species have been considered as socio-economically important species by the local villagers. On-going threats (conversion to agricultural land, wildlife hunting, slash and burn, and increasing population) were observed in the area. Finally, the Andanan watershed forest reserve is home to five Philippine endemic and two Mindanao faunal region endemic lizard species. Thus, it is important that this reserve should have better management and protection. **(Author's abstract)**

**Keywords:** Andanan watershed, Endemism, Reptiles, Squamates Biological Sciences, Biology

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NP

### Local fungal endophytes as rich sources of chitinase genes

Bacal, Christine Jurene O. , Diaz, Mark Jeffrey S. , Yu, Eizadora T. , Malto, Zabrina Bern

The ability of three fungal endophytes (JB10, JB11, and D12 isolates) to degrade chitin, and their potential as microbial sources of chitinases was investigated. Amplification and sequencing of the ITS regions revealed the identity of the fungal isolates: JB10 (*Fomitopsis* sp.), JB11 (*Aspergillus tubingensis*), and D12 (*Daldinia eschscholzii*). All three fungi were able to grow on minimal media with colloidal chitin as sole carbon source, albeit at different rates. Isolates JB11 and D12 are observed to have comparable or faster growth rates in chitin as compared to the simpler potato dextrose carbon source. Turbidimetric measurements show that the fungal cultures are able to degrade chitin with 3–5 d of incubation. While the crude, secreted proteins from these three fungi show comparable total chitinolytic activities (~0.35 U/mL), JB11 was found to have the highest exochitinase activity (~0.25 U/mL). Bioinformatic analysis of the chitinase (GH18) genes for *A. tubingensis* (JB11) and *D. eschscholzii* (D12) revealed variability in the GH18 chitinase sequences in terms of the amino acid sequences of the canonical DXXDXDXE catalytic motif as well as the presence of additional domain architectures, which make these fungi ideal sources for chitinases for both biotechnology applications and chitinase enzyme mechanistic studies. (Author's abstract)

**Keywords:** *Aspergillus tubingensis*, chitinase, *Daldinia eschscholzii*, fungal endophyte, GH18, Biology

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NP

### Maldi-TOF mass spectrometry and analytical profiling index characterization of airborne staphylococci

Jaratrungkawee, Amornmart , Yeung, Clarisse , Montalban, Bryan , Jainhuknan, Jaran , Cabrera, Esperanza , Vallar, Edgar , Torres,

Indoor air quality is often measured in terms of nonviable contaminants. In the Philippines, the viable components of air have not received as much attention as the nonviable counterparts. Among the viable components of indoor air are airborne bacteria, which are potential health hazards. In this initial study, airborne bacteria present in an indoor cafeteria were characterized. Bacterial isolates from indoor air were analyzed using Matrix-Assisted Laser Desorption Ionization Time-of-Flight Mass Spectrometer (MALDI-TOF MS). Mass spectral analyses of the 64 environmental isolates revealed high proportions of *Staphylococcus* spp., *Bacillus* spp., *Micrococcus* spp., and *Lactobacillus* spp. Among the *Staphylococcus* species identified by MALDI-TOF MS were that of *S. epidermidis*, *S. haemolyticus*, *S. hominis*, *S. saprophyticus*, and *S. lentus*. We further investigated the metabolism profiles of *Staphylococcus* genus using Analytical Profiling Index (API). Notably, MALDI-TOF MS and API provided similar identification of the *Staphylococcus* spp. isolates. To the best of our knowledge, this is the first report of MALDI-TOF MS airborne bacterial identification in the Philippines. (Author's abstract)

**Keywords:** *Staphylococcus* spp., *Bacillus* spp., *Micrococcus* spp., *Lactobacillus* spp., *S. epidermidis*, *S. haemolyticus*, *S. hominis*, *S. saprophyticus*, *S. lentus*, Biology

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2012,  
(Filipiniana Analytics)  
NP

## Metabolic profile and composition of endogeic earthworm *Pontoscolex corethrurus* gut bacterial community collected from Mt. Makiling, Laguna, Philippines

Simbahan, Jessica F., Supnet, Sarah Jean

Earthworm gut microflora is known to perform important functional traits related to the decomposition of organic matter in soil. However, studies on the composition and function of the earthworm gut bacterial community in the Philippines is very limited. *Pontoscolex corethrurus*, an endogeic earthworm species belonging to Family Glossoscolecidae (subclass Oligochaeta), is commonly found in tropical soils under undisturbed native vegetation. This study highlights the functional diversity of microbial communities found in the gut of *P. corethrurus* collected from Mt. Makiling in Los Baños, Laguna, Philippines. Microbial response or catabolic potential index of 0.986 was assessed using Average Well Color Development (AWCD). Richness (R) value of 69 was determined as the number of oxidized carbon substrates, and Shannon–Weaver index (H) value of 0.361 as richness and evenness of response was identified. These indices were calculated, following the community level physiological profiling (CLPP) using Biolog EcoPlate™. Analysis of variance (ANOVA) and principal component analysis (PCA) were used to demonstrate the differences of the bacterial functional diversity. Wells with positive substrate utilization were run in denaturing gradient gel electrophoresis (DGGE) and extracted for molecular identification of the bacteria with the highest substrate utilization. CLPP analysis, ANOVA and PCA indicated the functional diversity of earthworm gut bacterial community. DGGE analysis further confirmed the structure and composition of these bacterial communities that positively utilized different substrates. (Author's abstract)

**Keywords:** Earthworm gut, *Pontoscolex corethrurus*, Biolog EcoPlate™, DGGE, Microbial community, Biology

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NP

## Metagenomic analysis reveals the presence of heavy metal response genes from cyanobacteria thriving in Balatoc Mines, Benguet Province, Philippines

Sanchez, Libertine Rose S., Cao, Ernelea

Tailing ponds of mining sites heavily contaminated with metals is a serious problem in many parts of the world. Metagenomic sequencing and bioinformatics analysis of water samples from the Balatoc mine tailings—an abandoned mining site in Itogon, Benguet, Philippines—revealed microbial communities, particularly cyanobacteria consortia that implied their ability to survive in metal-stressed environments. Thus, their presence can be further investigated for applications in bioremediation. Surface water samples were collected from three sampling points in the Balatoc mine tailings. Physicochemical properties of the samples were also determined. Genomic DNA was extracted from all water samples and subjected to shotgun sequencing using Illumina NextSeq2500 2 x 150 paired ends. Thirty-eight (38) Gbases raw reads obtained from three data sets showed similar microbial assemblages using St. Petersburg genome assembler (SPAdes v3.10.1). Taxonomic assignments to contigs using CLAssfier based on reduced K-mers (CLARK) revealed the relative abundance of 97% Bacteria and 3% Archaea. All sampling sites were found to have relatively the same physicochemical properties. The abandoned Balatoc tailing site exhibited high temperature (31.50°C), alkaline pH (8.42), and elevated levels of copper (Cu<sup>2+</sup>) (1.53 mg/L) and zinc (Zn<sup>2+</sup>) (0.077 mg/L). A CLARK v1.2.5 custom database of cyanobacteria was also used to determine the classification, taxonomic assignment, as well as the estimation of percentage relative abundance of the cyanobacteria. Taxonomic assignments of all metadata revealed a dominant cyanobacterium, classified as *Leptolyngbya* sp., which comprises about 3% of the assembled contigs. Prokka v1.12 was used for annotation and protein-coding sequences (CDS) were evaluated for gene ontology (GO) using the evolutionary genealogy of genes-Non-supervised Orthologous Groups (eggNOG) Mapper v4.5. The genes conferring stress-response to metal ions Cu<sup>2+</sup>, Zn<sup>2+</sup>, lead (Pb<sup>2+</sup>), and cadmium (Cd<sup>2+</sup>) are reported to be involved in efflux/transport functions and heavy metal resistance that can be major attributes of *Leptolyngbya* sp. for survival to extreme metal conditions. (Author's abstract)

**Keywords:** Metagenomics, Metal response genes, Shotgun sequencing, Biology

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2019/10,  
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NP

0206

### **Molecular characterization of pediocin genes (Ped PA-1/AcH) and plasmid transfer into *Bacillus subtilis* via electroporation**

**Perez, Maria Teresa M., Ramos, Rowena E., Laurena, Antonio C., Elegado, Francisco B., Sabino, Noel G.**

Pediocin, a Class IIa bacteriocin of *Pediococcus acidilactici* (S3, K2A2-3, and 3G3) has been known to inhibit various strains of listerial species. Gene modification in strains to be used for fermentation and pediocin production was proposed as a strategy to develop competitive commercial biopreservatives. The pap genes (papABC) of the pediocin operon responsible for the production of pediocin were amplified using published and designed primers. BLASTn homology analysis using the papB sequences was found to be most similar to *P. acidilactici* K10 (Accession No. AY705375.1) and *P. acidilactici* pSMB74 (Accession No. UO2482.2) by 98-99%. The predicted protein structures generated via bioinformatic tools revealed the ligand-binding sites reinforcing possible functions of PedA, PedB, and PedC proteins. *Bacillus subtilis* NRRL B-3749 served as the competent host for the plasmid transfer encoding the pap genes. Analysis of variance verified that the putative transformant BS235 produced better inhibition zones (13.83mm) than the control strains *P. acidilactici* S3 (13.17mm) and *B. subtilis* B-3749 (7.33mm) did in spot-on-lawn assays. (**Author's abstract**)

**Keywords:** Pediocin, Pap genes, Plasmid, Transformation, Biology

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2018/07,  
(Filipiniana Analytics)  
NP

0207

### **Morphological characterization, meiotic behavior and pollen fertility of *Canna* (*Canna* x *generalis* LH Bailey and EZ Bailey)**

**Magdalita, Pablito M., Mendiola, Merlyn S., Ondoy, Juar**

The morphology, meiotic behavior and pollen fertility of selected 'Bandera Española' or *Canna* (*Canna* x *generalis* LH Bailey & EZ Bailey) were characterized. *Canna* 'Percy Lancaster' is a medium sized cultivar with branching habit, green and oval-shaped foliage with white margin and the stem is round and green. The panicles of flowers are open, yellow and heavily spotted with red, while the stamens are large, edges are ruffled, and petals are yellow. *Canna* 'Yellow King Humbert' is also medium sized, has upright growth habit, and tillering is prolific with green and oblong shaped foliage. The flowers are cupped, yellow and the throat has red spots on yellow. *Canna* 'Wintzer's Colossal' is tall, tillering is average with branching habit, has green, ovoid shaped foliage. The flowers are open, red, stamens are large, and rhizomes are thick, up to 3cm in diameter and purple. On the other hand, the meiotic behavior of hybrid 3 (light yellow x red orange) (2n=18) in metaphase I and metaphase II showed that some chromosomes aligned normally at the equatorial plate but laggards which are the bivalents that arrived late at the equatorial plate were also observed. The meiotic behavior of 'Percy Lancaster' (2n=18), in metaphase I showed that their chromosomes behaved mostly as univalent resulting from reduced chiasmata formation and abnormal behavior like laggards formation during metaphase I. Pairings observed were quadrivalents, trivalents and bivalents. Among the hybrids characterized, hybrid 3 (H3R1) has the highest percentage of fertile pollen grains at 96% while hybrid 4 (H4R2) has the lowest pollen fertility at 67%. (**Author's abstract**)

**Keywords:** *Canna*, Chromosome number, Meiosis, Morphology, Pollen fertility, Biology

**Morphological observations on the floral variations of niyog-niyogan (*Combretum indicum* (L.) DeFilipps)**

*Timog, Emmanuel Bonifacio S. , Gentallan, Renerio P. , Cejalvo, Reneliza D. , Endonela, Leah E. ,  
Altoveros, Nestor C. , Borromeo, Teresita H. , Bartolome, Michael Ced*

Niyog-niyogan (*Combretum indicum* (L.) DeFilipps) is important both as a medicinal plant and an ornamental plant. The utilization of its mature fruit as vermifuge is recommended by Department of Health. In the Philippines, different floral types can be observed both in natural and cultivated settings; however, reports on the distinction among the floral types are limited. A study of the variations in floral structure of *C. indicum* was carried out. Seven variants of single and double flowers were classified on the basis of quantitative (petal length and width, hypanthium length, stigma length) and qualitative (petal shape, style type, relative length of stamens, relative length of stamen with the perianth) traits. Fruit set was noted in both floral types. Two single flower types were observed and were differentiated only by petal size (11 x 5 mm; 20 x 8 mm) and hypanthium length (50 mm; 90 mm). The double flower types, all of which were found in cultivation, were distinguished through qualitative attributes as (a) pin type, without stamens, (b) pin type, with exerted stamens, (c) pin type, with included stamens, (d) thrum type, with exerted stamens, and (e) tristylous type, with exerted stamens. This study to characterize *C. indicum* variants in the Philippines is relevant in elucidating the mechanisms of its pollination in order to formulate ways to increase fruit set and select variants for higher fruit set. **(Author's abstract)**

**Keywords:** *Combretum indicum*, Floral type, Single flower, Double flower, Biology

**Multiple molecular markers (*ITS*, *rbcL*, and *trnT-F*) reveal the phylogeny and historical biogeography of Philippine *Neonauclea* Merr. (Rubiaceae)**

*Alejandro, Grecebio Jonathan D., Torres, John Carlo S. , Berdijo, Rean Rupert A. , Bagon, Joash Marion I. ,  
Ciocon, Jan Luziane Marie Kristine M. , Ordas, Jorge An*

With the advent of innovative molecular techniques, numerous scientists have employed this advantage in biodiversity and evolutionary research. This study explored the evolutionary relationships and history of Philippine *Neonauclea* Merr. (Rubiaceae) using the nuclear region *ITS* and plastid regions *rbcL* and *trnT-F*. Our reassessment of the genus present a strong support for its monophyly in contrast to its earlier proposed paraphyly with its closely allied genera *Myrmeconuclea* and *Ludekia* (Razafimandimbison *et al.* 2005). The 18 new accessions of Philippine *Neonauclea*, however, did not form a monophyletic clade, which reveals its polyphyletic nature. The molecular analyses of the relationships within the widespread endemic *N. formicaria* individuals suggest that its species concept needs to be re-evaluated. Results from S-DIVA propose a profound phylogeographical history for *Neonauclea*, with its recent divergence across the Philippine archipelago involving numerous intra-island radiations and recolonization of several lineages, which appear to have originated from the Indomalayan-Australian eco-regions. The study highlights the importance of genetic material as a tool for evaluating evolutionary relationships and elucidating biogeographical patterns of Philippine biota. **(Author's abstract)**

**Keywords:** DNA markers, Historical biogeography, *Neonauclea*, Philippines, Phylogeny, Biology



**Nitrogen fixation and phosphate solubilization activities of gut-associated bacteria isolated from African Night Crawler (*Eudrilus Eugeniae* Kinberg, 1867)**

*Obusan, Marie Christine , Mapile, Maria Re*

Recognized as “ecosystem engineers,” earthworms play an important role in soil nutrient cycling. With the benefits offered by their decomposition activities and microbial interactions, it is of significance to explore the nutrient mineralization potential of their gut-associated microorganisms in relation to the nutrient content of their vermicasts. In this study, adult individuals of *Eudrilus eugeniae* Kinberg, 1867 or African night crawler were collected from the vermicompost facility of University of the Philippines Diliman, starved to accumulate their vermicasts, and dissected to obtain their gut samples for microbial isolation. Two bacterial isolates showed solubilization of inorganic phosphate on Pikovskaya medium with solubilization index (SI) ranging from 2.55 to 2.67. High phosphate availability (56-73 kg/ha) was measured in the vermicasts. Interestingly, all phosphate solubilizing isolates were also able to fix nitrogen on nitrogen-free malate medium. Nitrate nitrogen (NO<sub>3</sub>-N) content of vermicasts (50 kg/ha) was found to be more than twice compared with the adjacent soil (20 kg/ha). 16S rRNA sequencing confirmed the genotypic identifications of the isolates showing highest homology (99%) to *Aeromonas* and *Bacillus* species previously reported for nitrogen fixation and phosphate solubilization activities. The gut-associated bacteria from *E. eugeniae* Kinberg, 1867 exhibit promising nitrogen-fixing and phosphate solubilizing activities that need to be further explored for various agricultural applications. **(Author's abstract)**

**Keywords:** Gut-associated bacteria, Vermicasts, Nitrogen fixation, Phosphate solubilization, *Eudrilus eugeniae*, Biology

**Off bottom culture of dakdakan (*Codium geppii*, Smidt 1925) at the marine water of Northern Poblacion, San Francisco, Cebu, Philippines**

*Gonzales, Jonar D. , Muaña, Eva P. , Nudalo, Jiezel L. , Costan, Edito B. , Gonzales, Aderito G. , Andrade, Norberto B. , Tanduyan, Serapion N., Miro, Dha*

*Codium geppii* and *Codium edule*, locally known as dakdakan, are usually eaten by fisher folk as marine vegetable salad and the natural stocks of these marine vegetables have declined. This study was conducted to find out the growth performance of these two species in different levels of water and at different culture sites. This study used the complete randomized design (CRD); four areas (site 1= grassy, site 2=muddy, site 3=rocky, and site 4= culture site) were selected for the experimental set up. The experimental set up consisted of three layers (treatment 1=surface, treatment 2=midlayer, and treatment 3= bottom layer). All the experimental cages were set in the mariculture site of the Cebu Technological University, San Francisco Campus. Survival and mortality rates were observed and the physico-chemical aspects of the area were also taken. Results show that the grassy area site topped in terms of growth increment of 3-kg increase equivalent to 150% for the three-month culture period; followed by the culture area site (140% increment); followed by muddy site (125% increment) then the rocky site (75% increment). As for the water layers, the surface layer in the grassy site topped (150% increment), followed by the surface layer in the culture site (140% increment), the surface layer of the muddy site (125% increment) and the middle layer in the rocky site (10% increment). Results further show that the bottom layer of the muddy site had the highest growth rate (9%) followed by the rocky site (8%). The grassy and culture sites, on the other hand, had negative increment (−98.8%). **(Author's abstract)**

**Keywords:** *Codium edule*, Plastic screen, Off bottom culture, Biology

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NP

0212

**A PCR-based assay for the detection of *Schistosoma japonicum* from human samples**  
*Obleopas, Romula A. , Schwem, Brian E. , del Rosario, Joanne Marie M. , Santos, Joy Ann P. , Pelovello, Marvin V. , Belizario, Vicente Y. Jr. , Destura, Ra*

*Schistosoma japonicum* is the causative agent of schistosomiasis in the Philippines. Current diagnostics suffer from low sensitivity and accuracy, hence an accurate and reliable diagnosis of schistosomiasis is essential for its prevention and control. In this study, a PCR-based assay for the detection of *Schistosoma japonicum* for patient stool and serum samples was developed.

Three candidate primer sets targeting mitochondrial genes *COX3*, *NAD4*, and *NAD5* were assessed. *COX3* primer pair was used for the rest of the study for sensitivity, specificity, and performance testing. Lastly, the assay using *COX3* primer pair was compared to Kato-Katz and circumoval precipitin test (COPT).

*COX3* and *NAD5* primers showed to be suitable for the assay as sequencing analyses gave high similarities of 96-98% for *S. japonicum*, while *NAD4* showed no similarity to any organisms. The PCR-assay was shown to have a detection limit of 4ng/ul DNA and is specific only to *S. japonicum*. The assay detected seven out of ten *S. japonicum*-spiked stool samples and ten out of ten *S. japonicum*-spiked serum samples. Comparative performance testing with Kato-Katz and COPT showed high specificity of 100% for both samples, but low sensitivity for formalin-fixed stool samples and stored serum samples.

This study developed a sensitive and specific PCR-based assay to detect *S. japonicum* from human samples. Our results suggest that this PCR assay could be useful for the detection of *S. japonicum* in fresh clinical samples and can be further improved to be used as a reference to improve other diagnostic assays for schistosomiasis.  
**(Author's Abstract)**

**Keywords:** *Schistosoma japonicum*, schistosomiasis, PCR, *COX3*, Biology

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2019/12,  
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0213

**Phenological assessment of selected indigenous timber species in Ilocos Norte**  
*Ayson, Roseller, Garma, Sergia, Rosario, Joselito, Samsam, C*

Seed shortage is oftentimes the limiting factors in scaling-up the rehabilitation of denuded areas. This is due to the unpredictable fruiting seasons of most trees and short viability of recalcitrant seeds. Hence, this study was conducted to provide information on the phenology of superior mother trees of selected indigenous timber species (ITS) to develop a seed calendar that could facilitate seed collection and planning of nursery operation and timely production of quantity planting stocks. The study was carried out in selected areas in Ilocos Norte where the superior mother trees of premium ITS are found. Six indigenous timber species namely: *Anisoptera thurifera*, *Vitex parviflora*, *Sindora supa*, *Dracontomelon dao*, *Intsia bijug*, and *Wrightia pubescens* were evaluated. The vegetation profile, soil variables and agroclimatic factors were determined. Individual trees with diameter breast height greater than 20 cm were considered. Leafing, flowering, fruit development and maturation were observed once a month for 3 years. Results revealed that peak of flower bud inception of *V. parviflora*, *D. dao*, *W. pubescens* and *A. thurifera* starts after leaf flush during the first rain in May while flowering activity of *S. supa* and *I. bijuga* comes earlier during mid-summer. However, the flowering activity of *V. parviflora* continuously occurs towards the early dry months in January followed by fruit development and maturation. Fruit development and maturation

had the longest phenophase of 8-9 months in *A. thurifera* and *W. pubescens*, 3-4 months in *V. parviflora*, 4-5 months in *I. bijuga* and 2-3 months in *D. dao* and *S. supa*. Timing of flowering and fruiting remains unchanged in almost all the timber species. Thus, the ideal time of collecting seed or fruit of *D. dao* is August – September, *V. parviflora* is September- October, *S. supa* is May – June, *I. bijuga* is October-November, and *A. thurifera* is April – May. (**Author's abstract**)

**Keywords:** Phenology, Indigenous timber species, Seed shortage, Phenophase, Seed calendar, Biology

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0214

### ***Photoheterotrophic hydrogen Production of Rhodobacter sphaeroides KCTC 1434 under alternating Ar and N2 headspace gas***

***Oh, Young-Sook , Ventura, Ruby Lynn G., Ventura, Jey-R S.***

In this paper, the effect of switching argon (Ar) and nitrogen (N2) headspace gases during the onset of photofermentative H<sub>2</sub> production on butyrate and propionate was studied using *Rhodobacter sphaeroides* KCTC 1434. Reactor headspace were initially purged with N<sub>2</sub> in the first set-up, while Ar was used in the second set-up. After 60h, the first set of reactors were repurged with N<sub>2</sub> (PN2R, BN2R); while the second set were replaced with Ar (PArR, BArR). Results showed that replacement with N<sub>2</sub> automatically decreased H<sub>2</sub> productivity in propionate and butyrate by 5.5 and 4.0 times, respectively. Replacement with N<sub>2</sub> led to changes in cell densities and increased final pH in the culture medium. On the other hand, initial exposure to N<sub>2</sub> and subsequent re-purging with Ar significantly increased ( $p=7.87 \times 10^{-10}$ ) cell weight and delayed entry of the strain to stationary phase of cell growth. H<sub>2</sub> production lag times were determined to be 144h for PArR (Substrate conversion efficiency, SCE=96.63%) and 172h for BArR (SCE=55.60%). Exposure to any of the gases did not bring significant difference in substrate consumption. Overall, the investigation showed that utilizing N<sub>2</sub>-to-Ar headspace purging is feasible in photofermentation setup. Further exploration involving pH control and quantification of ammonia (NH<sub>3</sub>) and polyhydroxybutyrate (PHB) may be carried to extend the use of this setup in a photofermentation system. (**Author's abstract**)

**Keywords:** Biohydrogen production, Photofermentation, Reactor headspace gas, *Rhodobacter sphaeroides*, Biology

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2019/03,  
(Filipiniana Analytics)  
NP

0215

### ***Phytochemical and antimicrobial properties of some Philippine bamboo species***

***Lapuz, Rebecca B. , Mosteiro, Audel V. , Bisana, Grace Rowena B. , Ramos, Rowena E. , Dionglay, Maril***

The study aimed to screen the phytochemical components of ethanolic and aqueous extracts of Kauayan Tinik, Kauayan Kiling, and Bolo. The bamboo leaf extracts were also evaluated for their antimicrobial activity against *Pseudomonas aeruginosa* PNCM 1335 and *Escherichia coli* PNCM 1634 strain. Results indicated K. tinik, K. killing, and Bolo contains the essential phytoconstituents, which are potential therapeutic agents. Likewise, the bamboo leaf extracts exhibited two 2-diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging property. All leaf extracts have antimicrobial activity against *P. aeruginosa* and *E.coli*. (**Author's abstract**)

**Keywords:** Phytochemicals, Antimicrobials, Bamboo, DPPH, Biology

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***Phytochemical screening and antimicrobial activity of Eucalyptus deglupta leaf extract***  
***Rañola, Rey Alfred G., Obinguar, Sarah-***

*Eucalyptus deglupta* Blume (Myrtaceae) commonly known as bagras or kamarere, which is its trade name in the lumber industry, is a type of eucalyptus species abundant in the Philippines. For this study, the phytochemical and antimicrobial activity of leaf extract fractions of *E. deglupta* was carried out. Phytochemical screening was carried out using thin layer chromatography (TLC) while antimicrobial activity of *E. deglupta* against *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Candida albicans*, and *Aspergillus niger* was carried out using agar-well diffusion method. Phytochemical screening of the extracts revealed the presence of flavonoids, phenols, steroids, and tannins. Results of the antimicrobial analysis shows that the ethanolic extract demonstrated pronounced activity against *E. coli* (26 mm; n=3) while the hexane extract (14 mm; n=3) and ethyl acetate extract (13 mm; n=3) had moderate activity. Ethyl alcohol also showed moderate activity against *S. aureus* (13 mm; n=3) while both the hexane (11 mm; n=3) and ethyl acetate (12 mm; n=3) extracts had partial activity. The three solvent extracts were resistant to *P. aeruginosa*, *C. albicans*, and *A. niger*. The secondary metabolites found in the extract has antimicrobial activity against different microorganisms. The extract was also subjected to compatibility study with a cosmetic cream base using Fourier-transform infrared spectroscopy (FTIR). Results showed that the ethanolic extract was compatible with the formulated cream base. To the authors' best knowledge, this is the first antimicrobial study of *E. deglupta* leaf extract. The activity of the ethanolic extract at 5% concentration shows that *E. deglupta* can be a potential source of active ingredient and antibacterial preservative for cosmetic products. (Author's abstract)

**Keywords:** *Phytochemical, Antimicrobial screening, Eucalyptus deglupta, Biology*

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NP

***Phytoplankton diversity and abundance during a pyrodinium bloom in Irong-Irong Bay, Western Samar, Philippines (September-December 2017)***  
***Yap-Dejeto, Leni G., Folio, Fatima***

One of the most persistent red tide event caused by the dinoflagellate *Pyrodinium bahamense* happened in Irong-Irong Bay. This started in 2015 and lasted for more than two years as of this writing (2018). Irong-Irong Bay, despite having mariculture sites has very few data with regards to this point of concern. Field sampling was done monthly from September to December 2017. Physico-chemical parameters such as temperature, pH, salinity, depth, turbidity, current velocity, light intensity, and total suspended solids as well as nitrate, phosphate, and chlorophyll-a were recorded. A 20µm mesh size plankton net with 30 cm diameter and 1 m length, and a bucket yielded 65 phytoplankton species. Lowest and highest cell density was recorded during the month of November ( $3.1 \times 10^4$  cells/L) and December ( $37 \times 10^4$  cells/L), respectively. *Pyrodinium bahamense* dominated during the months of September ( $3.1 \times 10^4$  cells/L) and November ( $0.43 \times 10^4$  cells/L) while *Skeletonema* dominated during the months of October ( $9.9 \times 10^4$  cells/L) and December ( $29 \times 10^4$  cells/L) *P. bahamense* was present in all sampling months with a total average cell density of  $0.080 \times 10^4$  cells/L. It is lower compared to the 2016 study with a total average cell density of  $0.77 \times 10^4$  cells/L. *Noctiluca scintillans*, which is a potential predator of *P. bahamense*, was also present in all sampling months. This species might have largely affected the abundance of *P. bahamense* in the area. It reached its peak during the month of November with an average cell density of  $0.32 \times 10^4$  cells/L. (Author's abstract)

**Keywords:** *Pyrodinium bahamense, Noctiluca scintillans, Skeletonema, Irong-Irong Bay, Philippines, Biology*

**Plants used by the subanens in treating livestock and poultry diseases and malaise in  
Misamis Occidental and Zamboanga Del Sur**  
*Manting, Muhmin Michael E. , Zozobrado, Hiezel Fa*

Plants with medicinal properties serve as a potent medicine for curing various diseases in humans and in animals. Filipinos, particularly those in rural and isolated areas, practice ethnoveterinary medicine due to the high cost of commercial drugs. Plants used in ethnoveterinary medicine are cheaper, locally available, and easily accessible. However, ethnoveterinary practice has not been given enough attention and may face the risk of disappearing altogether. This practice has been passed on from generation to generation through word of mouth and lacking proper documentation. Plants used by the Subanen in treating livestock and poultry were surveyed and documented in Misamis Occidental and Zamboanga del Sur by convenience-purposive sampling through semi-structured questionnaire and key informant interviews. A total of 71 respondents aged 30–94 years old, of which four were key informants (herbalist and tribal leaders), were interviewed. There were 45 and 38 medicinal plant species documented in Misamis Occidental and in Zamboanga del Sur, respectively. Leaves were the most frequently used plant parts, which are mostly prepared through pounding and applied topically in Misamis Occidental while it is prepared as a decoction and administered orally in Zamboanga del Sur. The family Fabaceae had the highest number of plant species used in both provinces. *Blumea balsamifera* (L.) DC. and *Tinospora crispa* (L.) Hook. f. & Thomson had the highest relative frequency of citation (0.48) and cultural index (0.10) observed in Misamis Occidental. In Zamboanga del Sur, *T. crispa* (L.) Hook. f. & Thomson was observed to have the highest relative frequency of citation (0.42) while *Sansevieria trifasciata* Prain. *Psidium guajava* L., *T. crispa* (L.) Hook. f. & Thomson, and *Ormosia calavensis* Blanco had the highest cultural index (0.06). Diarrhea was the most encountered problem in both areas during the wet season. (**Author's abstract**)

**Keywords:** *Ethnoveterinary, Medicinal plant, Botanical practices, Biology*

**Predicting mangrove suitable areas using GIS weighted suitability analysis in Oriental  
Mindoro, Philippines: A decision support tool in management of critical resource**  
*Macandog, Damasa M., Jumawan, J*

A weighted suitability analysis was conducted in predicting suitable areas for mangrove rehabilitation in Oriental Mindoro, Philippines. There were six thematic maps used, projected in PCS zone 51N, rasterized and reclassified. Weighted overlay technique was implemented using a straightforward score class ranging from 1-3. Weight influences were assigned to mangrove areas (30%), land cover (20%), rivers (15%), roads (15%), soil types (10%) and slope (10%). The workflow was made to run in ModelBuilder feature of the ArcMap. Mangrove suitability map was generated ea in three suitability classes. The area covered by each suitability class was extracted using the zonal geometry tool of the spatial analyst extension. There were 10 out of 15 municipalities in the province detected with effective suitable areas. The predicted suitable areas had a total of 75,433.20 km<sup>2</sup>. The municipality of Mansalay gave the highest in low suitability (13,549.26 km<sup>2</sup>), Calapan City for mid suitability (15,321.13 km<sup>2</sup>), and Naujan (891.11 km<sup>2</sup>) for high suitability areas. Overall, Calapan City has the highest computed suitability areas (19,847.28 km<sup>2</sup>) regardless of the categories. The generated data could be efficiently utilized in planning and management of mangrove resources. The study demonstrated the applicability of GIS framework as decision support tool for potential mangrove rehabilitation initiatives. (**Author's abstract**)

**Keywords:** GIS, Weighted Suitability, Mangroves, Oriental Mindoro, Biology

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0220

### **Predicting potential distribution of zooplankton species in Philippine freshwater ecosystems utilizing species distribution modeling**

**Lopez, Mark Louie D., Papa, Rey Donne S., Tuanmu, Mao-N**

Species distribution modeling (SDM) is a widely used method to predict possible species distribution range by using known occurrence data with environmental conditions in a certain geographic region. This method has been comprehensively used in terrestrial organisms but rarely utilized for aquatic species. In this study, SDM for seven Philippine freshwater zooplankton species, including the invasive species, *Arctodiaptomus dorsalis* were constructed in MaxEnt to define species distribution, and for non-invasive species, facilitate conservation and protection of their habitats. The models were then evaluated using three methods: AUC, Cohen's Kappa, and True Skill Statistics (TSS). Of the species tested, all models achieved acceptable evaluation results (AUC > 0.70; Kappa and TSS > 0.50), except for *Moina micrura* and *Mesocyclops varicans*. Moreover, flow regime, topographic slope, and soil organic content around aquatic bodies have a significant contribution to the constructed SDM for most species. This study shows the potential use of SDM methods like MaxEnt in predicting the possible distribution of zooplankton species across river and lake networks in the Philippines, especially in determining the extent of distribution of some invasive taxa. This inferential capacity of SDM in freshwater zooplankton opens doors to different predictive analyses that can be used in drafting sound conservation and management policies. (Author's abstract)

**Keywords:** Species distribution modeling, Zooplankton, Copepoda, Cladocera, Freshwater ecosystem, Biology

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0221

### **Preliminary study on the distribution of the introduced gall-forming fly, *Cecidochares connexa* (Macquart) (Diptera:Tephritidae) for the biological control of the invasive alien weed *Chromolaena odorata* (L.) R.M. King & H. Rob. (Aster**

**Rosialda, Patricia Bea R., Quibod, Ma. Niña Regina M., Day, Michael D**

The distribution of *Cecidochares connexa* (Macquart), a biological control agent of the invasive plant *Chromolaena odorata* (L.) R.M. King & H. Rob. was determined around the three main islands—Luzon, Visayas, and Mindanao—in the Philippines. A total of 105 sites in 17 localities with *C. odorata* were surveyed for the presence of *C. connexa*. *Cecidochares connexa* was present at 82 sites in eight localities, limited to around Visayas and Mindanao. Some sites where the gall fly was reported were up to 400 km from the initial release sites around Davao, Mindanao. *Cecidochares connexa* was not found at any of the nine localities surveyed around Luzon. Visual observations showed that the gall fly is having some impact on *C. odorata*, as evidenced by dead branches and stems. These results show that *C. connexa* has firmly established in the country and that it has the ability to disperse long distances to new areas. It is likely that *C. connexa* will continue to disperse further with time. However, a more robust study regarding its presence in other parts of the country and its effectiveness as a biological control agent is needed. (Author's abstract)

**Keywords:** Luzon, Visayas, Mindanao, Biology

### **Production of conjugated linoleic acid by lactic acid bacteria: screening and optimization**

*Oliveros, Maria Cynthia R. , Sarmago, Ione G. , Pham, Laura J. , Mendoza, Bernadette C. , Tapia, Angelo M., Bautista, Jose Arceo N*

This study was conducted to screen and optimize locally isolated lactic acid bacteria (LABs) for conjugated linoleic acid (CLA) production. Ten (10) LAB strains were evaluated for CLA production in De Man, Rogosa, and Sharpe (MRS) broth supplemented with 0.01% free linoleic acid (LA). Lipids were extracted from the broth with chloroform/methanol. The resultant fatty acid methyl esters were further extracted with n-hexane and were analyzed by gas chromatography using a Shimadzu GC-14 unit (Shimadzu Corp., Kyoto, Japan) equipped with SUPELCOWAX 10 column. Three (3) LAB strains—*Lactobacillus plantarum* 1066, *Lactobacillus fermentum* 1014, and *Lactobacillus casei* 1064—were able to produce CLA. *L. plantarum* 1066 was selected for optimization where LA supplementation (100 and 200 µg/ml) and incubation time (0, 6, 12, 18, and 24h) were used as variable factors for CLA production. Supplementation with LA at 100 or 200µg/ml in MRS broth did not significantly affect the growth of *L. plantarum* 1066 after 24h of incubation, as well as its production of CLA. However, it was observed that CLA production showed a strong positive correlation with LA concentration. (**Author's abstract**)

**Keywords:** *Conjugated linoleic acid, Lactic acid bacteria, Linoleic acid, Biology*

### **Quantitative trait loci associated with root elongation ability of rice under nitrogen-deficient condition**

*Suralta, Roel R. , Castillo, Mark Philip B. , Estrada, Sherilyn B. , Banting, Maybell DM. , Mallari, Rachelle P. , Obara, Mitsuhiro , Mananghaya, Teodora E. , Niones, Jonathan M. , Undan, Jerwin R. , Manangkil, Jenni*

Nitrogen (N) is an important nutrient influencing the growth and yield in rice. Root plasticity is a key trait in the higher uptake of nutrient from the soil, especially in conditions where some major nutrients such as N is under optimal. In this study, a total of 168 BC1F4 mapping population from a cross between Malay 2 and US-2 and their parents were grown in hydroponics with deficient (5µM) and sufficient (500µM) N for 8 days to identify putative quantitative trait loci (QTLs) associated with root elongation. Eighty-three (83) markers were used in QTL detection using composite interval mapping. Results showed that US-2 had significantly greater shoot length and number of nodal roots than Malay 2 under N-deficient conditions. Around 19.6 and 26.8% of the population in N-deficient and N-sufficient conditions, respectively, had either longer or similar seminal root length compared with US-2. For the allele distribution, 43.1% of the population had homozygous allele for Malay 2, 20.9% had homozygous allele for US-2, and 8.4% had heterozygous allele for both parents. A total of eight putative QTLs associated with seminal root length (*qSRL11.1* and *qSRL2.1*); number of nodal roots (*qNNR6.1*, *qNNR11.1*, and *qNNR11.2*); root dry weight (*qRDW11.1* and *qRDW11.2*); and shoot length (*qSL2.1*) in chromosome 2, 6, and 11 regions were detected under both N treatments. (**Author's abstract**)

**Keywords:** *Homozygous allele, Hyonics, N-deficient, QTL, Root plasticity, Seminal root, Biology*

**Radiation sterilization of Mexican fruit fly *Anastrepha ludens* (Leow) based on pupal eye color**

*Hernandez, Emilio, Obra, Glenda B. Resilva, Sot*

This paper reports on the documented pupal eye color changes of Mexican fruit fly *Anastrepha ludens* (Leow) at different holding temperatures. In holding mature larval samples at 15, 19, and 26°C (standard holding temperature); 28°C; and at environmental temperature (24–34°C), the development of pupae lasted 49, 33, 16, 15, and 16d, respectively. Holding pupae at lower temperature delays pupal development and slows down progression of eye color changes. This is very important in manipulating pupal development, especially when uncontrolled problems occur during sterile insect technique (SIT) operations. The recommended timing of pupal irradiation for *A. ludens* at 26°C (standard holding temperature) is 2d before adult emergence, where the pupae are 12–14d old and the eye colors are dark brown, very dark brown, and dark grayish green. Using this eye colors as the reference guide for irradiation of pupae, the right age when held at 15, 19, and 28°C and at environmental temperature (24–34°C) was 41–45, 28–31, 11–13, and 12–14d old, respectively. A table using documented and close-up photograph of pupal eye color can be used as a reference guide to determine the best time for the irradiation of pupae in an SIT program. (**Author's abstract**)

**Keywords:** *Anastrepha ludens*, Mexican fruit fly, Pupal eye color, Biology

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**First record of folivory in the tube-nosed fruit bat, *Nyctimene rabori* Heaney & Peterson, 1984 in Mt. Lantoy Key Biodiversity Area, Cebu, Philippines**

*Lillo, Edgardo P. , Nuevo, Ritche U. , Rosales, Raamah C. , Alcazar, Steve Michael T., Malaki, Archiebald Baltazar B.*

Four individuals of *Nyctimene rabori* were captured at different bat net stations in Barangay Canbantug, Argao town within the peripheries of Mt. Lantoy Key Biodiversity Area in Cebu Island, Philippines at 500–700 meters above sea level. We present the first observation of folivory behavior in *Nyctimene rabori* on mango plant (*Mangifera indica*). The bat feed on young leaves and shoots of the mango plant where it was released. It chewed on the leaves, swallowing some parts and ejecting some. Interestingly, the bat also ate the petiole and the entire young green stem (about 6 in long and 0.5–0.8cm diameter). It consumed the entire stem with only a small amount expelled. The activity lasted for almost 8 min of intermittent feeding. Fruit bat folivory is rarely documented in the Philippines. Knowledge on the diet of fruit bats is important in the conservation and management of the species. (**Author's abstract**)

**Keywords:** Folivory, Fruit bat, *Mangifera indica*, Mt. Lantoy Key Biodiversity Area, *Nyctimene rabori*, Biology

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## Regeneration and development of enzymatically-isolated protoplasts of *Kappaphycus* spp. (Solieriaceae, Rhodophyta)

Chato-Salvador, Rone

The production and quality of *Kappaphycus* seaweeds in the Philippines have been declining since 2007, mainly due to the inadequate supply of good quality seedstocks. Among the strategies pursued to solve the problem is through the production of improved strains from protoplasts or from living cells devoid of cell walls. However, despite development of technology to isolate protoplasts for *Kappaphycus* spp., using protoplasts in seedstock production and in strain improvement is still not possible due to their low regeneration rate. This study was conducted to optimize the conditions for regeneration and subsequent growth of protoplasts isolated from *Kappaphycus* spp. through enzymatic methods. Viable protoplasts from different strains of *Kappaphycus alvarezii* and *Kappaphycus striatus*; different tissue types (medullary, cortical); and ages (apical, basal) were isolated using a two-step enzymatic method. The isolated protoplasts were embedded in droplets of soft carrageenan gel, and then flooded with f/2 medium during the first 2–3 weeks of culture. These were then cultured in lighted shelves at different irradiance levels (i.e., 22±2°C and 12:12 L:D photoperiod). Protoplasts of subcortical cells obtained from the apical portion of seven farmed and wild strains of *K. alvarezii* regenerated into 5–12mm germlings (<1cm plants) after 26–32 days of culture in gel droplets. Regeneration rate was 10–36%, and two regeneration patterns were observed. This resulted in the development of either a dichotomously branched thallus or uniseriate, branching filaments within six months. Results of regeneration in gel droplets with f/2 medium at different irradiance level showed that the different strains had different irradiance requirements. (Author's abstract)

**Keywords:** *Kappaphycus* spp., Seedstock production, Strain improvement, Biology

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NP

## Reinforcing infrageneric classification of Philippine *Ophiorrhiza* L. (Rubiaceae): establishing species delineation using morphology and DNA data

Alfeche, Niña Kathryn G. , Sunga, Allanice Lizzette S. , Santos, Julia L. , Omaña, Trisha Mae G. , Odulio, Eiana Joshier A., Alejandro, Grecebio Jonathan

The identification and classification of species remain the stepping stone in the exploration of scientific possibilities in all living organisms, especially in the plant sciences. The questionable status and uncertain species delineation confine the mastery and further utilization of these species. In the extensive field survey for interesting Philippine rubiaceous species, two endemic *Ophiorrhiza* L. species from Agusan, Mindanao (*O. caespitulosa* Elmer and *O. curtiflora* Elmer) and one endemic from Negros Oriental, Visayas (*O. biflora* Elmer) were collected. Morphological examination was conducted to determine both identity and comprehensive characteristics of the species. All samples were subjected to molecular analysis utilizing the nuclear ITS and chloroplast *rbcL* and *rps16* regions to infer phylogenetic placement within the Philippine *Ophiorrhiza*. The recollection of these species provided additional morphological and geographical distribution data. The combined morphological and molecular data also supported the delineation of the Philippine *Ophiorrhiza* into two major subclades defined by the position of the inflorescences, persistence of the stipules and pubescence of the floral parts. The larger, suffrutescent *O. caespitulosa* and *O. curtiflora* of Agusan, with its pseudo-axillary inflorescences, deciduous stipules and glabrous stems showed affinity to species of the same morphological traits (subclade A) while *O. biflora* of Negros was more closely related to the species with opposite traits (subclade B). Ultimately, proper identification and classification will render these species useful for further studies in ethno-medicine and drug discovery. (Author's abstract)

**Keywords:** Delineation, Endemic, Molecular phylogeny, *Ophiorrhiza* L., Biology

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**First report of *Perkinsus* sp. in cultured oysters along the coastal waters of Manila Bay, Philippines**

*Cruz-Flores, Mary Jane , Villones, Jyle Chito E. , Lalas, James Kason P. , Evangelista, Jr., Pablo C. , Contreras, Anthony Joseph M., Molina, Daryne Claire F. , Sacmar, Lindel A*

Oysters cultured in the Manila Bay, specifically in Cavite City; Naic, Cavite; and Obando, Bulacan, were surveyed for the occurrence of *Perkinsus* sp. for three months from June to August 2012. Ray's fluid thioglycollate medium (RFTM) revealed the presence of *Perkinsus* sp. hypnospores in oyster tissues. Based from the hypnospores present, the infection rate was recorded highest in Obando, Bulacan, with 79.4%, followed by Naic, Cavite, with 66.1% and Cavite City with 62.8% as the lowest. Light infection intensity was likewise recorded highest in Obando, Bulacan, with 18.93, followed by Naic, Cavite, with 12.86 and Cavite City with 12.56 as the lowest in which no significant differences occurred across sites. However, a decreasing pattern in the intensity of infection was observed from June to July 2012, and an increase was observed in the month of August 2012, which revealed significant differences across the collection period, specifically during July 2012 and the first collection in August 2012. Furthermore, histological sections were made to confirm the RFTM for the occurrence of the parasite and its potential damage to the host tissue. Oyster hemocytes were likewise observed along with *Perkinsus* sp. Circular damage in the mantle was evident. In comparison with the usual size of *Perkinsus* sp. which is  $\sim 1\mu\text{m}$ , the observed smaller size of the trophozoite stage is indicative of a species only endemic in the country. (**Author's abstract**)

**Keywords:** *Perkinsus* sp., Oysters, *Crassostrea iredalei*, Biology

**The rice lesion mimic mutant (*Lms*) with enhanced resistance to drought**  
*Yaegashi, Hiroki , Takagi, Hiroki , Fekih, Rym , Tamiru, Muluneh , Abe, Akira , Undan, Jerwin R., Terauchi, Ryo*

Although a substantial number of mutants that show spontaneous cell death or necrotic lesions in the absence of pathogens and abiotic stresses, commonly called lesion mimic mutants (LMMs), have been identified in multiple crop species, only a few of the genes associated with the LMM phenotypes are characterized so far. Based on the identity of these genes, it has been suggested that most lesion mimic phenotypes are caused by physiological alterations that affect the plants response to biotic and abiotic stress. Some LMMs are also known to confer resistance to multiple isolates of rice blast and bacterial blight, and are thus associated with defense responses. Here we report the identification of a rice *lesion mimic and senescence* (*lms*) mutant, the isolation of the corresponding LMS gene harboring the mutations responsible for the abnormal mutant phenotypes, as well as show that the *lms* mutant exhibits an enhanced tolerance to drought. (**Author's abstract**)

**Keywords:** *Lesion mimic*, *Necrotic*, *LMS gene*, *Cell death*, Biology

### Screening of bacteriophages against different genotypes of extended-spectrum $\beta$ -lactamase (ESBL)-producing *Klebsiella pneumoniae* isolated from five hospitals in Cavite and Metro Manila, Philippines

Monzales, Janine M., Martin, Janine L., Cornista, Joel C., Balolong, Marilen P.

Extended-spectrum  $\beta$ -lactamase (ESBL) *K. pneumoniae* infections are emerging health problem in the Philippines. Recently, bacteriophages have been explored to target several antibiotic resistant bacteria as a potential alternative therapeutic option to conventional antibiotics. This study isolated extended-spectrum  $\beta$ -lactamase (ESBL) producing *K. pneumoniae* harboring different  $\beta$ -lactamase genes to evaluate the host range specificity of an isolated bacteriophages. *K. pneumoniae* were isolated from five selected hospitals in Cavite and Metro Manila, Philippines and its ESBL-production was determined through the Phenotypic Confirmatory Disc Diffusion Test (PCDDT). The identity of the isolates was then confirmed by amplification and sequencing of the 16 rRNA gene. (Author's abstract)

**Keywords:** ESBL, beta-lactamase genes, *K. pneumoniae*, bacteriophage, phage therapy, Biology

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### Screening of lovastatin production in five selected mushroom species

Alvarez, Lourdes V. , Candog, Rhea Jane Q. , Borjal, She

One medically important compound found in mushrooms is lovastatin, a secondary metabolite that is essential for lowering blood cholesterol. The study was carried out to detect the potentiality of *Lentinula edodes*, *Pleurotus sajor-caju*, *Trametes gibbosa*, *Schizophyllum commune*, and *Coprinellus disseminatus* to produce lovastatin. Mushroom species were collected from different sources and were isolated on potato dextrose agar (PDA). The mycelial cultures were then subjected to double submerged fermentation. Crude extracts were obtained after the fermentation process and were subjected to characterization, mycochemical analysis, and lovastatin screening through UV-visible spectrophotometry. All mycelial cultures exhibited growth in the production medium. Among the five species, *S. commune* showed optimal growth with  $1.55 \pm 0.090$  g mycelial biomass. Crude extracts of all the mushroom species were black-brown, water-soluble, and neutral in pH. Results of the mycochemical screening revealed the presence of flavonoid, saponin, tannins, glycosides, anthraquinones, alkaloids, and terpenoids. On the other hand, results of the lovastatin screening showed that all of the five mushroom species were lovastatin producers. *C. disseminatus* gave the highest value for lovastatin concentration among the five with  $17.17 \pm 0.007$  mg L<sup>-1</sup>, followed by *S. commune*, *T. gibbosa*, and *P. sajor-caju*. *L. edodes* conferred the lowest lovastatin concentration at  $2.02 \pm 0.019$ . (Author's abstract)

**Keywords:** Lovastatin, *Coprinus disseminatus*, UV-visible spectrophotometry, *Lentinula edodes*, *Pleurotus sajor-caju*, *Trametes gibbosa*, *Schizophyllum commune*, *Coprinellus disseminatus*, Biology

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### Seed dispersal patters of two selected forest trees, with varying modes of dispersal in Mt. Makiling Forest Reserve

Luna, Amelita C., Aguilon, Dianne Joy D. , Alles, Hannah Jane , Cruz, Rex Victor O. , Maldia, Ler

Seed dispersal is one of the major ecological processes shaping plant community development. In this study, seed dispersal patterns of two selected forest trees with varying modes of dispersal in the Mt. Makiling Forest Reserve (MMFR) were evaluated. Using the inverse modelling approach, 36 seed traps were established inside a 4-ha long-term monitoring plot in MMFR. Seed collection was conducted weekly for four months. The species studied were chosen from among the trapped seed species because they met the criteria set in the beginning of the data collection: the seeds of each species landed in at least 10% (approximately 4) of the seed traps and had sufficient number of seeds (at least 30 seeds) for observation. Of the twelve collected species, *Planchonella duclitan*, classified as animal-dispersed, and *Spathodea campanulata*, recognized as wind-dispersed, met these criteria. Using Pearson and Kendall's rank correlation analyses, both species showed significant negative association between the distance of the trap from the parent tree and the density of the seeds caught by the seed traps. The computed rho values for *P. duclitan* and *S. campanulata* are  $-0.9534$  ( $p < .05$ ) and  $-0.9000$  ( $p < .05$ ), respectively. The target species had their seed shadows concentrated within 5 m for *P. duclitan* and 10 m for *S. campanulata*, suggesting that *S. campanulata* has a wider range of dispersal than *P. duclitan*. (Author's abstract)

**Keywords:** Inverse modelling approach, Pearson and Kendall's rank correlation analysis, Seed dispersal pattern, Seed shadow, Biology

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0233

### **Selection pressure: its influence on the size, carapace shape, and genetic diversity of *Scylla* sp. in selected areas of the Philippines**

*Leasi, Francesca , Stern, David , Vicente, Helen J. , Roa, Elnor C. , Gorospe, Jessie G. , Demayo, Cesar G. , Torres, Mark Anthony J. , Castrence-Gonzales, Ruby, Crandall, Keith A*

The biological attributes of an organism are influenced by selection pressure. Exploitation may affect not only the size but also the genetic diversity, shape, and abundance, among other biological features, of organisms and populations. To test this concept, the size, abundance, phenotypic diversity, and genetic diversity of *Scylla* sp. in selected areas of the Philippines were examined using information from secondary sources, geometric morphometrics, and genetics. Samples of the three species of crabs (*S. serrata*, *S. tranquebarica*, and *S. olivacea*) were collected from Panguil Bay, Bislig Bay, Sibuyan Sea (Roxas City), and Lingayen Gulf. Owing to its distinct taste and larger size compared to the other two species, *S. serrata* is highly preferred and subjected to high fishing pressure because of high demand in the local and export markets. The volume of catch and size of *S. serrata* in Bislig Bay declined in a span of 10 years. Among the three species, *S. serrata* had the least carapace shape variation and the lowest haplotype and nucleotide diversities. Unsustainable artificial selection pressure might have caused the decreasing size, declining volume of catch, less carapace shape variation, and low haplotype and nucleotide diversities of *S. serrata*. Further investigation and implementation of management intervention is imperative to conserve *S. serrata*. (Author's abstract)

**Keywords:** Geometric morphometrics, Cytochrome oxidase I, Haplotype diversity, Nucleotide diversity, Bislig Bay, Biology

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NP

0234

### ***Solanum melongena* (eggplant) crude anthocyanin extract and delphinidin-3-glucoside protects *Caenorhabditis elegans* against *Staphylococcus aureus* and *Klebsiella pneumoniae***

**Ching, Angela C., Rentutar, Juleen A. , Kim, Jillan P. , Gamit, Andrei Luis P. , Acero, Romina Roan G. , Roxas, Chelsea Kaye F., John Sylvester B. Nas,, Saludaes, Alaic**

During infection, ROS signaling is activated to protect the cells from invading microorganisms. However, high level of ROS may also damage the host tissue. The anthocyanin delphinidin is known to have a strong antioxidant activity which protects cells from oxidative damage. We explored the potential of crude anthocyanin extract from the fruit of *Solanum melongena* (Eggplant) and Delphinidin-3- glucoside in enhancing the innate immunity in *Caenorhabditis elegans* against *Staphylococcus aureus* and *Klebsiella pneumoniae*. We used *Caenorhabditis elegans* to study innate immune response because it lacks adaptive immunity. First, we determined the sublethal concentration of *S. melongena* crude anthocyanin extract (SMCAE) and Delphinidin-3-glucoside (D3G) in *C. elegans*. We used the sublethal concentration of SMCAE and D3G to supplement the nematodes during its exposure to *S. aureus* and *K. pneumoniae*. We then observed its survival rate until day five post-L4. We also tested SMCAE and D3G for probable antimicrobial activity against *Staphylococcus aureus* and *Klebsiella pneumoniae*. We found out that both SMCAE and D3G showed no inhibitory effect on the growth of the bacteria. However, both SMCAE and D3G enhanced the survival of the nematode when exposed to *S.aureus* and *K. pneumoniae*. Overall, we speculate that the anthocyanin delphinidin in *S. melongena* crude extract protected the *C. elegans* against *S. aureus* and *K. pneumoniae* infection through its antioxidant activity. (**Author's Abstract**)

**Keywords:** Anthocyanin, delphinidin, innate immunity, *Caenorhabditis elegans*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, Biology

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0235

## **Species composition and size-structure relationships of ichthyofauna in Lake Mainit, Philippines**

**Cabuga, Cresencio , Jumawan, Joycelyn C., Seronay, Romell A.**

Lake Mainit is an important shared resource of Agusan Norte and Surigao del Norte, distinguished as the deepest and fourth largest lake in the Philippines. Lake Mainit supports a high diversity of aquatic fauna and a thriving freshwater fishery resource. The lake and river fisheries, however, are rapidly being depleted due to unsustainable or destructive fishing practices, overfishing, and lack of enforcement of key fisheries and environmental policies. The last comprehensive fishery assessment was in 2008. Updated information to guide the decision making of resource managers is integral for sustainable fisheries management. This study reports the species composition and length-weight relationships (LWRs) of 24 fish species collected using six types of fishing gear from October to December 2017 from four municipalities bordering the lake—a 39% decline in fish species from the previous 2008 assessment. The species collected belong to 15 families and were mostly introduced to the country. One fish species is vulnerable (*Cyprinus carpio*) and another species (*Neothethus thessa*) is endangered according to the IUCN Red List. The  $W = aL^b$  values in the LWR  $W = aL^b$  ranged from 2.22 to 3.88. This study shows that introduced species (60%) have dominated the species composition of the lake and majority of these introduced species were utilized as a major part of the diet of lake residents and most of the fish-eating public of Agusan Del Norte and Surigao del Norte. The size structure and inventory of fishes show a decline in species composition and are an important update to the comprehensive profile on the status of the lake and riverine fisheries in the area. (**Author's abstract**)

**Keywords:** Protected areas, Biodiversity, Ichthyofauna, Biology

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NP

## Species composition of the macrofouling community in South Harbor Manila Bay during the northeast monsoon period

Valenzuela, Rafael Lorenzo , Ocampo, Melody Anne , Trinidad, Claire, Vallejo, Jr., Benja

Manila Bay is one of the most important bodies of water in the Philippines. Within it is the Port of Manila which facilitates international logistics via its South Harbor. International vessels carry macrofoulers from foreign waters. When an introduced fouling organism is transported and established into a native fouling community, it may become invasive. This study assessed the species composition of the macrofouling community in South Harbor, Manila Bay during the northeast monsoon period. Nine fouler collectors adapted from the North Pacific Marine Sciences Organization (PICES) were submerged in five sampling points in Manila Bay on Oct 2017 until Feb 2018. Identification was done via morphological and CO1 gene analyses. A total of 18,830 organisms were classified into 17 families. For the first two months, *Amphibalanus* sp. was most abundant; in succeeding months, polychaetes became most abundant. This shift is attributed to intraspecific competition within barnacles and the reproductive pattern of polychaetes. Diversity and richness values across sites increased, a common trend in primary succession events. New macrofoulers were reported: *Barbatia* sp., *Membranipora* sp., a Stylochid flatworm, a Venerid clam, and Hesionid, Phyllodocid and Cirratulid polychaetes. Non-indigenous species were observed: *Mytilopsis* sp., *Mytella charruana*, *Brachidontes* sp., *Hydroides* sp. and Family Spionidae. These species are potentially invasive and may alter the ecosystem. Hence continuous monitoring is being done. (Author's abstract)

**Keywords:** Fouling, Manila Bay, Species Composition, DNA Barcoding, Biology

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NP

## Species diversity and endemism of herpetofauna in Basilisa and Loreto near mines sites, Province of Dinagat Islands, Caraga Region, Philippines

Boucher, Shawn Joshua P. , Abellano, Christine Joy B. , Fernandez-Gamalinda,

Herpetofauna is ecologically significant in maintaining the balance of many ecosystems in the Province of Dinagat Islands, Mindanao, Philippines. With the aim to contribute to the very few scientific studies on the assessment and monitoring studies in the diversity, abundance, distribution, and endemism of herpetofauna in the selected sites of the Province of the Dinagat Islands, this study was conducted. The actual assessment was done in the selected sites of Loreto and Basilisa in the months of November 2017, April and June 2018 using the transect method, pitfall traps, and extensive opportunistic sampling. A total of 38 significant herpetofaunal species belonging to 15 families and 33 genera were identified and recorded with high endemism of 76%. The most abundant species observed in the sampling sites were *Limnonectes magnus* (N=246, 36%) and *Pulchrana grandocula* (N=234, 34%). Basilisa had the highest species diversity with  $H' = 2.27$  and 25 Philippine endemic species (66%). The presence of endemic, near threatened, vulnerable, and endangered species indicates that the sampling sites are essential habitats for reptilian fauna. However, some of the habitats were observed to be disturbed by some anthropogenic activities that will cause the decline of the reptilian population in the area, which requires immediate attention and conservation. (Author's abstract)

**Keywords:** Species richness, Abundance, Mining, Endemism, Vulnerable, Anthropogenic activities, Biology

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Transactions of the National Academy of Science and Technology, Volume No. 41 Issue No. 1, 126  
2019 July,  
(Filipiniana Analytics)  
NP

### **Species indentification of *Xanthomonas* causing bacterial spot disease in pepper and tomato using Biolog Gen III Microplate and PCR**

*Pinote, Maristil I., Lorenzo, Jaira T. , Corbita, Nova Cyrell S. , Ferrater, Jedeliza B. , Belaganto, Cherry R.*

Bacterial spot disease is one of the most destructive diseases in pepper and tomato, particularly in places where high temperature and frequent rainfall occur. It is caused by four distinct *Xanthomonas* species: *X. euvesicatoria*, *X. vesicatoria*, *X. perforans* and *X. gardneri*. The first two species are the most widely distributed, causing bacterial spot disease both in pepper and tomato. Species identification of the two *Xanthomonas* isolates from pepper and tomato was done using the Biolog Gen III microplate and polymerase chain reaction through species-specific primers used by Araujo *et al.* (2012). Based on the phenotypic and genotypic characteristics of the isolates, such as positive utilization of acetic acid and the amplification of 173 bp target DNA, the isolates from pepper and tomato were identified as *X. euvesicatoria*. To our knowledge, this is the first report of *X. euvesicatoria* in the Philippines. (**Author's abstract**)

**Keywords:** *Pepper, Tomato, Bacterial spot, Identification, Xanthomonas, Biology*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 76  
2018/07,  
(Filipiniana Analytics)  
NP

### **Species richness, endemism, and threatened amphibians and reptiles in Mt. Malindang Range natural Park (MMRNP) - Hoyohoy Site**

*Manapsal, Mark Anthony , Villantes, Yunalyn , Hingco,*

Amphibians and reptiles are among the most ecologically essential bioindicators in the ecosystem, but these are also under threat due to some anthropogenic activities that have adverse impacts on natural ecosystems. This study was conducted to determine the species richness, endemism, and threatened status of amphibians and reptiles on Mt. Malindang Range Natural Park (MMRNP)-Hoyohoy Site. Standards methods (i.e., modified strip transect sampling, live-trapping with pit-fall, and glue-board traps) and purposive sampling were conducted. Results show that the MMRNP-Hoyohoy Site had a total of 15 herpetofaunal species, composed of eight amphibians and seven reptiles. Out of the eight herpetofauna families, Scincidae and Colubridae had the highest species richness. Of the species recorded, 10 are Philippine endemic, which indicates overall endemism of 66.67%. Two of the total number of endemic species (*Megophrys stejnegeri* and *Philautus acutirostris*) are classified as vulnerable. The presence of these endemic and vulnerable species is an indication of the need to protect the MMRNP-Hoyohoy Site as an important habitat for these herpetofaunal populations. (**Author's abstract**)

**Keywords:** *Bioindicators, Families, Herpetofauna, Vulnerable, Biology*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 176  
2018/07,  
(Filipiniana Analytics)  
NP

### **Spore culture of threatened and economic species of polypodiaceae using modified culture media**

*Coritico, Fulgent P., Lituanas, Chris Rey Nietes, Aurfeli D., Amoroso, Vic*

The increasing demand for the commercial uses of economic ferns has resulted in the decline of the population of ferns in the wild. To alleviate the threat on the availability of fern resources and their loss in its natural habitat,

the development of methodologies using spores for ex situ conservation is encouraged. This study was conducted to monitor the spore germination, gametophyte and sporophyte development, and conserve the threatened and economically important *Aglaomorpha heraclea* and *Platyserium grande* using modified media (pure ground clay pot, ground adventitious roots of tree fern, mixture of ground clay pot with adventitious roots of tree fern or with soil). The two species germinated within seven days after culture and obtained 100% germination within 7–28 days. Regardless of the culture media, spores of the two species continued to grow mature gametophytes exhibiting *Drynaria* type of prothallial development. Antheridial formation was observed 5–13 weeks after culture while the archegonia were formed at 9–16 weeks. Formation of sporophytes differed in two species but was observed 12 weeks after culture in *A. heraclea* and longest in *P. grande* (22 weeks). Mixture of ground clay pot with adventitious roots of tree fern was found to be the best medium for propagation. Out-planted individuals showed 100% survival, which indicating the efficacy of using modified media for ex-situ conservation of threatened and economic ferns. (**Author's abstract**)

**Keywords:** *Propagation, Fern, Spore germination, Gametophyte, Sporophyte, Biology*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 177  
2018/07,  
(Filipiniana Analytics)  
NP

0241

### **Study on aflatoxin production of *Aspergillus* species isolated from Philippine dried fish products using LC-MS/MS**

*Dacuya, Aaron C., Dela Cruz, Jeane A., Dela Cruz, Thomas Edison E., Ebarvia, Madelaine*

Mycotoxin contamination due to toxigenic fungi occurs frequently in various food commodities. These can have serious human and animal health risks. In the Philippines, dried fish is still widely considered as an important commodity due to its availability in the market and ease of processing. Testing of these food products in the market ensures its safety. This study entails the evaluation of aflatoxin-producing *Aspergillus* from Philippine dried fish products. Thirty-one samples of eleven types of dried fish products from nine local markets were collected for the isolation of toxigenic fungi. A total of 115 *Aspergillus* isolates were recorded from all the dried fish products. Morphological characterization grouped the isolates into nine morphospecies. Identification of these fungi using sequence analysis of the ITS genes and morphocultural characterization confirmed their identities as *Aspergillus alliaceus*, *A. clavatus*, *A. flavus*, *A. niger*, *A. ochraceus*, *A. oryzae*, *A. steynii*, *A. tamarii* var. 1, and *A. tamarii* var. 2. The nine morphospecies were cultured on Malt Extract Broth for 14 days for the detection of aflatoxin. Determination of aflatoxin was done using LC-MS/MS. Results showed that all of the *Aspergillus* cultures were positive for aflatoxin production. Different levels of aflatoxin were detected but still need further confirmation and quantification. *Aspergillus* species isolated on the dried fish products are capable of aflatoxin production after the 14-day incubation period. (**Author's abstract**)

**Keywords:** *Aflatoxin, Aspergillus, Dried fish products, Mycotoxin, Biology*

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Transactions of the National Academy of Science and Technology, Volume No. 41 Issue No. 1, 171  
2019 July,  
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NP

0242

### **Tegumental studies of adult *Fasciola gigantica* (giant liver fluke) from Philippine carabaos (*Bubalus bubalis*) using scanning electron microscopy for lead bio-indicator analysis**

*Chang, Aimee Caye G., Flores, Mary Ja*

Recent studies show that parasites such as liver flukes have a capacity to bioaccumulate heavy metals significantly than the liver and muscle tissues of the host without compromising effects on them. One such heavy metal is lead



(Pb) which is an abundant pollutant in the environment. Therefore, this study aimed to evaluate the effects of lead in the tegument of *Fasciola gigantica* (giant liver fluke) isolated from infected livers of carabaos *in vitro* using the following concentrations of lead: 0ppm, 110ppm, 160ppm, and 210ppm. Results indicate that upon exposure to lead, liver flukes tend to curl and exhibit wrinkled appearance after 15 hours. Furthermore, scanning electron microscopy studies of the tegument showed that chemical exposure of the flukes to lead caused similar alterations observed when flukes are exposed to anthelmintic drugs which are sloughing, blebbing, furrowing, and folding. Moreover, two novel types of alterations were observed in this study which are wrinkling and crumpling of the tegumental surface. In conclusion, distinct morphological and tegumental characteristics observed in liver flukes due to lead tolerance suggests its potential as bio-indicator of environmental pollution and thus promotes its use as a good candidate of an effect indicator. **(Author's abstract)**

**Keywords:** *Fasciola gigantica*, Giant liver flukes, Philippine carabaos, Tegument, Scanning electron microscopy, Blebbing, Crumpling, Biology

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Manila Journal of Science, Volume No. 9 Issue No. 1, 1-7  
2016,  
(Filipiniana Analytics)  
NP

0243

### **Toxicity, antibacterial, and antioxidant activities of fungal endophytes *Colletotrichum* and *Nigrospora* spp. isolated from *Uvaria grandiflora***

**Notarte, Kin Israel R., Devanadera, Mark Kevin P., Mayor, Anna Beatriz R., Cada, Mary Christine A., Pecundo, Melissa H., Macabeo, Allan Patrick G.**

Endophytic fungi are less explored in terms of their pharmacological applications, thus screening their phytochemical constituents and biological activities is of interest. In this study, the endophytic fungi *Nigrospora* and *Colletotrichum* spp. were isolated from the leaves of *Uvaria grandiflora*. The identity of the endophytes was established by molecular analysis of their fungal intergenic spacer. Biological screening showed that the fungal endophytes were most active against methicillin-resistant *Staphylococcus aureus* (MRSA), with the ethyl acetate broth extract of *Colletotrichum* sp. showing the biggest zone of inhibition (ZOI) for MRSA at 19 mm. For antibacterial activity against *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, and *Klebsiella pneumoniae*, the ethyl acetate broth extract of *Nigrospora* sp. elicited better antibacterial activity (ZOI>11 mm). Antioxidant assessment using 1,1-diphenyl-2-picrylhydrazyl (DPPH), ferric reducing antioxidant power (FRAP), and superoxide scavenging assays showed that *Nigrospora* broth extract had the best free radical scavenging activity with an IC<sub>50</sub> of 3.92 mg/mL. Meanwhile, the broth extract from *Colletotrichum* sp. showed the best reducing power (RP<sub>50</sub>=4.41 mg/mL) and superoxide scavenging activity (SC<sub>50</sub>=0.78 mg/mL). Using *Artemia salina* for toxicity screening, both fungi were toxic having an LD<sub>50</sub><0.40 mg/mL. The culture broth extracts showed greater antibacterial, antioxidant, and cytotoxic activities compared to the mycelial extracts. Phytochemical screening of the broth extract revealed the presence of flavonoids, sterols, phenols, and terpenoids in both fungal extracts. Tannins and coumarins were specifically detected in *Colletotrichum* sp., while alkaloids and indole derivatives were detected only in the *Nigrospora* endophyte. **(Author's abstract)**

**Keywords:** Antimicrobial, Antioxidant, Endophytes, Secondary metabolites, Toxicity, *Uvaria*, Biology

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2019/09,  
(Filipiniana Analytics)  
NP

0244

### **Transcriptome analysis of milkfish after exposure to *Aeromonas hydrophila* using next-generation sequencing**

**Velarde, Michael C., Ragasa, Lorenz Rhuel P., Argayosa, Anacleto M., Basiao, Zubaida U., Dinglasan, Jaime Lore**

Milkfish is a major finfish product of the Philippines. But because the whole genome sequence of milkfish is still unknown, it is difficult to study the different molecular pathways involved in milkfish after bacterial exposure. Here, transcriptomic analyses by next-generation sequencing (NGS) were used to identify gene expression in milkfish liver after exposure to bacterial antigens from inactivated *A. hydrophila*. Obtained reads per individual were assembled *de novo* and fragments per kilobyte of exon per million mapped reads (FPKM) were measured to identify overall gene expression. Differential expression (DE) was analyzed by Cufflinks-Cuffdiff software. Gene ontology (GO) overrepresentation analysis revealed that milkfish exposed to *A. hydrophila* altered expression of genes involved in immune response pathways such as T cell and B cell signaling. The most differentially regulated genes include histamine n-methyltransferase (*hnmt*), nicotinamide phosphoribosyltransferase b (*namptb*), poliovirus receptor-related 2 like precursor (*pvr12*), and the hepcidin antimicrobial peptide 1—which are all involved in immunity. Overall, the study showed that milkfish liver contains immune-related genes that respond to bacterial antigens. **(Author's abstract)**

**Keywords:** *Aeromonas hyhila*, *Chanos chanos*, RNA-Seq, Transcriptome, Biology

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Philippine Journal of Science, Volume No. 148 Issue No. S1, 33-41  
2019/10,  
(Filipiniana Analytics)  
NP

0245

### **Transcriptome of the traditional coconut variety Laguna Tall**

*Rivera, Susan, Rivera, Ramon , Emmanuel, Ernesto , Punzalan, Ma. Regina, Bautista, Ma. Anita, Saloma, Cynth*

Coconut, *Cocos nucifera* L., is widely cultivated for its edible and non-edible products. In the Philippines, the traditional coconut variety, Laguna Tall (LAGT), exhibits good genetic potential as a pure population or as open-pollinated variety (OPV). It was the male parent of the first PCA-recommended hybrid. Because of its importance in agronomic breeding, efforts are geared towards increasing genetic resources through genome and transcriptome sequencing. Here, pooled total RNA from leaves, nuts, and flowers of mature stage LAGT was sequenced using Illumina HiSeq 2000, followed by *de novo* assembly using four different transcriptome assemblers: Trinity, SOAPdenovo-Trans, Trans-Abyss, and Velvet-Oases. Each assembly was evaluated for accuracy using RSEM-EVAL, a reference-free evaluation method for transcript abundance data. Trans-Abyss outperformed the other three assemblers, but to have a better representation of the LAGT transcriptome, assemblies generated by the four programs were combined using the Evidential Gene tr2aaccs pipeline. A total of 79,263 transcripts were generated from the combined transcriptomes. Also, Fragments Per Kilobase of transcript per Million mapped read (FPKM) units were used to quantify *in silico* gene expression. A total of 68,147 transcripts were generated by RSEM and compared against the CDD, Trembl, and UniProt databases. Gene ontology (GO) analysis and KEGG classification revealed that up to 33.8% of LAGT genes are involved in protein modification. The top 20 expressed genes were annotated using the nr database, which revealed that the most highly expressed transcript is a novel transcript. Microsatellite markers were also obtained for future use as breeding tools. Overall, this study provides a comprehensive assembly of the *Cocos nucifera* L. transcriptome useful as a molecular toolbox to identify key factors involved in important biological and cellular processes in coconut. **(Author's abstract)**

**Keywords:** *coconut*, *de novo assembly*, *LAGT*, *reference transcriptome*, *RNA-seq*, *Biology*

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Philippine Journal of Science, Volume No. 148 Issue No. S1, 153-164  
2019/10,  
(Filipiniana Analytics)  
NP

0246

### **Tree species diversity and stand structure of the forest patch in Baganihan, Marilog Forest Reserve, Southern Philippines**

*Amoroso, Victor B. , Acma, Florfe M. , Salolog, Mary Cor S. , Coritico, Fulg*

Tree diversity, stand structure and composition were conducted in the forest patch of Barangay Baganihan, Marilog forest reserve, Davao City. Sixteen 20 x 20 m plots (at 1,224-1,240 m asl ) were established in the area. A total of 215 individuals of 25 families, 24 genera, and 32 tree species were recorded. Analyses of the data showed that the forest in the area can be categorized as montane forest based on forest structure (average diameter, height, canopy cover) and species composition. *Palaquium philippense*, *Syzygium tula*, and *Astronia ferruginea* has the highest species importance values. Shannon-Weiner index ( $H'$ ) is relatively high when compared to the other mountain ecosystems in Mindanao with  $H= 1.38$ . Three threatened species were noted viz., *Agathis philippinensis*, *Palaquium philippinense* as vulnerable, while *Cinnamomum mercadoi* as other threatened species. Eight (8) endemic species were documented, viz., *Alstonia parvifolia*, *Dillenia megalantha*, *Lithocarpus submonticolus*, *Cinnamomum mercadoi*, *Litsea segregata*, *Syzygium tula*, *Aidia pulcherrima* and *Palaquium philippense*. At present, the biodiversity in the area is under threat due to the different disturbances. The present study has helped the indigenous peoples of Marilog District in deciding the tree species for the Assisted Natural Regeneration (ANR) activity in Marilog forest reserve. **(Author's abstract)**

**Keywords:** *Species richness, Forest structure, Tree profile, Mindanao, Biology*

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Transactions of the National Academy of Science and Technology, Volume No. 41 Issue No. 1, 125  
2019 July,  
(Filipiniana Analytics)  
NP

0247

### **Trichome composition of leaf domatia as potential morphoanatomical marker of the four commercially viable *Coffea* species**

*Cardenas, Lourdes B., Balinado, Ll*

Trichomes are epidermal extensions that play a role in providing structural defense, affecting photosynthesis, and accumulating secondary metabolites. These trichomes may also occur in leaf domatia—providing various roles for interaction with mites and other arthropods. In the present study, leaf domatia of four *Coffea* species—namely *C. arabica* L., *C. canephora* Pierre ex. A. Froehner, *C. liberica* Hiern, and *C. excelsa* A. Chev—were examined for trichome composition. Leaf domatia were observed in all species and were found to be in association with trichomes. Its distribution, on the other hand, interestingly differed among species and could thus serve as a potential morphoanatomical marker. Trichomes in *C. arabica* were observed to exist around domatia pore, while it forms along the adjacent epidermal tissue in *C. canephora*. However, no difference was found between *C. liberica* and *C. excelsa*. Both exhibited trichome formation within domatia chambers and along the entry point of domatia pore. **(Author's abstract)**

**Keywords:** *Coffea, Coffee, Domatium, Leaf anatomy, Trichome, Biology*

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2019/06,  
(Filipiniana Analytics)  
NP

0248

### **Ultrastructural characterization, bacterial endophytes, and effect of latex on bacterial growth in vitro of *Erwinia mallotivora* Goto in papaya (*Carica papaya* L.) exhibiting regrowth from crown rot disease**

*Justo, Valeriana P. , Rivarez, Mark Paul S. , Dela Cueva, Fe M. , Magdalita, Pabl*

Bacterial crown rot is an emerging disease in papaya (*Carica papaya* Linn.) in Southeast Asia. It is caused by a necrotrophic, gram-negative, facultative aerobic bacterium known as *Erwinia mallotivora* Goto. In seedlings, crown rot exhibits a very slow hypersensitive reaction to infection, taking around 5–6 weeks until recovery and until lateral stem regrowth occurs. This study examined the genotypes that exhibited recovery or regrowth from crown rot infection using scanning electron microscopy. Ultrastructurally, *E. mallotivora* or any rod-shaped

bacteria were not detected in the regrown tissues, suggesting tolerance to bacterial crown rot. However, bacterial cells are present in non-regrowth plants, suggesting susceptibility to the disease. Culturally, two species of bacteria, namely, *Sphingomonas* sp. and *Microbacterium* sp. were isolated and were thought to be endophytically associated with papaya. Recovery from the disease was also aided by the action of the papaya latex. In *in vitro* conditions, the water-soluble fraction of the latex was able to totally inhibit bacterial growth within 30 hours of exposure at 80% v/v. This implies the important role of latex against bacterial crown rot during early part of infection. (**Author's abstract**)

**Keywords:** *Carica papaya* L., *Erwinia mallotivora*, Latex, Regrowth, Biology

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 78  
2018/07,  
(Filipiniana Analytics)  
NP

0249

### **Utilization of hydrated petrifilm coupled with filtration in the detection and enumeration of *Escherichia coli* in water samples**

**Raymundo, Asuncion K., Villegas, Lucille C., Ramos, Marie Angeli, Catsao, Kristine V., Tarroza, Angelou Vane**

Hydrated 3M™ Petrifilm™ *E. coli* / coliform (EC) plates coupled with filtration (HPECF) was found to be suitable in the analysis of 100 mL water samples, which is required in standard protocols in food and pharmaceutical industries. This was demonstrated with the use of suspensions of pure *Escherichia coli* and *E. coli* mixed with *Enterobacter aerogenes* and *Pseudomonas aeruginosa* – with 93–100% cell recovery. The results indicated that the HPECF method could be valuable in standard water quality analysis in pharmaceutical companies as it provides an acceptable and faster way to comply with the 2017 Philippine National Standards for Drinking Water (PNSDW). Likewise, HPECF results can be obtained after 48 h instead of 120 h as being currently used in the Most Probable Number (MPN) method, making HPECF three times faster than MPN. Furthermore, a simple cost-benefit analysis revealed that the use of HPECF can reduce the cost of water testing by 50% as compared to the MPN method. Consequently, the HPECF method is a more economical and faster alternative to the standard MPN method for water quality analysis for manufacturing companies. (**Author's abstract**)

**Keywords:** *Coliform*, *E. coli*, Filtration, Petrifilm, Water analysis, Biology

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Philippine Journal of Science, Volume No. 148 Issue No. 2, 395-  
2019/06,  
(Filipiniana Analytics)  
NP

0250

### **Utilization of natural local dyes in loop-mediated isothermal amplification (LAMP) products for the colorimetric nucleic acid detection of various pathogens in shrimp**

**Villaflores, Oliver B., Genavia, Shana, Malabuyoc, Julianne Marie A., Rasul, Janel Zahra P., Besid, Krister Paul A., De Ocampo, Joshua Mari D., Maningas, Mary Beth**

Outbreaks of lethal diseases such as White Spot Syndrome Virus (WSSV) and *Vibrio parahaemolyticus* in shrimp farms increased mortality rate and induced a decline in the Philippine shrimp production. Early detection using the Loop-Mediated Isothermal Amplification (LAMP) technique is the best option to mitigate the effects of virulent infection. Utilizing local dye sources through colorimetric nucleic acid detection can optimize farmer accessibility and cost-efficiency. Through this method, selected local plants' pigments were screened to observe their potential as an alternative visual dye to commercial dyes used in LAMP today. Extracted dyes from Turmeric and Annatto showed significant differences in results between both positive and negative controls when tested on both pathogens. The distinct color reaction of the aforementioned natural dyes proves efficiency in their function as a nucleic acid stain as well as their capability as a visual dye in detection. Therefore, the utilization of natural,

local dyes as an alternative holds great promise, which allows rapid detection of pathogens with resources more readily at reach, especially in times of critical urgency. (**Author's abstract**)

**Keywords:** WSSV, *Vibrio parahaemolyticus*, Lamp, Colorimetric nucleic acid detection, Natural dyes, Biology

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Transactions of the National Academy of Science and Technology, Volume No. 41 Issue No. 1, 160  
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NP

0251

### **Vertical structure of heterotrophic bacterioplankton communities in the Western Pacific Ocean**

*Shiah, Fuh-Kwo , Awingan, Joan S. , Li, Kuo-Yuan , Wang, Ku-Wai , Chang, Chun-Wei , Austria, Elea*

The abundance and composition of summer heterotrophic bacterioplankton communities at the Western Pacific Ocean (WPO) were determined using catalyzed-reporter deposition-fluorescence *in situ* hybridization (CARD-FISH) technique. Several oligonucleotide probes specific to the Domain Bacteria (EUB338), Phylum Proteobacteria ( $\alpha$ -,  $\beta$ -, and  $\gamma$ -Proteobacteria and SAR 11); Actinobacteria (HGC); and Cytophaga-Flavobacter-Bacteroides (CFB) were used to identify and quantify the common bacterial phyla relative to total microbial abundance using 4',6-diamidino-2-phenylindole (DAPI) over a depth profile—from 10 to 4000m. The profiles of microbial and bacterial abundance, temperature, and oxygen all decreased with depth, in contrast to the profiles of the inorganic compounds. Around 30–59% of the DAPI-positive cells took up the EUB338 probe, suggesting that bacteria are numerically significant components of the microbial biomass in the WPO. Phylum *Proteobacteria* was the predominant group in the whole water column, with classes  $\alpha$ - and  $\gamma$ -Proteobacteria and SAR 11 numerically dominating at specific depths. Statistical analyses showed an association between the bacterial groups— $\alpha$ -Proteobacteria and CFB—and the environmental parameters—temperature and chlorophyll-a concentration—at the depth of 100m, suggesting the role of organic matter and temperature in structuring the bacterial community in this oceanic regime. This study provided a preview on the abundance and controls of specific groups of heterotrophic bacteria in the WPO, warranting a more detailed and comprehensive investigation of the community structure at clade or genus level. (**Author's abstract**)

**Keywords:** CARD-FISH, Community structure, EUB 338, Heterotrophic bacteria, Western Pacific Ocean, Biology

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Philippine Journal of Science, Volume No. 148 Issue No. 1, 155-165  
2019/03,  
(Filipiniana Analytics)  
NP

0252

### **Visual census surveys of reef fishes in marine protected areas of Lanuza Bay, Surigao del Sur**

*Seronay, Romell A. , Masangcay, Shirlamaine Irina G., Calagui, Laurence*

Reef fishes are important food sources and act as key indicators because they are highly affected by any change in an ecosystem. Assessment parameters such as species richness, density and biomass allow us to measure the condition of the reef ecosystem. To determine the status of reef fishes in Lanuza Bay, nineteen Marine Protected Areas (MPAs) from Cantilan, Carrascal, Lanuza, Cortes and Tandag, Surigao del Sur were assessed from September 2018 to November 2018 by evaluating fish groups (coral indicators, major and commercially important species) both inside and outside MPAs. In each site, fish visual census was conducted using three 50 m transect lines with 10 m wide in the shallow depths (~10 m) of the coral reef area. Species richness and density was highest in Lanuza MPA with 137 species/1,000 m<sup>2</sup> and 1,399 ind/1000 m<sup>2</sup>, respectively and lowest in San Pedro MPA with 40 species/1,000 m<sup>2</sup> and 125 ind/1,000 m<sup>2</sup>, respectively. Difference between species richness and density can be noted between inside and outside zones in all sites which were highly represented by major species. In

terms of biomass (MT/km<sup>2</sup>), all MPA sites in Cortes reveal high to very high conditions influenced by the commercially important species. Years of strict and proper management of MPAs in the area have reaped great results with excellent fish biomass such as in Lanuza and Cortes MPAs that highly support the fishery industry in Lanuza Bay. Low levels of the measured parameters in some sites may be influenced by threats including natural disasters, human activities and siltation. This study serves as supplementary information to enhance management of MPAs and regulate fisheries in the said bay. **(Author's abstract)**

**Keywords:** *Coral reef fish, Species richness, Density, Biomass, Fish visual census, Biology*

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NP

0253

***In vitro* anticoagulant potential of *Caesalpinia pulcherrima* (Caballero) leaf methanolic crude extract in selected Filipino individuals using prothrombin time assay**

*Salcedo, Stefani Joyce F., Velasco, Rainier Ulrich*

Anticoagulants are compounds used to treat patients with cardiovascular diseases by reducing the coagulation of blood and preventing formation of new blood clots through inhibition of the coagulation cascade. Long-term use of Warfarin, a widely used anticoagulant, has many adverse effects. This study focused on confirming *Caesalpinia pulcherrima* as potential source of natural coumarin, a known chemical substance that inhibits blood coagulation. Human plasma of 30 healthy individuals ranging from 18 to 25 years old were collected and subjected to three different concentrations of *C. pulcherrima* extract: 10 mg mL<sup>-1</sup>, 30 mg mL<sup>-1</sup>, and 50 mg mL<sup>-1</sup> diluted in normal saline solution. In vitro analysis using prothrombin time (PT) assay was performed and international normalized ratio (INR) values were obtained. Results were then compared with the range of 1.6–2.6 (Wang & Chiang, 2013) to determine whether the extract is a decent anticoagulant. The values obtained for PT were 16.25s (±1.63s), 17.48s (±1.29s), and 19.17s (±1.65s) for 10 mg mL<sup>-1</sup>, 30 mg mL<sup>-1</sup>, and 50 mg mL<sup>-1</sup> extract concentrations, respectively. This indicates that there was a direct proportional relationship between the treatment and the PT. The INR values were observed to be increasing per concentration which indicates that the extract is a good anticoagulant. The results showed that the plant extract is effective for prolonging the blood coagulation process based on the PT assay. This study demonstrated that the extract may be a potential source of natural coumarins. **(Author's abstract)**

**Keywords:** *Anticoagulant, Caballero, Prothrombin, Extract, Coumarin, Caesalpinia pulcherrima, Biology*

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NP

0254

**Zooplankton as indicators of water quality in Manila Bay**

*Gatdula, Norvida C., Borja, Valeriano M., Furio, Elsa F., Jose, Ella*

Zooplankton abundances correspond to environmental fluctuations. They are more critical and dynamic in coastal areas because of combined land and marine influences. Hydrobiological survey was done every other month in Manila Bay in 2017. Physico-chemical parameters like temperature, salinity, dissolved oxygen and chlorophyll-a concentration were measured using SBE CTD 19 Plus. Zooplankton samples were subjected to microscopy. Redundancy analysis showed that there are significant correlations between zooplankton abundances and environmental parameters. *Microsetella norvegica* were most abundant showed inverse correlation with dissolved oxygen. *Euterpina acutifrons* was found to be aggregating in stations with high temperature and high nitrate concentrations. The inverse relationship of *Paracalanus* sp. and *Oithona* spp. with salinity was notably visible in the months of January, September and November. Dominance of *Oithona* spp. was observed in coastal areas of

the bay. The 23% variance in zooplankton composition and abundance were explained by the following parameters: temperature, dissolved oxygen, salinity and nitrate concentrations. **(Author's abstract)**

**Keywords:** *Zooplankton assemblages, Environmental parameters, Redundancy analysis, Zooplankton diversity, Biology*

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NP

## BOTANY

0255

### Constraction of enriched mini-genomic library in sugarcane (*Saccharum officinarum* L.) VMC 87-599

*Lalusin, Antonio G. , Laurena, Antonio C. , Sanguillosa, Jerry B. , Rasco, Jhun Laure*

Enriched mini-genomic libraries of sugarcane variety VMC 87-599 were constructed by genome filtering approach using methylation-sensitive restriction enzymes (*Pst*I and *Aat*II) in order to facilitate microsatellite marker discovery, which has various applications in plant breeding and genetics. Plasmid DNA containing sugarcane DNA fragments were isolated and were sequenced using vector-based primers. Trimmed sequences were analyzed in Basic Local Alignment Search Tool (BLASTn) for putative gene identities. A total of 517 quality sequences were obtained. Sequence homology search using Blastn of combined genomic library characterization showed similarities with *Saccharum officinarum* (22%), *Sorghum bicolor* (12%), *Zea mays* (12%), *Setaria italica* (2%), *Oryza sativa* (1%), and other grass species (2%). No significant hits accounted for almost half (49%) of the total sequences. Also, combined libraries contained 3.6% organellar sequences, of which 1.9% were chloroplastic and 1.7% were mitochondrial. Nuclear gene sequences comprised 12.7% of the total sequences, and 6.9% were hypothetical/uncharacterized proteins. Characterized enriched libraries provided a preview of the complex genomic constitution of a sugarcane genome. **(Author's abstract)**

**Keywords:** *Sugarcane, Enriched genomic mini-library, Methylation-sensitive, Restriction enzymes, Bioinformatics, Botany*

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(Filipiniana Analytics)  
NP

0256

### Establishing genetic association among selected members of *Citrus* species through protein profiling obtained from comparative electrophoresis

*Lazaro-Llanos, N. , Saulog, K. F. , Janairo,*

The use of seed proteins in the evaluation of genetic diversity is cost effective and less time consuming. Water and salt-soluble proteins from the seeds of *Citrus* species: *C. reticulata*, *C. aurantifolia*, *C. grandis*, *C. sinensis*, *C. limon*, and *C. microcarpa* were extracted and variations in electrophoretic profiles were determined. Finely grounded seeds were homogenized in 50mM Tris buffer, pH=7.0, centrifuged at 14,000rpm for 10 minutes at 4°C, and the supernate collected as the water-soluble fraction. The pellet was resuspended in 50mM Tris buffer, pH=7.0 in 150mM NaCl, homogenized, then centrifuged at 14,000rpm for 10 minutes at 4°C, and the supernate collected as the salt-soluble fraction. Samples were analyzed using SDS PAGE. Nine protein bands were found common to all samples and six bands were used as genetic markers in the water-soluble fractions. A dendrogram was constructed for the water-soluble proteins. In the salt-soluble fraction, ten protein bands were found to be common to all samples and five bands were concluded to be genetic markers. *C. reticulata* and *C. sinensis* possessed

identical water and salt soluble protein profiles and *C. grandis* were found to be most distinct among the samples. (Author's abstract)

**Keywords:** *Citrus fruits, Protein profiles, Genetic markers, Discontinuous SDS – PAGE, Botany*

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Manila Journal of Science, Volume No. 6 Issue No. 1, 1-9  
2010,  
(Filipiniana Analytics)  
NP

0257

### **Functional traits of stem and leaf of *Wrightia candollei* S. Vidal**

**Maldia, Lerma S.J. , Malabrigo, Pastor L. Jr. , Quimado, Marilyn O. , Pulan, Dennis E. , Fernando, Edwino S. , Hernandez, Jonat**

Morpho-anatomical functional traits of native tree species are deemed important in forest restoration. Although much is known about morpho-anatomical traits of many terrestrial plants, such traits in Philippine native trees remain unclear. In this study, the stem and leaf morpho-anatomy of *W. candollei* S. Vidal was investigated to provide insights on its potential for restoration of dry, degraded lands. Results suggest that the morpho-anatomical structure of leaf and stem of *W. candollei* conforms to characteristics typical of plants adapted to dry areas and to species commonly used for restoration. The presence of trichomes, multiple layers of storage cells and mechanical cells, sclerenchymatic phloem cap, multiple vascular bundles, living xylem parenchyma, and steep leaf inclination were observed and interpreted as important leaf and stem structural traits of *W. candollei*. These morpho-anatomical traits are commonly associated with (1) solar radiation and water loss reduction; (2) tissue/organ mechanical reinforcement; and (3) water uptake and storage. Therefore, *W. candollei* – in association with the other native species – might be potentially useful for restoration of dry degraded lands in the Philippines. However, ecophysiological and phenological studies, as well as watering regime experiments, are recommended to better understand the actual habitat preference of the species. (Author's abstract)

**Keywords:** *Anatomy, Endemic, Functional traits, Native species, Restoration, Botany*

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2019/06,  
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NP

0258

### **Germination and growth of different native orchid species**

**San Pascual, Alangelico O. , Villareal, Ruben L. , Magdalita, Pabl**

Many native orchid species are considered jewels of the Philippines. While they are disappearing in the wild, they need to be multiplied *in vitro* for future use in plant breeding work. The germination and growth of different native orchid species that were self-pollinated were tested using three media formulations. Germination experiment of three different native species of orchids (*Dendrobium* sp., *Phalaenopsis aphrodite*, and *Grammatophyllum* sp.) was done using three tissue culture media formulations. *Dendrobium* sp. germinated 41 days after inoculation in Knudson C plus NAA, 61 days in hormone-free Knudson C, and 82 days in Knudson C plus GA3. Another experiment subcultured the different germinated native orchid species in three different media formulations. Fifteen weeks after subculture, the growth of *Spathoglottis* sp., *Vanda* sp., and *Cattleya* sp. were promoted in hormone-free Knudson C, Knudson C plus NAA, and Knudson C plus GA3, respectively. Hundreds of whole plants of the different native orchid species with complete root and shoot were recovered and potted-out. It was observed that tissue-cultured *Spathoglottis* sp. flowered earlier by one year and a half after potting-out. (Author's abstract)

**Keywords:** *Cattleya, Dendrobium, Grammatophyllum, Phalaenopsis, Spathoglottis, Vanda, Botany*



### **Growth and sporulation of three *Colletotrichum* species as influenced by organic chemicals**

*Dela Cueva, Fe , Tiongco, Rizalina , Balendres, Mark Angelo , de Castro,*

*Colletotrichum* species are important pathogens that infect fruits, vegetables, and ornamental crops worldwide. Recently, an outbreak of chilli anthracnose has been observed in Luzon and Mindanao, and polymerase chain reaction analysis revealed three *Colletotrichum* species (*C. acutatum*, *C. gloeosporioides* and *C. truncatum*) are responsible for the outbreaks. With no effective measure available, anthracnose caused by these three pathogens could be devastating to the chilli industry. Chemical fungicides may be valuable, but their use has been discouraged worldwide due to its potential risk. Thus, sustainable chemical approaches to chilli anthracnose management are needed. In this study, the growth and sporulation of *C. acutatum* and *C. gloeosporioides* under the influence of 14 organic chemicals were assessed in potato dextrose agar, individually amended with chemicals at 1% concentration. Growth was rarely inhibited, but sporulation of the two pathogens was variably influenced by the organic chemicals. Polygalacturonic acid, Meso-erythritol, Malonic acid, Maltose, Mannitol, and Glycine inhibited the sporulation of both pathogens. Arginine, Inositol, L-Tyrosine, and Vitamin-B1 inhibited only *C. gloeosporioides*. This study suggests that organic chemicals in vitro can inhibit sporulation, although the two pathogens reacted differently. Future glasshouse and field work underpinning the efficacy of the chemicals that inhibit pathogen sporulation may offer novel chemical control measures against anthracnose of chilli in the country. (Author's abstract)

**Keywords:** Chilli anthracnose, *Colletotrichum gloeosporioides*, *Colletotrichum truncatum*, Botany

### **Growth performance of *Litsea philippinensis* Merr. seedlings as affected by two organic concoctions**

*Aribal, Lowell G. , Marin, Mellprie B. , Marin, Rico A. , Yambagon, Rich*

The study aimed to evaluate the effects of Indigenous Microorganism, Oriental Herbal Nutrient, vermicast, and inorganic fertilizer to the growth performance of Bakan (*Litsea philippinensis* Merr.) seedlings. The study was conducted using Completely Randomized Design with six treatments, replicated three times. The variables evaluated include root collar diameter, seedling height, number of leaves, percent survival, and disease infections. Results showed that adding complete fertilizer and two organic concoctions significantly increased height, root collar diameter, and percent survival of Bakan seedlings as compared to the control. However, the effects on the number of leaves and disease infection (leaf spot and leaf blight) were statistically not significant. Moreover, the results showed that the two organic concoctions outperformed the inorganic fertilizer in terms of the height of the seedlings. It can be concluded that the two concoctions used could be good substitutes or alternatives to inorganic fertilizer, in which with continued use may incur much more adverse effect to the soil in terms of acidity, compaction, structure, among others. Conversely, using these concoctions may set a good example to indicate that organically based products can yield relatively comparable results as those with inorganic fertilizers. (Author's abstract)

**Keywords:** *Litsea philippinensis*, Organic concoctions, Vermicast, Botany

### **Microbial inoculated plants to bring back green cover and live soil environment in barren mine tailings?**

*Cortes, Angelbert D. , Aggangan, Nelly S., Anarna, Julieta A.*

To bring back green cover and dead soil to life, a barren mine tailing area that had been abandoned for three decades in Brgy. Capayang, Mogpog, Marinduque was planted with tree legumes. Aseptically pre-germinated two-week old narra (*Pterocarpus indicus*) and *Acacia mangium* were inoculated with biofertilizers (mycorrhizal fungi and nitrogen fixing bacteria) during transfer into individual polybags. Plant growth response to biofertilizers was positive three months after inoculation. In the field, lime, compost, and NPK fertilizer were applied to all seedlings. After 15 months, mycorrhizal narra seedlings had height increases ranging from 98–139% and stem diameter increases from 67–87% relative to the control (78cm). Narra planted without any amendments had 50% seedling survival and height of 36cm versus 78cm with lime and vermicompost but no biofertilizers. MYKORICH® inoculated seedlings were more than 200 cm tall. On the other hand, the biggest stem diameter was obtained from BioN™-, MYKOVAM®-, and Mykorich+BioNinoculated plants with increases ranging from 17-19% relative to the control (5.79cm). On *A. mangium*, BioN and Surigao isolate increased height by 28%. Seedling survival was 98% in narra and 95% in *A. mangium* one year after planting. Fungal population was highest ( $9.9 \pm 5.5$  CFU $\times 10^4$  g soil<sup>-1</sup>) in MYKORICH-inoculated narra versus  $0.82 \pm 0.17$  CFU $\times 10^4$  g soil<sup>-1</sup> in the control plants. BioN+Surigao isolate-inoculated *A. mangium* had the highest ( $65.5 \pm 5.5$  CFU $\times 10^4$  g soil<sup>-1</sup>) fungal population versus the control ( $1.12 \pm 0.26$  CFU $\times 10^4$  g soil<sup>-1</sup>). Bacterial population was highest in *A. mangium* inoculated with Bio-N ( $28.26 \pm 0.93$  CFU $\times 10^4$  g soil<sup>-1</sup>) while the lowest was in the control ( $0.5 \pm$  CFU $\times 10^4$  g soil<sup>-1</sup>). Biofertilizers promoted plant growth, survival, and soil microbial build up in an abandoned mine tailing area in Brgy. Capayang, Mogpog, Marinduque, thus, bringing back green cover and a living soil environment. **(Author's abstract)**

**Keywords:** *Acacia mangium*, *Pterocarpus indicus*, Microbial population, Botany

### **Molecular analysis of selected traditional rice varieties using *tsv1*-linked SSR markers**

*Caguiat, Xavier G*

The tremendous information that can be sourced from a vast Genebank reservoir is on the availability of shared information about the germplasm stored in one. In order to support the breeding of superior rice varieties in terms of yield and ability to combat various stresses, the genebank would still require fundamental characterization, which includes phenotyping and genotyping of its germplasm. This paper aimed to provide preliminary evaluation of a small randomly selected germplasm using *tsv1*-linked simple sequence repeat markers. Markers consisted of di-tetra repeat motifs with 5–24 repeat numbers. Expected sizes ranged from 123 to 465 with polymorphism information content ranging from 0.23 to 0.73. Cluster analysis showed six major clusters at 50% genetic distance coefficient. Three clusters (Clusters A, B, and C) had individual germplasm, one cluster (Cluster D) with three germplasms, another cluster (Cluster E) had 55 germplasms, and lastly, another cluster (Cluster F) had 42 germplasms. PCoA showed groupings of the germplasm into three distinct groups, which could infer possible resistance, moderate resistance, and susceptibility among the entries. Confirmatory induced screening could be performed to validate this finding. In general, the materials consisted of selected germplasm resulted in presence of alleles linked to the *tsv1* gene. These rice germplasms could be source of resistance to rice tungro spherical

virus if further validation is completed. Furthermore, molecular markers could be useful to accelerate screening of vast genetic resources in terms of various biotic and abiotic stresses. (**Author's abstract**)

**Keywords:** *Biotic stresses, Evaluation, Germplasm, Tungro, SSR, Botany*

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NP

0263

### **Morpho-physiological and anatomical characteristics of smooth narra (*Pterocarpus indicus* Willd. forma *indicus*) subjected to salt stress**

*Quimado, Marilyn O., Maldia, Lerma S.J., Manipol, Marjorie M., Combalicer, Marilyn S, Luna, Amelita C.*

*Pterocarpus indicus* Willd. forma *indicus* (Fabaceae) is an indigenous species in the Philippines. This study was conducted with the tree species available in Mt. Makiling Forest Reserve (MMFR). The study assessed the status of the species by analyzing its morphological, physiological, and anatomical characteristics. Two pot experiments were conducted, namely, (1) response of seeds soaked to varying NaCl concentrations and (2) response of seedlings to application of varying NaCl concentrations. Based on the results, *P. indicus* forma *indicus* grew significantly in terms of height, number of leaves, leaf area, root collar diameter, root nodules, and root-shoot ratio under the control. It showed near responses to 100mM NaCl. On the other hand, the growth of the species is suppressed under 300mM NaCl. Its physiological characteristics (i.e., germination, survival, and photosynthetic rates) were higher in the control than in the NaCl treatments. In terms of seed anatomical characteristics, no radicle cells were damaged and its cell number was higher and its cell length was longer in the control treatment. Therefore, the species can thrive under moderate saline soils only. Thus, adaptation of the species still depends on the type of environment. Further research on the species' physiological and anatomical responses to salinity in the soil is recommended. (**Author's abstract**)

**Keywords:** *Anatomy, Morphology, Physiology, Salinity, Pterocarpus indicus, Botany*

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NP

0264

### **Morpho-physiological characterization and protein analysis of mungbean genotypes screened for waterlogging tolerance**

*Boquilla, Mercury Joy T., Ebuña, Helen LV*

Waterlogging causes adverse effects on mungbean productivity. Thus, screening for the most promising genotypes with waterlogging tolerance is essential to improve its potential as a rotational crop for rice. A split-plot experiment in Randomized Complete Block Design was conducted to evaluate 16 mungbean genotypes for waterlogging tolerance based on their morpho-physiological characteristics and crude protein content (CPC) under prolonged waterlogging duration. Tukey's HSD was performed for traits that showed significant variations based on ANOVA. Pearson's Product-Moment Correlation indicated strong positive association with seed yield by weight of 100 seeds, pod length, plant height at 30 days after planting (DAP), and number of seeds per pod, which ranged from  $r=0.82^{**}$  to  $r=0.85^{**}$ . Tolerance to waterlogging was positively correlated with fresh weight, duration of flowering, days to first flowering, and days to first priming; the last parameter had the highest correlation coefficient ( $r=0.70^{**}$ ). Using regression analysis, the relationship between seed yield and CPC to the duration of waterlogging was expressed as  $y=10.371-0.4315x$  ( $R^2=0.982$ ) and  $y=23.648-0.7453x$  ( $R^2=0.9725$ ), which estimated a yield reduction of 0.43 g and 0.75% decrease in CPC for every day of exposure to waterlogging stress. (**Author's abstract**)

**Keywords:** Soybean, Waterlogging tolerance, Waterlogging stress, Crude protein content, Yield reduction, Botany

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0265

### **Performance evaluation of tomato (*Lycopersicon esculentum*) in response to vermi leachate application at varying fermentations**

*Gonzaga, Nelda R., Pescadero, I*

The growing concerns about the adverse effect of chemicals on the environment and on agricultural practices involving organic and environmental-friendly compounds are gaining attention globally. An investigation was conducted in a 2×3 factorial arranged in Randomized Complete Block Design in three replications at the Organic Research Center of Misamis Oriental State College of Agriculture and Technology from March to October 2014. The study focused on the effect of vermi leachate application at varying fermentation periods on the growth, yield, and occurrence of Tomato Yellow Leaf Curl Virus (TYLCV). Results showed that vermi leachate application had significant effects on the growth and yield of tomato. Taller plants were observed in treatments that have drench application at 30, 45, and 60 DAT. Tomato plants at 60 DAT and applied with vermi leachate at 2.5 months of fermentation exhibited taller plants. Foliar application of vermi leachate significantly influenced growth in the earlier days of development to 50% flowering. Heavier and more marketable fruits and lesser percentage of TYLCV incidence were recorded. Results showed a greater potential in vermi leachate application in improving the growth and yield parameters of tomato. (**Author's abstract**)

**Keywords:** Vermicompost, Vermi leachate, Drench, Foliar application, Tomato, Botany

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2018/07,  
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NP

0266

### **Resilience of *Senna tora* (L.) Roxb. in drought and waterlogged conditions at vegetative stage**

*Jamago, Joy M., Ata, N*

The sustainability of agriculture, food and nutrition security, and sustained income of small farmers may depend on either the identification or development of climate-resilient crops that are tolerant to environmental stresses. *Senna tora* in Bukidnon, although still largely regarded as a leguminous weed, is reportedly being used by some locals for food, feed, and medicine. The leaf and seed protein concentrations of some Bukidnon ecotypes are also better than that of the common mungbean. A 3×10 factorial experiment in Randomized Complete Block Design was conducted in this study from April to June 2017 in a screen house. The study aimed to (1) determine the morphological, physiological, and biochemical responses of 10 *S. tora* ecotypes (Factor B) to 16 days of drought and waterlogging stresses (Factor A) at vegetative stage; (2) identify traits associated with tolerance to either or both stresses; (3) estimate phenotypic diversity under each stress; and (4) identify ecotype(s) with potential tolerance to either or both stresses. Stressed plants were allowed to recover for a week before final data were measured/recorded. In general, ecotypes were more sensitive to waterlogging than to drought. A total of 20 morpho-physiological characters were affected by stress imposition as per ANOVA. Four traits showed interaction between ecotypes and water stresses. Phenotypic diversity estimates showed moderate to high diversity for 14 of the 15 quantitative traits across water stresses. Plant stress tolerance was highly correlated with number of leaflets ( $r=0.63$ ) and leaf area ( $r=0.62$ ). None of the ecotypes were sensitive only to drought, but three were sensitive only to waterlogging. Another three ecotypes showed no sensitivity to both stresses, which may have potential dual tolerance or perhaps resistance to both stresses at vegetative stage. (**Author's abstract**)

**Keywords:** *Abiotic stress, Drought, Senna tora, Stress tolerance, Waterlogging, Botany*

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NP

0267

### **Screening of tomato (*Lycopersicon esculentum* Mill.) for waterlogging tolerance under greenhouse condition**

*Delfin, Evelyn F., Valle, Michelle L*

Tomatoes are highly sensitive to environmental stresses such as drought and waterlogging. This study evaluated 24 tomato accessions from the breeding group for waterlogging tolerance under greenhouse condition to identify possible sources of waterlogging-tolerant accessions. The 24 tomato accessions were evaluated using seedlings grown in plastic bags that were placed inside 10-liter capacity plastic pails filled with water at approximately 5cm above the soil surface for seven days at flowering stage. Waterlogged treated plants were allowed to undergo recovery period of seven days while the control plants were watered regularly. Plant samples were processed and measured for different agronomic parameters. Results showed significant reductions in the morphological characteristics (e.g., biomass partitioning, root traits, and relative leaf greenness) of the 24 tomato accessions due to waterlogging, with reduction values ranging from 1–60%. Percent survival ranged from 25–83%, with TM 10167-2 having the highest survival rate. The top five performing tomato accessions were identified based on the ranking on percent reduction for each plant character measured and on the correlation coefficient of the character in relation to total shoot dry matter. The identification of top-performing tomato accessions under waterlogged condition indicates the possibility of finding sources of tolerance for waterlogging. (**Author's abstract**)

**Keywords:** *Tomato, Waterlogging, Waterlogging tolerance, Greenhouse screening, Botany*

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(Filipiniana Analytics)  
NP

0268

### **Stress physiology of PSB Rc68 and NSIC Rc222 under progressive drought condition**

*Niones, Jonathan M. , Suralta, Roel R. , Divina, Cynthia C. , Kalaw, Sofronio P. , Lapuz, Resean R. ,  
Manangkil, Jennifer M. , Mananghaya, Teod*

Drought stress significantly affects the growth and development of rice plants, and one of the best strategies to mitigate the effects of drought on rice production is to use drought-tolerant rice varieties. This study aimed to generate information on the drought tolerance mechanism of PSB Rc68 and NSIC Rc222 at vegetative stage under progressive drought conditions. These varieties are improved, high-yielding, and drought-tolerant cultivars. Pre-germinated seeds were grown in a pail filled with 8 kg soil and were subjected to well-watered (controlled condition) and in drought-stress conditions. The imposition of drought stress was started 14 days after sowing when the soil moisture content (SMC) reached 12%. The progressive drought stress was maintained until the test genotypes reached the vegetative stage. Comparing PSB Rc68 and NSIC Rc222 in well-watered and drought stress environment, PSB Rc68 showed -39.9% reduction in shoot dry weight, whereas NSIC Rc222 showed -42.1%. The less reduction of PSB Rc68 shoot dry weight was attributed to the increase in its total root length of 2.7% compared with that of NSIC Rc222 (-18.0% reduction). The PSB Rc68 increased total root length was attributed to higher water use efficiency, which led to higher shoot dry weight under water limiting condition. (**Author's abstract**)

**Keywords:** *Drought, Rice, Root, Shoot, Water use, Botany*

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## **Survey and characterization of landraces of winged bean (*Psophocarpus tetragonolobus* L.) in Ilocos Norte**

**Antonio, Menisa A. , Rosales, Raymund Julius G. , Batara, Frances Charlyn G., Agustin, Epifania O. , Malab, Geovannie Stanley S.**

Winged bean (*Psophocarpus tetragonolobus* L.) is an economically important leguminous crop known for its versatility and adaptability to various environmental conditions. Most of the cultivars grown in Ilocos Norte are landraces and demonstrate wide morphological differences, all of which remain fully undocumented. Thus, a field survey was conducted to document the existing cultural management practices of farmers. Germplasm materials were collected for crop establishment and were characterized morphologically using the Descriptors' List for winged bean (Biodiversity International 2007). Phenotypic diversity was estimated using the standardized Shannon-Weaver's Diversity Index ( $H'$ ), and clustering was done in Numerical Taxonomy and Multivariate Analysis System. Winged bean is basically grown basically as a subsistence crop in Ilocos Norte, with minimal cultural management practices employed. Results showed that phenotypic diversity of the 33 accessions was high. Both the qualitative and quantitative morphological characters accounted for the high variability, with  $H'$  of 0.88 and 0.83, respectively. Clustering procedures grouped the accessions into long-podded (>20cm) and short-to-medium podded accessions (<15–20cm). Several accessions appeared as duplicates of one or the other. Based on the characteristics, some of the accessions have potential for commercialization and (eventually) for registration as a variety. Thus, research results are necessary for subsequent varietal selection, conservation, and development. **(Author's abstract)**

**Keywords:** *Landraces, Phenotypic diversity, Morphological characterization, Cluster analysis, Germplasm collection, Botany*

## **Yield and growth of mungbean under partial shade**

**Maghirang, Rodel G. , Delfin, Evelyn F. , Sabanal, Alvin Quiel , Rodriguez, Maria Cielo Paula B. , Alip, Ramon Christop**

Intercropping coconut with mungbean is an alternative method of increasing mungbean production and farm income. However, partial shading by coconut reduces the quantity and quality of light received by intercrops. Thus, screening for partial shade tolerance is a good strategy to increase mungbean productivity under shade condition. A replicated field trial evaluated the performance of 14 selected mungbean entries under full sunlight and artificial shade structures with 50% and 70% partial shade levels. Mungbean entries were evaluated in terms of yield and other agronomic traits. Genotypic differences were observed in terms of internode distance, plant height, nodulation, and relative leaf greenness across growing condition. Yield reduction was observed to increase with the increase in shade level. The range in yield reduction among entries was 27.5–66.3% and 49.7–79.6% for 50% and 70% shade, respectively. Pag-asa 5 had the highest yield under both shade levels, with potential yield of 1.33 and 0.93 tha<sup>-1</sup> for 50% and 70% shade, respectively. Pag-asa 5 also ranked first in terms of number of pods under 70% shade. The trial conducted showed the differential response of mungbean to partial shading and the superiority of Pag-asa 5 over other mungbean entries in terms of yield. Thus, this can be recommended as stop gap variety for partial shade condition. **(Author's abstract)**

**Keywords:** *Partial shade tolerance, Intercropping, Mungbean, Artificial shade, Nodulation, Botany*

## CHEMISTRY

0271

### **Antibacterial activity of a developed lemongrass (*Cymbopogon citratus*) mouthrinse prepared at different concentrations**

*Taclan, Lorcelie B. , Mergal, Vicky C. , Rosas, Andre T. , Kiatyanyong, Thanattha , Dominguez, Jochebed Dia*

This study determined the antibacterial activity of a developed lemongrass mouthrinse containing 25% and 50% lemongrass oil concentration against *Aggregatibacter actinomycetemcomitans*. Lemongrass was dehydrated using a multi-commodity heat pump dryer and hydrodistillation method was used to extract the oil from the dehydrated lemongrass. Mouthwash was prepared at 25% and 50% lemongrass oil concentrations based on guidelines of the American Dental Association Council on Dental Therapeutics and Remington's *Pharmaceutical Science*. The Kirby Bauer disk diffusion susceptibility test was used to determine the antibacterial effect of the developed mouthrinse. Results were analyzed using the 2007 United States Pharmacopeia biological reactivity test in vitro. Results showed that the zones of inhibition brought about by 50% lemongrass oil concentration mouthwash against *A. actinomycetemcomitans*, had a mean diameter of 35 mm as compared to 23.6 mm diameter in chlorhexidine and 20.3 mm in the 25% lemongrass oil treatment. The negative control had a mean diameter of 8 mm. Reactivity scores revealed that the 50% lemongrass oil concentration mouthrinse has Grade 4 severe reactivity as compared to the 25% lemongrass oil concentration as well as the positive and negative control. The Tukey test results also showed that of the four treatments, *A. actinomycetemcomitans* is more susceptible to the 50% lemongrass oil mouthwash than the rest of the treatments. **(Author's abstract)**

**Keywords:** *Antibacterial, Hydrodistillation, Biological reactivity test, Kirby Bauer disk diffusion susceptibility test, Zones of inhibition, Chemistry*

0272

### **Assessment of the catalytic activity of iron pincer complexes in the reductive cleavage of C-O bond in lignin model compound**

*Aguila, Mae Joanne B. , Bernardo, Elaine M. , Alamag, Al*

Lignocellulosic biomass, mainly composed of cellulose, hemicellulose, and lignin, is considered one of the most promising solutions to produce renewable energy, fuel, and chemicals. This study developed a catalytic system employing pincer complexes as catalysts that may enable the conversion of lignin into commodity chemicals. Due to the complex structure of lignin, a model compound was used to represent the linkages present in actual lignin. Pincer ligands, namely pyridyldiimine and benzyldiamine, were synthesized via condensation reaction of an aldehyde/ketone with 2,6-disubstituted anilines with percent yields ranging from 28–56%. The pincer complexes were then formed by reacting the synthesized ligands to different Fe precursors in 1:1 stoichiometry. These complexes were used in the in situ catalysis of anisole as the substrate and different hydrogen sources. Results from thin layer chromatography suggested cleavage of C-O bond in anisole yielding phenol as the main product, as compared with the commercially available sample. Evaluating different hydrogen donors revealed that acetic acid is the most effective, giving 30% percent yield of phenol. **(Author's abstract)**

**Keywords:** Lignin, Pincer complexes, C-O bond cleavage, Chemistry

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0273

### **Binding of nanoceramics with serum albumins**

*Mojica, Elmer-Rico E. , Desamero, Ruel Z.B. , Bathan, Gladys , De Guzman, Camille Rose V. , Cu, Jeanne Ter*

Metal oxide nanoparticles are widely used in products in automotive vehicles, biochemical engineering, electronics and communication technologies, medicine, and day-to-day consumer products, like food and cosmetics. These metal oxides, otherwise known as nanoceramics, adopt a number of structural geometries with an electronic structure that can exhibit metallic, semiconductor, or insulator character. Previous studies have shown interactions between nanoparticles and biological molecules, which raise concerns about their effect on human health. In this study, the interactions of four nanoceramics (i.e., aluminum oxide, silicon oxide, titanium oxide, and zinc oxide) with serum albumin (human and bovine) were monitored using UV-Vis spectroscopy, fluorescence spectroscopy, and circular dichroism. Results showed the reduction of absorbance and fluorescence for both serum albumins added with nanoceramics. The reduction was more pronounced with aluminum oxide. Circular dichroism (CD) analysis showed a change in conformation of serum albumins added with nanoceramics. These changes only mean that changes in the serum albumins' structure and conformation upon addition of these nanoceramics could affect the functions of the serum albumins in the biological systems. **(Author's abstract)**

**Keywords:** Nanoceramics, Serum albumin, Absorbance, Fluorescence, Circular dichroism, Chemistry

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NP

0274

### **Carbon-based supercapacitors utilizing electrospun nanofibers of imidazole-based ionic liquid/polymer blends**

*Marquez, Menandro C. , Atayde, Jr., Eduardo C. , Patricio, Jonathan N., Arco, Susan*

With the limited supply of fossil fuels and rapid energy consumption, there has been an increasing and urgent demand for exploring highly efficient, green, and sustainable energy storage systems. At present, all solid-state polymer electrolytes (SPEs) have been receiving much attention for high-performance energy storage devices, such as supercapacitors due to their unique characteristics (i.e., no leakage, low flammability, excellent processability, good flexibility, wide electrochemical stability window, high safety, and superior thermal stability). In this study, a novel supercapacitor assembly following an electrical double-layer capacitor configuration fabricated by sandwiching electrospun polyacrylonitrile (PAN) nanofibers doped with 1-methylimidazolium acetate (MIMOAc) and 1-ethyl-3-methyl-imidazolium bromide (EMIMBr) between two activated carbon/graphite composite electrodes is presented. The morphological and structural properties of the ionic liquid/polymer blends were evaluated by SEM, AFM, and FT-IR studies. Furthermore, the capacitive behaviors of MIMOAc-PAN and EMIMBr-PAN SPEs were investigated using cyclic voltammetry, which showed the lack of any redox peaks implying a pure electrostatic attraction in the electrode-electrolyte interface as supported by the corresponding Nyquist plots generated using EIS studies. These significant results compared well to the data obtained when using the conventional 1M KOH(aq) as electrolyte. These solvent-free electrolytes, based on conducting nanofibrous electrospun polymers, pose a potential avenue for next-generation supercapacitors in place of liquid electrolytes that are prone to leakage and electrode degradation. **(Author's abstract)**



**Keywords:** Supercapacitor, Electrospinning, Ionic liquids, Carbon/graphite, Polyacrylonitrile, Chemistry

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NP

0275

### **Characterization and stability study of reduced L-glutathione-loaded niosomes**

*Corpuz, Mary Jho-Anne, Osi, Marina, Santos, Joshua, Villaflores, O*

Glutathione is a major antioxidant in the body that serves as a substrate for conjugation reactions and regulates cell proliferation. Low levels of glutathione have been linked to cancer, liver problems and other chronic diseases. Studies have shown that oral supplementation is not effective in increasing the glutathione level in the body. The purpose of the study was to prepare a niosomal formulation of glutathione and to characterize the niosomal formulation. Furthermore, the study compared the effect of the charge inducer in the formulation. The method was divided to the preparation, characterization and stability study of the niosomal formulation. The niosomal formulation was produced by thin film hydration with varying Span 60 (Sorbitan monostearate) and cholesterol ratios. Niosomal formulation with highest entrapment efficiency was further characterized for mean particle size, surface morphology, and in vitro drug release. Formulation A entrapped 98.21% of the glutathione. Addition of charge inducer increased its entrapment efficiency to 98.91%. Furthermore, both niosomal formulations released glutathione at pH 7.4 in 1.0M phosphate buffer saline (PBS). The mean vesicular size obtained was 1,242.97±40.52nm. Differential Scanning Calorimetry revealed compatibility between glutathione and its excipients. Both formulations do not cause cytotoxicity in human dermal fibroblast. The stability study also revealed that it was stable at 5°C and 40°C for 3 months. Results of this study suggested the potential use of niosomes in the targeted delivery of glutathione. This is the first report on the use of niosomal preparations through thin film hydration technique in the delivery of reduced L-glutathione. (**Author's Abstract**)

**Keywords:** glutathione, niosome, drug delivery, formulation, bioavailability, cytotoxicity and stability, Chemistry

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Philippine Journal of Health Research and Development, Volume No. 22 Issue No. 3, 45-55  
2018/09,  
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0276

### **Chemical synthesis and characterization of zinc oxide-polypyrrole nanocomposites as potential photocatalyst**

*Payawan, Jr., Leon M., Sarmago, Roland V., Buenviaje, Jr., Salvador C., Edañol, Yasmin D.G., Usman, Ken Aldren S*

In this study, zinc oxide (ZnO) nanoparticles were synthesized from zinc acetate via sol-gel method. The ZnO nanoparticles were functionalized with polypyrrole (PPy) via chemical polymerization with FeCl<sub>3</sub>. Both ZnO and ZnO-PPy were found to be highly crystalline. The synthesized ZnO nanoparticles agglomerated and formed no distinct morphology, whereas ZnO-PPy was found to have spherical structural morphology with particle radius of around 200 nm. The experimental band gap energy of ZnO was 3.40 eV compared to the literature value of 3.37 eV. It was also found that polymer capping with PPy reduced the band gap to 2.52 eV. The polymer interaction of PPy with ZnO was electrostatic in nature. Photodegradation efficiency was improved upon PPy capping from 1.78% to 3.78% per hour. (**Author's abstract**)

**Keywords:** Zinc oxide, Polypyrrole, Nanomaterials, Chemical polymerization, Photocatalysis, Methyl orange, Chemistry

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2018 July,

### **Comparative physicochemical analyses of regular and civet coffee**

*Garcia, Emmanuel, Chan, Ste*

Regular and civet coffee beans of the *Coffea robusta* variety were analysed for  $\alpha$ -tocopherol and caffeine contents by HPLC, surface microstructure by SEM, minerals by EDX. Probably due to absorption, the  $\alpha$ -tocopherol content of the civet coffee beans was lower compared to the regular robusta coffee beans. Heating damages the cell membrane and vacuoles, causing an increased release of  $\alpha$ -tocopherol and caffeine. Interestingly, calculations showed that roasting produced a more pronounced increase in  $\alpha$ -tocopherol content in regular robusta than in the civet counterpart. Meanwhile, the caffeine content increase of the civet coffee beans may be attributed to the possible formation of amino acids which are precursors of caffeine biosynthesis. SEM revealed that civet coffee beans acquired surface micro-pitting due to the action of digestive enzymes. The roasted regular robusta and civet coffee beans showed a smoother surface due to the fusion of cellulose in the cell wall. The mineral content of the civet coffee beans were lower than that of regular robusta which may have been an effect of absorption by the civet. **(Author's abstract)**

**Keywords:** *Civet coffee, Robusta coffee, Caffeine, Surface microstructure,  $\alpha$ -tocopherol, Minerals, Chemistry*

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Manila Journal of Science, Volume No. 7 Issue No. 1, 1-5  
2011,  
(Filipiniana Analytics)  
NP

### **Development of polyaniline-modified carbon electrode for electrochemical determination of ascorbic acid**

*Dayao, Liere Roe, Santiago, Kar*

In this research, a facile electrochemical determination of ascorbic acid based on polyaniline-modified carbon electrode (PANI-MCE) was developed. The sensing membrane was synthesized via *in-situ* chemical oxidation process. The spectral and morphological properties of PANI-MCE membrane were characterized using Fourier transform infrared (FTIR) spectrometer and a scanning electron microscope (SEM), respectively. Using optimal preparation conditions, the fabricated PANI-MCE exhibited a high sensitivity of 18.7  $\mu\text{A mM}^{-1}$  ascorbic acid. A linear relationship ( $r=0.997$ ) was determined between the anodic peak current and ascorbic acid concentration in the range of 2–8 mM ( $n=4$ ). Moreover, an RSD of  $<10\%$  implies the sensor's high repeatability and reproducibility demonstrating the potential of PANI-MCE as a good candidate for ascorbic acid determination. **(Author's abstract)**

**Keywords:** *Conducting polymer, Electrochemical sensing, Ascorbic acid, Chemistry*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 227  
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NP

### **Digital image photometry of xylose in liquid medium**

*del Rosario, Ernesto J., Alojado-Rubianes, Ma. Rosele*

Digital image photometry (DIP) was used to determine xylose concentration in liquid medium. Xylose was quantified by its color reaction with phloroglucinol in a 96-well microplate sample holder using a commercial flat-bed scanner followed by image analysis with free-access software (ImageJ). The Red (R) values showed linear correlation versus xylose concentration in the range of 1.0–10.0mg/mL with correlation coefficient of 0.987. The DIP method was found to be accurate based on experimental pentose (versus theoretical) concentration values. The observed limits of detection (LOD) and quantification (LOQ) for xylose were 0.65mg/mL and 2.17mg/mL, respectively. The DIP method gave results that are reliable and comparable to other technical protocols requiring expensive equipment such as high performance liquid chromatograph (HPLC) or UV-visible spectrophotometer. The DIP method was used to evaluate the extent of xylose assimilation in liquid fermentation medium by four yeast strains. (**Author's abstract**)

**Keywords:** Digital photometry, Flatbed scanner, Image analysis, Phloroglucinol assay, Xylose determination, Chemistry

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Philippine Journal of Science, Volume No. 148 Issue No. 2, 217-224  
2019/03,  
(Filipiniana Analytics)  
NP

0280

### **Dissolution of cellulose in 1-butyl-3-methylimidazolium acetate**

*Arco, Susan D. , Lee, Allen Marbert S., Atayde, Jr., Eduardo C. , Patricio, Jonat*

Cellulose is the most abundant biorenewable material on earth with derivatives that have a wide range of applications. Various studies were conducted to determine a viable solvent for cellulose and found that ionic liquids (ILs) were reusable and environmentally-safe solvents of cellulose. In this study, 1-butyl-3-imidazolium acetate, [BMIM] Ac, was synthesized and was used for the dissolution of cellulose. [BMIM] Ac was synthesized using a two-step method: synthesis of [BMIM] Br using a solvent-free sonochemical preparation and synthesis of [BMIM] Ac using a simple ionexchange method. The ILs were characterized using FT-IR, <sup>1</sup>H-NMR, and <sup>13</sup>C-NMR. The dissolution of cellulose was done under an inert atmosphere and was aided by constant stirring at 100°C. Cellulose was regenerated by the addition of water as an anti-solvent. The reusability of the IL as a solvent was evaluated. It was determined that the maximum weight % of cellulose that can be dissolved in [BMIM] Ac was 12 wt%. The reusability of the IL was confirmed by the comparison of the IR spectra of the unused and used IL, showing no significant difference. (**Author's abstract**)

**Keywords:** Ionic liquids, [BMIM] Ac, Cellulose dissolution, Chemistry

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0281

### **Effect of solvent on Gd(DOTA)–complex formation: a preliminary investigation**

*Villaraza, Aaron Joseph L. , Pineda, Ernest Guil*

The thermodynamic stability and kinetic inertness of gadolinium-based MRI contrast agents remains an important research topic in the field of radiological contrast agent development. In this study, the kinetics and thermodynamics of Gd<sup>3+</sup>-complex formation with the macrocyclic ligand DOTA (*i.e.*, 1,4,7,10-tetraazacyclododecane-1,4,7,10-tetraacetic acid) was investigated under aqueous (acetate buffer pH 5.8) and non-aqueous (MeOH) conditions. Using Job's method of continuous variation, solutions were prepared of increasing mole fraction of Gd<sup>3+</sup> relative to xylenol orange (XO, *i.e.*, 3,3'-bis[N,N-bis(carboxymethyl)aminomethyl]-o-cresolsulfonephthalein) in MeOH, and their absorbances were measured at 582nm. The kinetics of complex formation *via* ligand substitution of DOTA and DO3A (*i.e.*, 1,4,7,10-tetraazacyclododecane-1,4,7-triacetic acid) with Gd-XO under aqueous and non-aqueous conditions were determined using UV-Vis spectrophotometry.

Furthermore, the thermodynamic parameters of DOTA complexation with  $Gd^{3+}$  for both solvent conditions were compared by measuring the heats of injection using isothermal titration calorimetry. Results of this study demonstrate that XO forms a well-defined 1:1 stoichiometry with  $Gd^{3+}$  regardless of solvent polarity. Meanwhile, the rate of ligand substitution between  $Gd$ -XO and the macrocyclic ligand is effectively minimized under non-aqueous conditions ( $k_{obs, buffer} = 33.9 \pm 1.0 \times 10^{-3} \text{ s}^{-1}$ ;  $k_{obs, MeOH} = 5.62 \pm 2.22 \times 10^{-3} \text{ s}^{-1}$ ). The binding reaction of  $Gd^{3+}$  with DOTA has comparable negative  $\Delta G$  values in the two solvents ( $\Delta G_{buffer} = -9.28 \pm 0.57 \text{ kcal/mol}$ ;  $\Delta G_{MeOH} = -8.19 \pm 0.14 \text{ kcal/mol}$ ), suggesting that the reaction is equally spontaneous under both conditions. However, computation of global thermodynamic properties demonstrate that the reaction is entropically-driven in acetate buffer in comparison with MeOH where the reaction is enthalpy-driven. Finally, the nature of solvent has an effect on the metal-to-ligand stoichiometry ( $N$ ) of the resulting complex, which in acetate buffer ( $N = 1:1$ ) is lower than that in MeOH ( $N = 1:2$ ). These results are important in the context of optimizing reaction conditions in the preparation of related MRI contrast agents. (**Author's abstract**)

**Keywords:** *Binding kinetics, Calorimetry, Gadolinium-based MRI contrast agents, Isothermal titration ligand exchange reaction, Solvent effects, Thermodynamics, Chemistry*

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0282

### **Electrochemical characterization of 1-methylimidazolium acetate and its effect on the properties of electrospun poly(vinyl alcohol) fibers**

*Arco, Susan , Marquez, Menandro , Patricio, Jonathan A. , Atayde, Jr., E*

Ionic liquids (IL) are a special class of compounds which have been explored in a variety of applications ranging from green solvents to materials for energy storage devices. Their utility stems from their amenability to facile functionalization that is tailored for a specific function. In recent years, ILs have been studied for their potential as electrolyte for batteries and supercapacitors. This is due to their wide potential window, thermal stability, low vapor pressure, and high conductivity. In this study, we report the synthesis and electrochemical characterization of 1-methylimidazole acetate (MIMOAc) and its effect on the structure of electrospun poly(vinyl alcohol) (PVA) fibers, a commonly studied separator membrane for supercapacitors. MIMOAc was synthesized by sonicating a 1:1 mixture of 1-methylimidazole and glacial acetic acid. After purification, the IL was subjected to cyclic voltammetry analysis to identify its electrochemical properties at a scan rate of  $100 \text{ mV s}^{-1}$  at different voltage ranges. Furthermore, the IL was used as dopant for the electrospinning of 7.5% PVA solution at 15 kV. Results showed that MIMOAc did not exhibit significant oxidation or reduction at a voltage range of  $-4\text{V}$  to  $+4\text{V}$ , hence making it an excellent candidate as electrolyte for batteries and supercapacitors. In addition, SEM and AFM characterization of the MIMOAc-doped PVA revealed that the fibers produced are thinner than that of the pristine PVA, thus allowing more surface area for ion mobility. (**Author's abstract**)

**Keywords:** *Ionic liquids, Fiber, Electrospinning, Poly(vinyl alcohol), Chemistry*

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0283

### **Electrochemical detection of hydrogen peroxide using copper oxide (CuO) nanoparticles modified multiwalled carbon nanotube paste electrode**

*Yago, Allan Christopher C., Buenaventura, Angelo Gabr*

Hydrogen peroxide ( $H_2O_2$ ), a strong oxidant, is used widely as oxidant, disinfectant, and bleaching agent. Determination of  $H_2O_2$  in different industries, such as pulp and paper industry, is important both in quality control

and from an economic perspective. An electrochemical sensor for H<sub>2</sub>O<sub>2</sub> was fabricated in this study. The sensor consisted of copper oxide (CuO) nanoparticles electrodeposited on anodized multiwalled carbon nanotube paste electrode (ACPE). Chronoamperometry was used as the electrodeposition technique both for Cu deposition and for oxidizing the Cu to CuO. The CuO layer was found to react with H<sub>2</sub>O<sub>2</sub> which leads to discernable voltammetric response towards H<sub>2</sub>O<sub>2</sub>. Different parameters were optimized including Cu deposition time, Cu oxidation time, and equilibration time of electrode with H<sub>2</sub>O<sub>2</sub> solution. Differential pulse voltammetry was used as the sensing technique for CuO/ACPE. A linear relationship was found between H<sub>2</sub>O<sub>2</sub> concentration and peak current (I<sub>p</sub>) between 40 µM to 1,200 µM with sensitivity of 0.0181±0.0003 µA µM<sup>-1</sup>. The limit of detection (LOD) was calculated to be 11.69 µM. The fabricated sensor has a potential to be used as electrochemical sensor for H<sub>2</sub>O<sub>2</sub> in bleaching effluents in pulp and paper industry. **(Author's abstract)**

**Keywords:** *Copper oxide, Hydrogen peroxide, Multiwalled carbon nanotube, Carbon paste electrode, Chemistry*

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NP

0284

### **Electrospun poly(1-hexyl-3-vinylimidazolium bromide) /poly(vinylidene fluoride) nanofibers as supercapacitor separator membrane**

*Patricio, Jonathan N. , Dumalaog, Jasper S., Atayde, Jr., Eduardo C. , Arco, Susan*

Energy storage devices, such as supercapacitors, play a vital role in creating sustainable energy systems to attain the world's daily reliable electricity supply. Studies on ionic liquids as liquid electrolyte for supercapacitors and batteries have been done. However, there have been no studies on the use of polymerized ionic liquids as solid electrolyte for such devices. In this work, a poly(ionic liquid)-poly(vinylidene fluoride), (PILPVDF), nanofiber composite was produced through electrospinning. The PIL of interest, poly(1-hexyl-3-vinylimidazolium bromide), was synthesized through sonochemical solventless reaction followed by free radical polymerization. Characterization of the synthesized ionic liquid monomer and polymer was done through FT-IR, <sup>1</sup>H-NMR, and <sup>13</sup>C-NMR spectroscopy. The conductivity and hydrophobicity of the electrospun nanofibers were also determined through water contact angle (WCA) measurement and linear and cyclic voltammetry. A supercapacitor prototype containing the synthesized nanofiber composite as the separator membrane was fabricated. The electrospun PIL-PVDF nanofibers exhibited hydrophobicity, which may be attributed to the inherent hydrophobic nature of both polymers. Fiber diameters ranging from 120 nm to 180 nm were acquired through atomic force microscopy. **(Author's abstract)**

**Keywords:** *Ionic liquids, Polymers, Nanofibers, Supercapacitors, Electrolyte, Chemistry*

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NP

0285

### **Ethanol vapor sensing with thermally reduced graphene oxide for potential application in breath alcohol detection**

*Sevilla, III, Fortunato B. , Ng, Alex Carl L., Salcedo, Alan Rodelle*

The monitoring of ethanol in breath is important in the prevention of accidents due to drunk driving. A sensor based on a thermally reduced graphene oxide (rGO) layer deposited on gold interdigitated electrodes was explored for sensing ethanol vapor. GO was deposited in an interdigitated electrode using the Langmuir-Blodgett method and was thermally reduced to rGO. The electrical resistance of the rGO layer was responsive to the presence of ethanol. This response was found to be dependent on the concentration of ethanol. Parameters such as flow rate and volume of the sensing chamber also influenced the sensor response. The sensor could detect ethanol vapor

concentration ranging from 53.5 ppm to 178.5 ppm with a sensitivity determined to be  $1.49 \times 10^{-4}$  ( $\Delta R/R$ ) ppm<sup>-1</sup> and a linearity of 0.977. This concentration range corresponds to the allowable levels of ethanol in breath. Concentrations higher than this range indicate intoxication and can be used as a ground for imprisonment. The sensor demonstrates a simple and straightforward detection of ethanol using reduced graphene oxide which exhibit good potential for application in alcohol breath monitoring system. **(Author's abstract)**

**Keywords:** *Reduced graphene oxide, Gas sensor, Ethanol, Chemiresistor, Interdigitated electrodes, Chemistry*

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2018 July,  
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0286

### **Fabrication of mip-based electrode for the potentiometric determination of chloramphenicol and method validation**

*Arco, Susan D. , Atayde, Jr., Eduardo C. , Bolo, Christ*

Chloramphenicol (CAP) is an antibiotic used in both human and veterinary medicine, which may induce aplastic anemia and bone marrow suppression in humans. Due to its toxicity, the use of CAP in foodproducing animals had been banned in many countries. In this study, a molecularly imprinted polymer (MIP)-based electrode was fabricated for the detection of trace amounts of CAP. Commercially available MIP-CAP was characterized via Fourier-Transform infrared spectroscopy and spectrophotometric binding studies. The MIP had a maximum binding capacity of  $10.1 \pm 0.6$  mg CAP gram<sup>-1</sup> MIP with an imprinting factor of 2.25. The MIP was highly selective to CAP and was verified via binding studies with structural analogs of CAP, salbutamol (SAL), and clenbuterol (CLB). The maximum binding capacity of the MIP towards SAL and CLB were  $1.5 \pm 0.4$  mg SAL and  $5.5 \pm 0.4$  mg CLB gram<sup>-1</sup> MIP. The membrane was prepared in a poly(vinyl chloride) (PVC) matrix consisting of the MIP-CAP, sodium tetrakis[3,5-bis(trifluoromethyl)phenyl]borate (NaTFPB), and 2-nitrophenyl octyl ether (NPOE). The fabricated electrode was connected to a digital multimeter to determine the amount of CAP in sample solutions. The concentration determined by the modified electrode was close to that determined using high-performance liquid chromatography (HPLC). **(Author's abstract)**

**Keywords:** *Chloramphenicol, Molecularly imprinted polymer, Poly(vinyl) chloride, High-performance liquid chromatography, Chemistry*

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2018 July,  
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NP

0287

### **Gut microbial diversity of Balb/C mice fed different cultivars of *Indica* rice**

*Manaois, Rosaly V., Watanabe,*

Recent research findings suggest that gut microbiota impact the overall health of the host. In this study, the potential effects of unpolished rice in modulating the intestinal bacterial population in Balb/c mice were examined. Five-week-old male Balb/c mice (n=5–6) were fed for 30 days with a synthetic diet of AIN-93G or diet supplemented with any of the unpolished forms of three Philippine *indica* rice varieties differing in pericarp color (*Ittum*, Black; *Saluyaw*, Red; NSIC Rc188, White). Three mice were selected from each group and their intestinal microbiota were analyzed by 16S pyro-sequencing. After the extraction of DNAs from the cecal contents, a 250-bp region from the V4 region of the 16S rRNA gene was amplified. Sequencing was performed and reads from all samples were clustered (at 97% sequence identity) into operational taxonomic units (OTUs), then aligned to the Greengenes bacterial reference tree. The cecal microbiota of all mice were composed of 562 OTUs from eight distinctive bacterial phyla, with four phyla (Firmicutes, Bacteroidetes, Defferibacteres, and Proteobacteria) accounting for more than 90% of all the obtained sequences. Alpha-diversity analysis showed that cecal

microbiota compositions were less diverse in AIN-fed mice than in rice-fed mice. Principal coordinate analysis and hierarchical clustering using unweighted pair group method with arithmetic mean suggested distinct clustering of each group. The Firmicutes/Bacteroidetes ratio was significantly different between the AIN and colored-rice groups. Abundance of Prevotellaceae was higher in the cecal content of rice-fed mice when compared with AIN-fed mice, while that of Bacteroidales S24.7 tended to be lower in colored ricefed mice. This work demonstrated that diets containing unpolished rice resulted in shifts in the composition of intestinal microbiota of Balb/c mice. (Author's abstract)

**Keywords:** Gut, Microbiota, Rice, Indica, Ittum, Saluyaw, Chemistry

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NP

0288

### **Heavy metals, trace elements and sedimentation samples in the marine protected areas in Lanuza Bay, Surigao del Sur** *Capangpangan, Rey Y., Seronay, Romell*

The presence of a high concentration of heavy metals in marine protected areas is considered indicators of anthropogenic influence. Currently, 19 marine protected areas have been established and locally managed within the local government units in Lanuza Bay, Surigao del Sur that may be threatened by pollutants from various sources. Sediment samples and sedimentation rate were taken using the PVC tube sampler and sediment traps respectively inside the MPAs in Lanuza Bay. Heavy metals and trace elements from sediment samples were analyzed using Inductively Coupled Plasma (ICP). The mean concentrations of the different metal ions in the 19 MPAs were remarkably low except for those abundant elements such as Al, Fe, P, and K which varied in the sampling sites. The concentration of heavy metals in Buenavista MPA was consistently higher as compared to other sampling sites, although the recorded values did not exceed the established PEL values. The concentration of total chromium in Adlay MPA and San Pedro MPA exceeded the established PEL value of 90 ppm. Noticeably, the MPA with higher total chromium concentration also obtained higher sedimentation rate with 2.632 mg cm<sup>-2</sup> d<sup>-1</sup> and 1.23 mg cm<sup>-2</sup> d<sup>-1</sup> in Adlay and San Pedro MPAs, respectively. The concentration of trace elements such as Mo, Ge, W, and Sb was also determined, but the environmental risk currently cannot be assessed yet considering that there are no established PEL values. (Author's abstract)

**Keywords:** Heavy metals, Sedimentation rate, Chromium, Trace elements, Chemistry

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NP

0289

### **Influence of different extraction methods on fatty acid composition of lipid extracts of *Chlorella vulgaris* Beijerinck from Laguna De Bay, Philippines** *Hernandez, Hidelisa P., Nacorda, June Owen, Saracanlao, Rochelle J*

*Chlorella vulgaris* Beijerinck cultures isolated from Laguna de Bay were cultivated and the biomass produced after one month of cultivation was subjected to stepwise selection of solvent system, algae-to-solvent ratio, and extraction method. The optimized procedure for *C. vulgaris* was found to be sonication with 2:1 (v:v) chloroform:methanol as extractant at 1:20 (g:ml) algae:solvent ratio producing 51% crude lipid (dry-weight basis). Using thin layer chromatography, the *C. vulgaris* lipid extract showed the following approximate composition: triglycerides (79%), sterols (14%), and 1,3-diglycerides present in substantial amounts. Gas chromatography–flame ionization detection of the fatty acids as fatty acid methyl esters showed the following components: myristic acid, palmitic acid, stearic acid, oleic acid, linoleic acid, linolenic acid, and traces of lauric acid. Analysis of the

lipid extracts showed that extraction procedure, along with the solvent system, affects both yield and lipid profile. Total lipid yield and sterol yield increase with increasing polarity of the solvent system. Triglycerides, on the other hand, decreases with the polarity of solvent systems used. A more varied fatty acid class was obtained using more polar solvents (8 fatty acids) compared with the usage of less polar ones (1-3 fatty acids). (**Author's abstract**)

**Keywords:** *Algal lipids, Fatty acid profile, Lipid yield, Solvent polarity, Sonication, Chemistry*

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2019/03,  
(Filipiniana Analytics)  
NP

0290

### **Introduction of the hypocholesterolemic peptide, lpypr, to the major storage protein of mung bean [*Vigna radiata* (L.) Wilczek] through site-directed mutagenesis** *Torio, Mary Ann O. , Anarna, Vita A. , Angelia, Mark Rickard N. , Upadhyay, Shrawan*

The LPYPR peptide was successfully introduced into three different variable regions (VR-1, VR-2, VR-5) of 8Sa globulin of mung bean. Mutated protein (MP) had 96.69% structural homology to that of the wild type (WT) protein. Protein expression was carried out in *E. coli* HMS174(DE3) with 40.66% expression for MP, which is 144.42% higher compared to that of WT. WT and MP had molecular weights of about 48.4 and 48.7 kDa, respectively. These samples were purified using HIC and hydrolyzed at different digestion times using trypsin as the digestive enzyme. UPLC analysis of the tryptic digests of MP showed successful release of the LPYPR. MP had increasing trends of cholesterol-binding capacity (mg g<sup>-1</sup> sample) with the 24-hour digests showing the highest % bound cholesterol of 380.76±6.61% and 434.44±10.88% for crude and purified MP, respectively. The sodium taurocholate binding capacity was also found to have increasing trend for the tryptic digests of MP with the 24-hour digests also showing the highest % bound sodium taurocholate of 59.75±0.30% and 61.95±0.51% for crude and purified MP, respectively. (**Author's abstract**)

**Keywords:** *Mung bean, 8Sa945 globulin, Site-directed mutagenesis, Cholesterolbinding capacity, Sodium taurocholate binding capacity, Chemistry*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 235  
2018 July,  
(Filipiniana Analytics)  
NP

0291

### **Ion-exchanged Philippine bentonites: preparation, characterization, and phenol adsorption property** *Conato, Marlon T. , Arcilla, Carlo A. , Uboan, Xandr , Espenilla, Mel Bryan L. , Mendoza, C*

Modified Philippine bentonites were prepared by ion-exchange with sodium chloride, a surfactant cetyltrimethylammonium bromide (CTAB), a pillaring agent (aluminum hydroxy polycation), and a hybrid inorganicorganic bentonite derived from a combination of CTAB and the metal polycation. The presence of intercalated modifiers and structural variations on the modified clay materials were monitored by spectroscopic techniques. Thermal analysis and in-situ high temperature XRD investigation of Philippine bentonites provided initial data on the structure-adsorption property. Adsorption properties in the removal of organic pollutants, such as phenol, from aqueous solutions were assessed through batch adsorption tests. The modified bentonites were all shown to have enhanced physical and chemical properties compared to the native bentonite. The results showed that the Philippines bentonites modified with CTAB and the CTAB/Alcombination were the most efficient towards sorption of phenol compared to the other bentonite materials. As the sorbent concentration increased, the removal percentages of phenol were shown to be increasing for the two organo-modified Philippine bentonites. Also, XRD results showed that the increased interlayer spacing of the bentonites modified with CTAB is one of



the factors for high uptake of phenol. The results of the study showed that the enhancement of the physicochemical properties of bentonite makes them attractive alternative adsorbents of organic pollutants for wastewater treatment. (**Author's abstract**)

**Keywords:** *Philippine bentonite, Ion-exchanged, Phenol adsorption, Chemistry*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 237  
2018 July,  
(Filipiniana Analytics)  
NP

0292

### **Laboratory-scale preparation of potentially inexpensive low- and middle-range protein molecular weight markers for SDS-PAGE**

*Alejo, Kennethjer G. , Recuenco, Mar*

Protein molecular weight (MW) markers for sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE) were prepared from proteins extracted and fractionated from egg white, skim milk, porcine serum, and wheat flour. Fractionation methods employed include adsorption on bentonite, isoelectric pH precipitation, ammonium sulfate precipitation, and acetone fractionation. The % recoveries based on reported yields of the egg white proteins—lysozyme, ovotransferrin, and ovalbumin—were 9.70%, 116.51%, and 25.34%, respectively. The % recoveries for caseins from skim milk, porcine albumin, and glutenin fraction from wheat were 93.00%, 0.15%, and 0.54%, respectively. Fractions from egg white, caseins, and porcine albumin (EMPA) were combined to prepare the low-range MW marker—with EMPA consisting of seven proteins and MW range of 11.8–77.1 kDa. The protein fraction from wheat (W) with six components and MW range of 16.2–106.3 kDa was prepared as the middle-range marker (WH). Using a commercial marker as a primary standard, the MWs of the markers' components were established. The prepared markers were then used as standards to estimate the experimental MWs of some common proteins. The experimental MWs were within 1.2–11.0% difference from the experimental MWs calculated from using the commercial marker as standard. The MWs were also within <13% error from the theoretical MWs, with lower % errors for the proteins with MWs within the markers' MW range. While some components—specifically the egg white proteins—could be present in their glycosylated forms, both markers showed the ladder profile—consistently suggesting stability of the components under heating, denaturing, and reducing conditions even with some possible effects of glycosylation on some components. (**Author's abstract**)

**Keywords:** *Egg white, Molecular weight markers, Proteins, SDS-PAGE, Wheat, Chemistry*

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Philippine Journal of Science, Volume No. 148 Issue No. 2, 373-384  
2019/06,  
(Filipiniana Analytics)  
NP

0293

### **Mass balance approach for purity assessment of organic materials: histamine dihydrochloride case study**

*Ebarvia, Benilda, Bion, Abigail , Galo, Ma. Rosnah , Tongson,*

The traceability of chemical measurement results to the International System (SI) of units is the most important key for the achievement of compatibility and reliability in chemical measurements and this has been a great concern not only in the chemical metrology communities but also in the routine laboratories. Traceability can be ensured by calibration or verification of measurement results against proper certified reference materials (CRMs), which are traceable to SI, reported with a credible statement of measurement uncertainty, and are provided by authorized bodies (usually National Metrology Institutes or NMIs), or accredited CRM producers that link traceability to NMI's standards. In the Philippines, the Metrology in Chemistry (MiC) Project at the Industrial Technology Development Institute, Department of Science and Technology (ITDI-DOST) is establishing the capability for purity assessment of organic compounds to support the CRM needs of local laboratories. In this

study, purity assessment of histamine dihydrochloride was conducted using mass balance approach. This is one of the most critical steps to link traceability of chemical measurements to SI units. The organic impurities (0.002%) were evaluated using high performance liquid chromatography with fluorescence detector (HPLC-FLD). Water content was determined to be 0.23% using Karl-Fischer (KF) coulometer with oven transfer. Volatile (0.25%) and nonvolatile matter (3.6%) were detected by thermogravimetric analysis (TGA). The purity of histamine dihydrochloride pure substance was initially assigned to be 96.18% with measurement uncertainty of 3.62%. **(Author's abstract)**

**Keywords:** *Purity assessment, Histamine dihydrochloride, Reference material, Traceability, Karl-Fischer coulometry, Chemistry*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 238  
2018 July,  
(Filipiniana Analytics)  
NP

0294

### **Mechanochemical synthesis of urea-potassium sodium tartrate eutectic system** *Gemperoso, Joshua P., Aguila, Mae Joanne B. , Magsino, Al Jer*

There is now a growing concern on the use of common organic solvents due to their high volatility and toxicity. A green chemistry approach is to substitute these solvents with eutectic systems with low freezing points by combining different components, with preference to substances that are easily decomposed in the environment. In this study, a eutectic system of urea and potassium sodium tartrate was synthesized through a series of steps including grinding, sonication, and heating. A binary solid-liquid phase diagram was constructed from cooling curves of the mixture of varying mole ratios of the components. It was found that the eutectic composition is 2:1 mole urea to potassium sodium tartrate and the eutectic freezing point is 18.3°C. **(Author's abstract)**

**Keywords:** *Eutectic system, Eutectic composition, Eutectic freezing point, Chemistry*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 242  
2018 July,  
(Filipiniana Analytics)  
NP

0295

### **Method development and validation of capillary electrophoresis: a practical aspect** *Suntorns*

The current review illustrates the method development and validation of capillary electrophoresis (CE) from experiences of the author research group. Various examples including drug monitoring, pharmaceutical, and natural product analyses are described. The author emphasizes that no specific CE condition is applicable for all problems. Analytes' physicochemical properties (e.g., solubility, dissociation constant, polarity, absorptivity, etc.) and their stability are major consideration. Sample matrices (e.g., biological fluid and tissues, foods, medicinal plants, etc.) can usually complicate an analysis and should be accounted for before a method is developed. Consequently, sample pretreatment/preparation procedures have to be carefully optimized as well. Successes in CE separation involve adjustments of both chemical (e.g., background electrolyte concentrations and pH, organic solvents, electro-osmotic flow modifiers, additives, etc.) and instrumental (e.g., sample loading techniques, temperature, voltage, capillary dimension, detectors, etc.) factors. Optimization of these factors can be achieved by univariate approach or statistical experimental design. The final optimum CE condition should be justified by acceptable analytical parameters (e.g., resolution, tailing factor, number of theoretical plate, total analysis time, etc.). Method validation is a follow up process, which should be carried out according to the predetermined protocol and criteria of performance. These criteria normally include specificity, linearity and range, accuracy, precision, and robustness. BGE and sample solution stability may be required in certain cases and system suitability should be carried out for method transfer. **(Author's abstract)**

### **Oral drug delivery systems from hyperbranched methacrylic acid and poly(ethylene glycol) copolymer nanocarriers**

*Arco, Susan D. , Atayde, Jr., Eduardo C. , Montalbo, Reynaldo*

The most preferred method of drug delivery is oral administration of pharmaceuticals because it is economical, convenient, and non-intrusive. However, a drug compound may be susceptible to degradation or precipitation along the upper gastrointestinal tract before it can be absorbed in the small intestine. To this end, pH- and thermo-responsive hyperbranched copolymers poly(methacrylic acid-co-ethylene glycol dimethacrylate)-b-poly(di(ethylene glycol) methyl ether methacrylate) and poly(methacrylic acid-co-ethylene glycol dimethacrylate)-bpoly(poly(ethylene glycol) methyl ether methacrylate) were synthesized by RAFT polymerization. The hyperbranched copolymers were produced with high molecular weights and low polydispersity. The copolymers underwent phase transitions at pH 5.7 and temperatures above 30°C, allowing them to behave differently under specific environments. Encapsulation of ibuprofen as a model drug produced drug carriers with a loading capacity of up to 14.47% and encapsulation of up to 72.35%. In in vitro drug release studies in simulated stomach pH conditions, protonation of the MAA core of the drug carriers increased its hydrophobicity. There, drug release was inhibited to release as low as 27% of the encapsulated drug within 5 hours. At simulated intestinal pH however, the MAA core was ionized. Dissolution of the MAA core facilitated a burst drug release wherein up to 85% of the encapsulated drug was released within 5 hours. The results of the study showed that the stimuli-responsiveness of the copolymers served as a switch to encapsulate or release a drug depending on the external environment. This property gives the copolymers potential as oral drug delivery agents.

**(Author's abstract)**

**Keywords:** *RAFT, Hyperbranched, Polymer, Drug, Delivery, Chemistry*

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### **Phenolic antioxidants from agricultural by-products for functional food and cosmetics applications**

*Natividad, Gaudencio M. , Rayos, Charmaine Eljie R. , Rafael, Ronalie B. , Natividad, Lexter R. , Ortinero, Cesar V. , Rafael, Rosa*

The use of synthetic antioxidants in food and cosmetics has been considered as an efficient method for preventing lipid oxidation. However, safety of these synthetic additives has been an issue due to some reports of their adverse effect on consumers. This stimulated the interest of researchers to evaluate naturally occurring compounds that have similar antioxidant effects. The phytochemical composition of the agricultural by-products was studied using thin-layer chromatography. The presence of steroids, anthraquinones, flavonoids, and phenols were determined. Total phenolic content (TPC) analysis of selected agricultural by-products revealed that vodka was the most effective solvent and that *M. indica* peelings (38.88mg AAE/g DW) had the significantly highest amount of total phenolics. This was followed by *C. microcarpa* peelings (21.38mg AAE/g). In terms of antioxidant activity, *M. indica* peelings can neutralize 50% of DPPH radicals at the concentration of 96.60mg L<sup>-1</sup> followed by *C. microcarpa* with effective concentration (EC<sub>50</sub>) of 332.1mg L<sup>-1</sup>. Product development was done, incorporating phenolic agricultural by-products into food and cosmetics. Cosmetic products like lotion, soap, and lip balm were made. Food products such as pasta, cookies, and bread were also made. The effects of the extracts on the shelf-

life of various products were assessed using sensory, microbial, and chemical methods. The results indicate that alcoholic beverages like gin can be an alternative, food-compatible solvent for the extraction of phenolic antioxidants from natural sources. *M. indica* fruit peel contains phenolic substances that exhibit strong antioxidant properties and can be used as substitute for synthetic antioxidants in enhancing the quality of food or cosmetic products. **(Author's abstract)**

**Keywords:** *Total phenolic content, Antioxidant activity, Products, Chemistry*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 147  
2018/07,  
(Filipiniana Analytics)  
NP

0298

### **Resistant starch content and in vitro starch hydrolysis index of selected Philippine rice with varying apparent amylose content**

*Rodriguez, Myrna S. , Tuaño, Arvin Paul P., Barcellano, Eljezyne Clomer*

Resistant starch content (RS) and in vitro starch hydrolysis index (HI) were determined in four Philippine rice varieties differing in apparent amylose content (AC). Starch digestibility pattern and kinetics were also studied in relation to AC and reported glycemic index (GI) of the rices used. Brown and milled rice samples of Improved *Malagkit Sungsong 2* (waxy with 1.7% AC), NSIC Rc160 (low-AC with 13.3% AC), IR64 (intermediate- AC with 17.6% AC), and PSB Rc10 (high AC with 24.0% AC), were cooked via beaker-double boiler method using pre-determined water-rice ratio related to AC. This resulted in similar cooked rice hardness values for all samples as verified by Instron 3343 texture analyzer, prior to starch hydrolysis experiments. RS of cooked milled rices ranged from 0.15% to 0.99% with the highest RS noted for the high-AC variety PSB Rc10. Their corresponding brown rices had RS ranging from 0.24% to 1.61%. In vitro HI were calculated from the ratio of the area under the curve (AUC) of the starch hydrolysis rates of the milled rices relative to the AUC of the reference food, white bread. HI varied from 59.3% to 102.2% with the highest HI noted for waxy rice Improved *Malagkit Sungsong 2*. Significantly lower HI values were recorded for their corresponding brown rice samples spanning 49.2–66.9%. Previously reported GI values of the same set of samples were highly correlated with the HI values obtained in this study. **(Author's abstract)**

**Keywords:** *Apparent amylose content, Brown rice, Digestibility, Milled rice, In vitro hydrolysis index, Starch, Chemistry*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 240  
2018 July,  
(Filipiniana Analytics)  
NP

0299

### **Synthesis and in vitro anti-mycobacterial activity determination of phthalimide derivatives**

*Paraiso, West Kristian, Alea, Glen*

Phthalimide derivatives were synthesized using the concept of molecular hybridization or combination of two pharmacophores in one drug. In this paper, the concept was utilized to synthesize new anti-mycobacterial compounds to combat emerging resistant *Mycobacterium tuberculosis* strains. Four new phthalimides were successfully prepared using a single-step condensation reaction between phthalic anhydride and four different sulfonamides: sulfadimethoxine, sulfathiazole, sulfamethizole, and sulfamethoxypyridazine. IR and <sup>1</sup>H NMR spectroscopic and mass spectrometric data verified the identity and structure of the synthesized compounds. The antimycobacterial activity of the synthesized phthalimides and their starting materials was evaluated according to CLSI standard procedures using the agar proportion method. The calculated LogP of both starting materials and phthalimides were also compared. Sulfathiazole, sulfadimethoxine, and sulfamethizole showed significant activity

against *Mycobacterium tuberculosis* H37Rv strain at 0.01 mg/ml, the lowest concentration at which they were tested. One of the four new compounds, 4-(1,3-dioxo-1,3-dihydro-2*H*-isoindol-2-yl)-N-(1,3-thiazol-2-yl)benzenesulfonamide, which was synthesized from sulfathiazole also exhibited the same activity. The derivatives from sulfadimethoxine and sulfamethizole, however, showed a decrease in activity. The phthalimides overall gave higher LogP values. The active new compound demonstrates that molecular hybridization may be used to design antimycobacterial compounds with improved activity and pharmacokinetic properties. (**Author's abstract**)

**Keywords:** *Phthalimide derivative, Molecular hybridization, Mycobacterium tuberculosis, Sulfonamide, Chemistry*

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Manila Journal of Science, Volume No. 8 Issue No. 2, 1-8

2013,

(Filipiniana Analytics)

NP

## COMPUTER SCIENCE

0300

### Reoptimization of the consensus pattern problem under pattern length modification

*Ordanel, Ivy D. , Malinao, Jasmine A. , Clemente, Jhoirene B., Juayong, Richelle Ann B. , Fernandez, Proceso L. Jr. , Adorna, Hen*

In Bioinformatics, finding conserved regions in genomic sequences remains to be a challenge not just because of the increasing size of genomic data collected but because of the hardness of the combinatorial model of the problem. One problem formulation is called the Consensus Pattern Problem (CPP). Given a set of  $t$   $n$ -length strings  $S = \{S_1, \dots, S_t\}$  defined over some constant size alphabet  $\Sigma$  and an integer  $l$ , where  $l \leq n$ , the objective of CPP is to find an  $l$ -length string  $v$  and a set of  $l$ -length substrings  $s_i$  of each  $S_i$  in  $S$  such that the total sum of  $d(s_i, v)$  is minimized for all  $1 \leq i \leq t$ . Here  $d(x, y)$  denotes the Hamming distance between the two strings  $x$  and  $y$ . It is known that CPP is NP-hard *i.e.*, unless  $P = NP$ , there is no polynomial-time algorithm that produces an optimal solution for CPP. In this study, we investigate a combinatorial setting called reoptimization in finding an approximate solution for this problem. We seek to identify whether a specific additional information can help in solving CPP. Specifically, we deal with the following reoptimization scenario. Suppose we have an optimal  $l$ -length consensus substring of a given set of sequences  $S$ . How can this information be beneficial in obtaining an  $(l + k)$ -length and  $(l - k)$ -length consensus for  $S$ ? In this paper, we show that the reoptimization variant of the problem is still computationally hard even with  $k=1$ . In response, we present four algorithms that make use of the given optimal solution—we prove that the first three algorithms produce solutions with quality that is bounded from above by an additive error that grows as the parameter  $k$  increases, while the fourth algorithm achieves a guaranteed approximation ratio. It has been shown that there is no efficient polynomial-time approximation scheme for CPP (Boucher 2015). In this paper, we show that we can save--steps in computation from the original running time of the known polynomial-time approximation scheme for CPP. (**Author's abstract**)

**Keywords:** *approximation, consensus pattern, PTAS, reoptimization, Computer science*

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Philippine Journal of Science, Volume No. 148 Issue No. 3, 535-549

2019/09,

(Filipiniana Analytics)

NP

### **Development and validation of a concept test in introductory physics for biology students**

*Morales, Marie*

This study is focused on the development and validation of a concept test in Introductory Physics for Biology students as a diagnostic tool, a misconception test, a formative assessment tool, and a summative test. Its final form is a 50-item multiple-choice concept test in Introductory Physics for Biology 1st term (Mechanics, Fluids & Heat) students wherein each item has four choices. One among the choices serves as the correct answer while the rest are considered distracters. It was originally developed as a 67-item multiple-choice concept test in Introductory Physics for Biology students covering all the topics specified in the syllabus of the course offered at the Philippine Normal University. Classical test item analysis and validation were conducted to establish test validity while item reliability was tested using Cronbach's Alpha, which was 0.67, and K-R 21, which was 0.70. Analysis of the distracters was done to determine the Physics misconceptions that can be diagnosed by the instrument. The misconception diagnostic capability of the test is a feature, which can be of help to Physics teachers for better concept understanding of students. **(Author's abstract)**

**Keywords:** *Misconception test, Assessment tool, Physics for Biology, Concept Test, Validity, Education*

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Manila Journal of Science, Volume No. 7 Issue No. 2, 1-19  
2012,  
(Filipiniana Analytics)  
NP

### **Effectiveness of peer-assisted-learning model in teaching physical examination in otorhinolaryngology to clerks and postgraduate interns**

*Atienza, Melflor A. , Capuz, Maria Ka*

Peer-assisted learning (PAL) is an established concept in which students obtain mutual benefits by teaching and learning from each other. In the clinical environment, this often occurs intentionally or unintentionally in various formats such as same level or cross level peer tutoring, peer mentoring, cooperative learning and the like. This study determined the effectiveness of Peer Assisted Learning in achieving identified program outcomes in the curriculum for clerks and postgraduate interns rotating in Otorhinolaryngology specialty.

Study has 2 parts. Part 1 was a one-group pre-test and post-test design that involved teaching training of 16 PGI to be peer tutors in Otorhinolaryngology Physical Examination (ORL PE) to clerks. Video recorded pre-training baseline and post-training actual skills demonstrations of the PGI were rated. Scores were compared using Wilcoxon Signed Ranks test with p value at 5% level of significance. Part 2 was a randomized controlled single-blind trial of Peer-Led vs. Expert Faculty-Led ORL PE training of 55 clerks. Tutees performed a post training video-recorded skills demonstration assessed by a faculty rater who was blinded as to who among the clerks underwent the PAL-Led or Expert Faculty-Led training. Scores of the tutees in the 2 models of instruction were compared using the Mann-Whitney U-test at 5% level of significance.

Part 1 results showed significant improvement in the post-training scores of the 16 PGI in the identified micro skills and ORL PE skills. For Part 2, 33 and 22 clerks underwent PAL-Led and Expert Faculty-Led instruction respectively. Comparison of performance scores of the clerks in the 2 models of instruction showed no significant difference.

Teaching training for PGI improved their knowledge, skills and attitude in teaching ORL PE skills to clerks. There was no significant difference in the performance outcomes between clerks that underwent PALLed and Expert Faculty-Led model of instruction. **(Author's Abstract)**

**Keywords:** *peer assisted learning, teaching training, Education*

### **Equivalence of entrustable professional activities and context-dependent item sets as summative assessments in undergraduate physical therapy programs**

*Grageda, Maria Elizab*

Summative assessment of student performance should provide information on achievement of program outcomes to support evaluation decisions. Alternative approaches to the traditional assessment systems like the written licensure examinations in Physical Therapy (PT) should be explored to ensure valid measurement of achievement of these terminal outcomes.

The study aimed at establishing equivalence of two summative assessments new to PT in measuring achievement of the PT outcomes: work-based assessment using Entrustable Professional Activities (EPA) and knowledge-based assessment using Context-Dependent Item Sets (CDIS).

Thirty-two newly graduated PT's underwent a one-week EPA assessment and took a 102 item CDIS test (based on 14 clinical vignettes). Qualitative data from blueprint review, group face-to-face interviews with participants and assessors, and field notes from observations, and quantitative data from EPA entrustment decisions and CDIS scores were utilized to ascertain their comparability in terms of Purpose, Administration, Quality and Decisions. This was used to determine the extent of equivalence of the two assessments.

Review of both blueprints show alignment with PT outcomes, with integrative content motivating participants towards professional development. Administration were equally acceptable to users, though EPA had more practice opportunities with a longer assessment time. Entrustment decisions in EPA had a high inter-rater reliability, while CDIS had low reliability, with most items having poor discriminative power. Decisions of “pass” or “fail” had good concordance when high prevalence indices were considered.

There is high extent of equivalence in purpose of EPA and CDIS but are not equivalent in terms of administration. There is moderate equivalence in quality and decisions, with potential for increased concordance if improved quality of CDIS is attained. (**Author's Abstract**)

**Keywords:** *summative assessment, outcome assessment, entrustable professional activities (EPA), context dependent item sets (CDIS), comparability, equivalence, Education*

### **Freshman physics majors' cognitive expectations and academic performance in their introductory physics Course**

*Mistades, Voltaire M*

The research investigates the extent of change in Physics majors' cognitive expectations—beliefs about the learning process and the structure of knowledge—after going through their first Introductory Physics course. Using the Maryland Physics Expectations (MPEX) Survey, the students' responses are compared with the responses of 'life-long learners of physics'. The students' post-instruction responses reflected highest agreement with the experts' response in the Concepts, Reality Link, and Effort Link dimensions of the survey. Analysis of the beliefs profile of the students in the upper quartile compared with the beliefs profile of the students in the lower quartile revealed that a more 'expert-like' thinking in the Coherence, Concepts, and Effort Link dimensions is present for the students who performed academically well in class. (**Author's abstract**)

**Keywords:** *Cognitive expectations, Academic performance, Introductory Physics, Beliefs about learning, MPEX, Education*

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Manila Journal of Science, Volume No. 7 Issue No. 1, 1-6  
2011,  
(Filipiniana Analytics)  
NP

0305

### **Institutionalization of the integrated school nutrition program model in different schools in CALABARZON**

*Lainez, Carmina Alicia N., Angeles-Agdeppa, Imelda, Longalong, War*

A school-based nutrition program model which integrated gardening featuring climate smart agricultural practices, nutrition education for students and parents, and supplementary feeding of underweight children was previously implemented for three years and was proven effective in improving the nutritional status of children and knowledge of parents and children.

This study aimed to mobilize and engage school officials to institutionalize the Integrated School Nutrition Program and document scale-up mechanisms for its implementation in CALABARZON.

The scaling-up relied largely on establishing a critical mass of schools termed as “lighthouse schools” (LS), which provided local research-based evidence while demonstrating scalability of the model. Fiftyeight (58) LS were selected in CALABARZON Region where a total of 80,222 children were enrolled in 2016-2017. Capacity building (training of trainers, workshops, orientations) was provided for school program implementers. Seeds and planting materials and information, education and communication (IEC) materials were also provided to the LS.

Garden produce was regularly utilized in the school-based feeding program (SBFP) incurring savings of ~Php 42.00 per student in 120 days. Different nutrition education (NE) modalities helped improve knowledge of children and parents, which resulted to “no plate waste” among schoolchildren. The NE activities also built a sense of cooperation among parents to help in the feeding activities and in sustaining the vegetable gardens. After 120 feeding days a significant decrease in the proportion of wasted students aged 5 to 19 y.o. from baseline (100%) to endpoint (64.71%) was observed. There was a further significant increase in the mean weight and height of students at the end of the additional 80 feeding days for male ( $p < 0.05$ ) and female ( $p < 0.05$ ).

Schools can serve as centers for learning and sharing about nutrition, food security, agro biodiversity conservation and climate change. Effective scaling-up requires demonstration of effective combination of advocacy and education, communication strategies directed at relevant agencies and sectors. Issues on sustainability, maintenance of soil quality and manpower need to be addressed for national scale implementation. (**Author's Abstract**)

**Keywords:** *school nutrition program, CALABARZON, lighthouse schools, nutrition education, Education*

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45th FSS Book of Abstracts, Volume No. Issue No. , 32  
2019,  
(Filipiniana Analytics)

0306

### **Proficiency indicators for Philippine STEAM (Science, Technology, Engineering, Agri/fisheries, Mathematics) educators**

*Palisoc, Caesar P. , Anito, Jovito C. , Avilla, Ruel A. , Abulon, Edna Luz R. , Morales, Marie*

The study aimed to develop a self-rating tool to determine the proficiency of Philippine Higher Education (PHE) STEAM (Science, Technology, Engineering, Agri-Fisheries, Mathematics) Educators. This design and development research emphasized elaborations of the Philippine Professional Standards for Teachers (PPST) in the tertiary STEAM education aligned with the Policies, Standards, and Guidelines (PSGs) of 46 STEAM



programs (science–22, technology–7, engineering–10, agriculture–5, and mathematics–2). The crafted indicators went through expert and statistical validations and analyses to establish the indicators' content validity, construct validity, and reliability. The experts assessed the indicators' similarity and variance, appropriateness, phraseology, and ambiguity of items and found that most items from the first version (90 items) suit the criteria and the country's context. Principal axis factor (PAF) analysis showed that only 60 items represent the seven factor loadings generated from the analysis. These seven factors matched the seven TPCK dimensions: Factor 1 (TPACK [Technological Pedagogical Content Knowledge]), Factor 2 (TPK [Technological Pedagogical Knowledge]), Factor 3 (TCK [Technological Content Knowledge]), Factor 4 (PCK [Pedagogical Content Knowledge]), Factor 5 (TK [Technological Knowledge]), Factor 6 (PK [Pedagogical Knowledge]), and Factor 7 (CK [Content Knowledge]). The first four factors with a majority of the generated 60 indicators already explained more than half of the variance as per PAF. Furthermore, all seven factors and the entire set of 60 indicators obtained above standard reliability indices as per Cronbach's alpha analysis, thus incurring valid and reliable 60 indicators of proficiency for PHE STEAM educators that may be utilized for reflective practice and policy inputs to Philippine STEAM Education. (**Author's abstract**)

**Keywords:** *Proficiency indicators, STEAM education, Technological pedagogical content knowledge, Education*

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0307

### **Transformative scale-up of the School of Health Sciences, University of the Philippines Manila**

*Paguio, Jenniffer T. , Dones, Luz Barbara P. , Peralta, Arnold B. , Salvacion, Maria Lourdes Dorothy S. , Atienza, Melflor A. , Sana, Erlyn A. , Pastor, Claire D. , David-Padilla, Carmenci*

The School of Health Sciences (SHS), University of the Philippines Manila, established in 1976 offers a one-of-its kind ladder-type, community-based curriculum in health sciences.

This study described the SHS curriculum and how it contributed to the transformative scale-up of the education of health professionals in the Philippines.

This study is a concurrent transformative mixed method design. Data were collected concurrently through interviews of university officials, faculty, students, alumni, communities, and partners as well as observations of review classes and office activities. Quantitative data were collected from school records and performance ratings of students. From the data emerged the basic principles of primary health care and community-based education and they were juxtaposed to describe transformative learning of SHS students and faculty.

All of the 3,481 students admitted from 1976 came from geographically isolated and depressed areas; more than 95% of the graduates are still in the country and chose to serve the communities. The school's ladder-type, community-based curriculum produced competent midwives, nurses, and physicians. SHS did not just transform its students but also the faculty, communities, its partner local, national, and international agencies, and changed the landscape of community-based education in the region.

SHS produced health professionals who chose to serve the communities. It continues to evolve to institutionalize primary health care and community-based education. (**Author's Abstract**)

**Keywords:** *community-based education, primary health care, competency-based curriculum, ladder-type program, transformative learning, Education*

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2019/03,  
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### **Accelerated hydrothermal degradation and biodegradation of electrospun polycaprolactone montmorillonite nanofiber membrane**

*Diaz, Leslie Joy , Riña, John Jaymar , Bornillo, Kristal Aubrey , Dela Cruz, Micha*

The nanocomposite of montmorillonite (MMT) clay and polycaprolactone (PCL) have been reported to successfully serve as a reusable adsorbent of heavy metal from wastewater from metal extraction. In this study, the degradability of the electrospun polycaprolactone (PCL) nanofiber membrane, as support material to MMT, was evaluated through accelerated hydrothermal degradation and biodegradation as a continuous effort to be able to appropriately discard the spent adsorbent materials. In the hydrothermal conditions, the membranes were immersed in NaOH solution and H<sub>2</sub>O at 35°C and 45°C at specific durations. While for the biodegradation, alkali-treated and untreated membranes were buried in two separate media, i.e. soil and compost, to evaluate the natural decomposition. The extent of degradation measured via gravimetry showed that the alkali-treated membranes subjected to hydrothermal degradation had the highest weight loss that ranged from 27% to 96% after 24 hours of immersion. The membranes buried in compost had weight loss ranging from 77% up to 100% after three (3) weeks of being in the ground. Compared to membrane made of pristine PCL polymer, it was also shown that MMT improved the degradability of the membrane such that 96% of weight loss was already observed after 24 hours of hydrothermal immersion and 100% weight loss after three (3) weeks of ground covering. This could have been brought about by the decrease in the degree crystallinity of the support polymer which was almost 30% lower compared to the pristine material. It was also found that biodegradation in compost was better than in soil such that a maximum weight loss of 100% in compost was observed compared to 70% weight loss in soil after 3 weeks. The former was found to contain 180 times more microorganisms than soil which could be responsible for the higher biodegradation performance. These results would be useful in establishing protocols for the disposal of PCL and its derivatives after being used in various applications not just in wastewater treatment but also in other applications like biomedical devices in the medical industry. (**Author's abstract**)

**Keywords:** *Degradation, Polycaprolactone, Montmorillonite, Nanocomposite Membrane, Biodegradation, Hydrothermal Degradation, Nanofiber Membrane, Engineering*

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NP

### **Adsorption studies on the removal of organic pollutants by the use of zeolite derived from Mt. Pinatubo ejecta**

*Usman, Ken Aldren S. , Edañol, Yasmin D.G., Buenviaje, Jr., Salvador C. , Payawan, Jr., Leon*

Synthetic dyes, such as methyl orange, methylene blue, and fuchsine were removed from aqueous solutions through the use of zeolite, which was synthesized from Mt. Pinatubo ejecta via hydrothermal technique. The structure of the zeolite was further studied using Fouriertransform infrared spectroscopy (FT-IR) and X-ray diffractometry (XRD). Atomic force microscopy (AFM) and scanning electron microscopy (SEM) were used to analyze the surface morphology of the zeolite. The adsorption capacities of zeolite, in mg dye g<sup>-1</sup> zeolite, were 9.138 for methyl orange, 19.256 for methylene blue, and 16.412 for fuchsine. The values obtained were from the optimum incubation time of 24 hours. The adsorption capacities were also found to increase as the dye initial concentration increases while the opposite trend was observed when the amount of adsorbent used was increased. Furthermore, the adsorption capacity for methyl orange, methylene blue, and fuchsine decrease with increasing pH. (**Author's abstract**)

**Keywords:** *Zeolites, Adsorption studies, Methylene blue, Engineering*

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**Bioaccumulation of Pharmaceutically Active Compounds (PHACS) in TH environment estimation of diffusion coefficients of different brands of loperamide in water at infinite dilution using conductance method**

*Bote, Jairus Lemuel G. , Adornado, Adonis P. , Magsombol, Frances Anne D. , Soriano, Al*

The diffusion coefficients of different local brands of loperamide, namely Diatabs®, Imodium®, Lomotil®, Lormide®, and RiteMED® Loperamide, were investigated to provide information on the behavior of the ions in water systems. Data were determined from the electrolytic conductivities of the systems, which were measured at different concentrations (infinite dilute region) and temperatures, ranging from 293.15 K to 313.15 K with 5 K increments, each done in three replicate runs considering the given conditions, and adjusted accordingly with calibration results. The molar conductivities were calculated and plotted as a function of concentration that fitted better in the modified Robinson-Stokes equation than the Kohlrausch equation with an acceptable absolute average deviation of 4.36%. Using the calculated data from this model, the infinite dilution diffusion coefficients (DBo) and self-diffusion coefficients at infinite dilution (Diono) were estimated using the Nernst-Haskell equation and Nernst-Einstein equation, respectively. In addition, other parameters were calculated by utilizing the available correlations, Arrhenius equation was used to calculate activation energy (Ea) and pre-exponential factor (A) and the Stokes-Einstein equation was used to calculate hydrodynamic radii of the ions. Through data interpretation and graphical analysis, the theories involved were supported. Findings showed a direct linear relationship between conductivity and temperature due to ionic mobility and extent of ionization. Generally, the estimation of diffusion coefficients of loperamide at infinite dilution through valid correlations was attained in this study. (**Author's abstract**)

**Keywords:** *Loperamide, Infinite dilution, Conductivity, Diffusion coefficient, Hydrodynamic radius, Engineering*

**Canopy gap detection and characterization following a typhoon disturbance using uas imagery**

*Gonzalvo, Karla Jane P., Barua, Leonardo D., Bantayan, Nathan*

The use of unmanned aerial systems (UAS) imagery is explored in characterizing changes in canopy gap following a typhoon disturbance within a 2-hectare long-term ecological research (LTER) plot. UAS provide on-demand imaging that supplements satellite imagery, which offers more limited temporal resolution. Orthorectified UAS imagery over dense vegetation provides snapshots representing canopy condition when the imagery is taken. Images were captured in July 2014, August 2014, and January 2017 representing the LTER plot condition before, immediately after, and long after typhoon Rammasun (locally known as Typhoon Glenda) devastated portions of the Mount Makiling Forest Reserve (MMFR), respectively. Object-based image analysis allowed for the creation of visually homogenous areas within orthorectified images called segments. Visual qualities including brightness and darkness of segments were used to identify canopy gaps. Analysis shows that prior to the typhoon, there were 0.36 ha of perceived canopy gaps within the LTER plot. This was increased to 0.62 ha immediately after the typhoon. Gaps decreased to 0.27 ha two years after, indicating recovery of the forest canopy. Spatial reconfiguration of canopy gaps was observed across the three time periods owing to the disturbance generated by the typhoon event. (**Author's abstract**)

**Keywords:** *Canopy gap, Aerial imagery, UAS, Long term ecological research plot, Object-based image analysis, Engineering*

### **Comparative study on the optimization of pretreatment parameters of Engineered Bamboo Industry (EBI) waste for cellulose fiber production**

*Dalumay, Rhazzel Jane A., Mamuad, Roselle*

The high utilization rate of fossil resources for the manufacture of some products, such as fuel- or petroleum-derived products like synthetic fiber, has a direct impact on the economy and the environment. Hence, an alternative resource to decrease today's rapid consumption of fossil resources is necessary. A potential alternative solution to this problem could be utilization of lignocellulosic biomass as an alternative fiber source. Dilute acid hydrolysis and alkaline pretreatment of cellulosic materials in the production of cellulose fiber for textile applications was studied. Engineered bamboo industry waste was utilized as the cellulosic material. Pretreatment concentration, pretreatment temperature, and pretreatment time were optimized based on percent yield. Results show that the optimum conditions for acid hydrolysis was 4 wt %, 150°C, and 50 minutes; for alkaline pretreatment it was 4 wt %, 120°C, and 100 minutes. Using ANOVA ( $p < .05$ ) to determine the best pretreatment method, results show that there is no significant difference in the two pretreatment methods although the alkaline pretreatment method obtained a higher percent yield of cellulosic fiber compared to dilute acid pretreatment. The properties (i.e., elongation at break, moisture absorption, and density) of the cellulose fiber produced were compared to the standard properties of a cellulose fiber commercially available and only the density was within the standard. **(Author's abstract)**

**Keywords:** *Hydrolysis, Bamboo, Cellulose fiber, Biomass, Engineering*

### **A computer assisted diagnosis system for the identification/auscultation of pulmonary pathologies**

*Cordel, Macario O. II, Ilao, Joel P*

Statistics show that the primary cause of morbidity and mortality among Filipinos are pulmonary illnesses. These illnesses could have been prevented if detected and treated early. With the physicians' medical knowledge and experience, early detection of possible common pulmonary diseases can be performed using a stethoscope. However, with the current physician-to-population ratio in the country, early detection of respiratory diseases may not be performed on most cases especially in the rural areas, causing even benign cases to lead to mortality. In this paper, we present the development of a system that classifies lung sound for possible pulmonary pathology. Using an electronic stethoscope, lung sounds were collected from healthy individuals and patients with common pulmonary problems for the developed system's training and evaluation. The collected data were pre-processed in order to remove mechanical and other external noises. Using Support Vector Machine (SVM) for modelling and classification, the developed system was able to achieve 100% identification of the normal lung sound from the adventitious lung sound, with an average cross-validation performance of 88%. The developed system, however, has low performance in classifying specific lung sounds, that is, normal vs. crackle vs. wheeze vs. ronchi, with an average accuracy of 61.42% and an average cross-validation performance of 90%. **(Author's abstract)**

**Keywords:** *Computer assisted diagnosis, Lung sound enhancement, Lung sound classification, Pattern recognition, Electronic stethoscope, Support Vector Machine (SVM), Engineering*

**Data mining map for property predictors prediction of density, viscosity, and refractive index of binary mixtures (ionic liquids + alcohols [methanol, ethanol, propan-1-ol]) using support vector regression**

*Adornado, Adonis P. , Duron, Marc John M. , Yamauchi, Ken L. , Soriano, Al*

Although the potential of ionic liquids (ILs) had been recently discovered, its applications and the study of its properties are still limited. As more ILs are being synthesized, the reduction in experimentation on their properties is necessary. This study presents a method of predicting the density, viscosity, and refractive index of binary mixtures of ILs and alcohol (methanol, ethanol, propan-1-ol) using support vector regression (SVR). Based on the input variables (temperature, mole fraction of IL, number of carbon atoms in cation, number of atoms in anion, number of hydrogen atoms in anion, and the number of carbon atoms in alcohol), the parameters were determined and used in creating models. The data used in this study were taken from the Ionic Liquids Database – ILThermo (v2.0), screened, and the properties were normalized. The optimal combination of all the properties tested was  $C=10000$ ,  $\epsilon=0.01$ , and  $\gamma=10$ . The average absolute percent deviations and root mean squared deviation (AAPD and RMSD) obtained were 0.2373% and 0.09088226 kg m<sup>-3</sup>, respectively. Results of the other properties were: 3.3070% and 0.000248669 Pa·sec for density, 0.0365% for viscosity, and 0.0000343782 for refractive index. It was observed that as the input variables changed, the properties also changed while variations in  $C$ ,  $\epsilon$ , and  $\gamma$  have effects on the number of support vectors, AAPD, and RMSD. The resulting model satisfactorily predicted the considered binary systems and can be used in solving similar systems precisely. **(Author's abstract)**

**Keywords:** *Density, Ionic liquids, Refractive index, Support vector regression, Viscosity, Engineering*

**Design of residence hall for electricity conservation**

*Manegdega, Ferdinand G. , Balbaronaa, Juvy A., Guevarra, Shirley V*

The reduction of electricity consumption of residence halls in a university without compromising the level of comfortability and nurturing environment and or increasing the level of comfortability and nurturing environment at optimal electricity consumption are the goals of efficient and sustainable university residence hall administration. This paper presents the results of the study for all the residence halls in the University of the Philippines Diliman campus. The established framework for determining the energy intensity of residence halls is used to determine factors that contribute to the current level of electricity consumption. Using Pareto analysis, ventilation is identified as the most energy intensive process contributing to 37% of the total monthly electricity consumption of all the residence halls, followed by lighting at 25% and then computing at 24%. The average electricity consumption per resident is 46.9 kWh per month with a standard deviation of 10.6 kWh per month. Another two surveys were conducted to determine the preferences of the residents in terms of the design of residence hall rooms and common areas, and on different categories describing residence hall characteristics. Some of the results from the respondents are: 52% chose rooms with both task and accent lighting to comply with user's requirements; 62% chose a balance between comfort and efficiency with personal closets, desks and storages; and 43% chose two residents per room with an area of 25m<sup>2</sup>. Sample residence hall room designs as well as energy consumption models for two different scenarios are presented. Air conditioned room is more expensive by 2.5 times compared to electric fan ventilated room. It is recommended to identify the effects of different residence hall architectural features in the academic performance of residents; to develop design

protocols incorporating the survey results; and to develop the level of comfortability that the university is willing to subsidize. (**Author's abstract**)

**Keywords:** *Residence Hall Energy Consumption, Academic Dormitory Energy Intensity, Building Energy Conservation, Engineering*

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0316

### **Determination of turbidity in water using UV-VIS spectrophotometer (in-house method)**

*Damian, Ruth , Ubando, Isaiah, Tayag, E*

Turbidity is an expression of the optical property that causes light to be scattered and absorbed rather than transmitted. Nephelometry is the standard method for the determination of turbidity, which measures the scattering of light in the sample. In this in-house method, transmitted light is measured by a UV-Vis spectrophotometer at 400 nm using a 50 mm quartz cell. A calibration curve was created using a Formazin standard suspension. The correlation coefficient ( $r$ ) was 0.9998 with a linear range of 0.25–32 nephelometric turbidity units (NTU) and instrument detection limit of 0.034 NTU. The method achieved a z-score of  $-0.25$  in ERA proficiency testing (Water Supply for Drinking Water Round 231) and recoveries of 97–102% using a certified reference material (ERA Lot No S231-699). This in-house method is a proposed alternative for the determination of turbidity in the absence of a nephelometer. (**Author's abstract**)

**Keywords:** *Turbidity, Water, UV-Vis spectrophotometer, Engineering*

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NP

0317

### **Development of arc-laminated bamboo lumber**

*Natividad, Robert A. , Jimenez, Juanito*

This study was conducted to develop arc-laminated bamboo lumber (ALBL) from bamboo splits using middle portions of the culms of *Kauayan-tinik* (*Bambusa blumeana* Schult.f.) and *Bolo* [*Gigantochloa levis* (Blanco) Merr.]. Arc lamination of quarter split culm was employed instead of the rectangular machined bamboo slats. Polyvinyl acetate (PVAc) and polyurethane (PUR) adhesives with glue spreads of 80, 120, and 160 g/m<sup>2</sup> were used. Mechanical press with an arc mold was used in the lamination. Conditioned laminated samples were tested following ASTM and PNS procedures. In general, the arc-laminated *B. blumeana* had better physical properties than *G. levis* as shown by the former's lower radial and tangential swelling in both PVAc and PUR adhesives regardless of glue spread. The mechanical properties and delamination tests showed that best glue spread is 80 g/m<sup>2</sup> for both bamboo species. This implies that glue spread can be lowered up to 80 g/m<sup>2</sup> for ALBL to reduce glue consumption. (**Author's abstract**)

**Keywords:** *Arc-segment lamination, Delamination, E-bamboo, Physico-mechanical properties, PUR, PVAc, Engineering*

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2019/03,  
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## Development of arc-laminated bamboo lumber for furniture and handicrafts

*Jimenez, Jr., Juanito P., Natividad, Robert*

Arc-laminated bamboo lumber (ALBL) from bamboo splits using the middle portions of the culms of Kauayan tinik (*Bambusa blumeana* Schult.f.) and Bolo [*Gigantochloa levis* (Blanco) Merr.] were developed. Arc lamination of quarter split culm was employed instead of the rectangular machine bamboo slats. Polyvinyl acetate (PVAc) and polyurethane (PUR) adhesives with glue spreads of 80, 120, and 160 g m<sup>-2</sup>-1 were used. Mechanical press with an arc mold was used in the lamination. Conditioned laminated samples were tested following ASTM and PNS procedures. Results showed that arc-laminated *B. blumeana* had better physical properties than *G. levis* as shown by the former's lower radial and tangential swelling for both PVAc and PUR adhesives, regardless of glue spread. The mechanical properties and delamination tests showed that best glue spread is 80 g m<sup>-2</sup>-1 for both bamboo species. This implies that glue spread can be lowered up to 80 g m<sup>-2</sup>-1 for ALBL to reduce glue consumption. ALBL creates a distinct grain design that resembles the prominent annual growth ring of temperate wood species when viewed at cross-section. Designers can create various geometrical patterns that can be made from ALBL to highlight its decorative applications in furniture and handicrafts. (Author's abstract)

**Keywords:** *Arc-segment lamination, e-bamboo, Furniture, Handicraft, Engineering*

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## Development of building-specific approach to city seismic response analysis for Metro Manila

*Quinaya, Pher Errol B., Grutas, Rhomme*

Information on the expected variability of maximum responses of buildings in cities of Metro Manila in the event of a strong earthquake can aid in disaster preparedness. A way to obtain such information is to combine the responses of individual buildings as influenced by different material properties and input ground motion. This study aims to develop a building-specific approach to city seismic response analysis for Metro Manila. Tools were developed for the tasks of processing feature data from GIS datasets, generation of building-specific input ground motion, automated MDOF model generation and analysis, and post-processing of results. Input ground motion for each model was generated using the parameters, earthquake magnitude, distance to epicenter, and site/soil conditions. As an application example, a scenario earthquake analysis was conducted for five cities in Metro Manila considering C1-L, C1-M and C4-H building types (a total of 264,625 models). Results show that C1-M types for the city with Site Class D and located nearest to the fault obtained the highest mean and standard deviation of maximum story drift. Comparing the five cities, cities situated in Site Class D obtained higher mean of maximum story drift in all building types than in cities situated in Site Class C. The visualization of spatial distribution of buildings with varying story drifts allows for verifying the derived statistical information, as well as for direct comparison of the response of cities. Analysis of computation costs shows that for this application example, 6.5 hours of runtime (if running in single processor), 650GB disk usage, and 50GB of memory were required to simulate a scenario for a total duration of 18.4 seconds. These figures were estimated to be only 18% of the total cost if the whole Metro Manila is to be analyzed for one scenario earthquake using the building-specific approach. (Author's abstract)

**Keywords:** *Building-specific approach, City seismic response analysis, Large scale computing, Engineering*

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(Filipiniana Analytics)  
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## Estimating earthquake risks: the use of rapid earthquake damage assessment software in Ilocos Norte

*Esteban, Edmund Edison A. , Agngarayngay, Hazel James P. , Alibuyog, Nathaniel R., Santiago, Karen Joyce*

One of the country's modest attempts to mitigate disasters that arise from earthquakes is the development of the Rapid Earthquake Damage Assessment System (REDAS), a software used to provide quick and near realtime simulated earthquake hazard map information as well as integration with exposure data and risk elements to determine the extent of potential damage caused by seismic hazards. This study used the REDAS software to evaluate the possible effects of an earthquake in Ilocos Norte. Specifically, it aimed to develop an earthquake exposure database, estimate risks, and calculate loss due to earthquake, and to provide local executives and legislators guidelines for policy formulation toward sound disaster risk reduction and climate change initiatives. Exposure databases were developed using surveyed data. The risk and impact assessments were based on the magnitude 6.5 earthquake that occurred in Ilocos Norte on August 17, 1983. The earthquake had a depth of 28 kilometers and its epicenter was located in Vintar (at 18.29° latitude and 120.83° longitude). Based on the simulation, a 6.5 magnitude earthquake will cause a total physical damage of 7,711,637 m<sup>2</sup> of floor area and will affect 53,861 buildings. Majority of the possible physical damage are slight and moderate damage although some buildings are also expected to suffer extensive and complete damages. Moreover, an economic loss of PHP 22.9 billion is likewise projected for the entire province. Majority of the projected physical damage are concentrated in Laoag City where most of the commercial areas are located and where built-up areas are larger compared with other municipalities. The earthquake is also expected to leave casualties, including 479 slight injuries and four non-life threatening situations. It can be recalled that the magnitude 6.5 earthquake, on which the simulation is based, left 16 people dead and 47 injured. **(Author's abstract)**

**Keywords:** REDAS, Earthquake assessment, Earthquake simulation, Disaster risk management, Engineering

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NP

## Fabrication of zirconia nanotubes for lead adsorption

*Reyes, Ma. Christine , Mancera, Clarisse , Reyes, Bianca Patrica , Balela, Mary Donnabe*

Zirconia (ZrO<sub>2</sub>) exhibits numerous interesting properties, including good ion exchange capability, high chemical and thermal stability, and excellent biocompatibility. Recently, ZrO<sub>2</sub> nanotubes have been gaining attention due to their numerous potential applications in gas sensing, photoelectronics, photocatalysis, and biomedicine. However, due to their excellent chemical and thermal stability, ZrO<sub>2</sub> nanotubes are also potential adsorbents for wastewater treatment. In this work, ZrO<sub>2</sub> nanotubes were prepared by anodization of zirconium (Zr) foil at varying voltages and temperatures. Increasing the voltage from 30V to 40V resulted in ZrO<sub>2</sub> nanotubes with larger average pore diameter and longer nanotube length. On the other hand, anodization at higher temperatures produced ZrO<sub>2</sub> nanotubes with large pore diameter of about 56.3nm. Then again, the ZrO<sub>2</sub> nanotubes showed shorter lengths of about 21.09µm due to enhanced fluoride etching. Batch adsorption test showed that lead (Pb) adsorption increased with time while adsorptive capacity decreased with higher Pb concentration. **(Author's abstract)**

**Keywords:** ZrO<sub>2</sub>, Nanotubes, Pb, Adsorption, Anodization, Engineering

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2018 July,  
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NP



## **Implementation of speed and torque control on quadrotor altitude and attitude stability**

*Laco, Nico , Hermoso, Gerard , Gavinio, Samuel , Dollosa, Christian Michael , Magsino, Elmer R., Roberto, Louise Angel*

Most quadrotor flight controllers make use of an attitude control loop, which is responsible for stabilizing the flight of the vehicle by directly driving the four motors via the electronic speed controllers (ESCs). Such a control loop loses its effectiveness when the motors and ESCs are not well matched resulting in variation of the control performance. This study presents an alternative control structure that incorporates an inner speed and torque control loop within the attitude and altitude loop in order to achieve better flight stability and maneuverability. The control structure is designed to make use of PID control in order to correct for errors in the process and drive the motors correspondingly. The control system is simulated and tuned using Simulink and later implemented on a dsPIC33 microcontroller where various feedback and instrumentation sensors are interfaced. The attitude feedback is implemented using a complementary filter to fuse the accelerometer and gyrometer data in order to arrive at usable attitude estimates. The result of the flight testing reveals that the experimental and simulation results vary only by an attitude standard deviation of less than 5° and an altitude standard deviation of 50cm. The control structure not only compensates for motor and ESC mismatches but also allows the attitude control loop, the one whose effects on the stability is most visible, to operate at the range of operation. **(Author's abstract)**

**Keywords:** *Speed control, Torque control, Attitude stability, Altitude stability, Engineering*

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2013,  
(Filipiniana Analytics)  
NP

## **Laboratory analysis on the mechanical properties of spiny (*kawayan tinik*) bamboo layers**

*Candelaria, Ma. Doreen E. , Ramos, Ma. Louise Marga*

Bamboo has been introduced as a possible alternative to some construction materials nowadays. Its potential use in the field of engineering, however, is still not widely practiced due to insufficient engineering knowledge on the material's properties and characteristics. Although there are researches and studies proving its advantages, it is still not enough to say that bamboo can sustain and provide the strength and capacity required of common structures. In line with this, a more detailed analysis was made to observe the layered structure of the bamboo, particularly the species of *kawayan tinik*. It is the main intent of this research to provide the necessary experiments to determine the tensile strength of dried bamboo samples. The test includes tensile strength parallel to fibers with samples taken at internodes only. Throughout the experiment, methods suggested by the International Organization for Standardization (ISO) were followed. The specimens were tested using a universal testing machine, with a rate of loading set to 0.6mm/min. It was then observed from the results of these experiments that dried bamboo samples recorded high layered tensile strengths, as high as 600MPa. Likewise, along the culm's length and across its cross section, higher tensile strength was observed at the top part and at its outer layers. Overall, the top part recorded the highest tensile strength per layer, with its outer layers having tensile strength as high as 600MPa. The recorded tensile strength of its middle and inner layers, on the other hand, were approximately 450MPa and 180MPa, respectively. From this variation in tensile strength across the cross section, it may be concluded that an increase in tensile strength may be observed towards the outer periphery of the bamboo. It is highly recommended to conduct experimental investigations on the layered compressive strength properties as well. **(Author's abstract)**

**Keywords:** *Lab Analysis, Mechanical Properties, Spinyt Bamboo Kawayan Tinik, Engineering*

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NP

## Model-based synthesis and Monte Carlo simulation approach to planning biochar-based carbon management networks

*Tan, Raymond R., Benjamin, Michael Francis D. , Belmonte, Beat*

Biochar-based carbon management networks (CMNs) are systems that can potentially achieve negative emissions via the net transfer of atmospheric carbon into the ground. Mathematical programming can be employed to effectively optimize these networks. Integer cuts of mixed integer linear programming model can be used to generate optimal and nearoptimal solution alternatives and the Monte Carlo simulation can then be used to evaluate the system performance of these CMNs. This approach can be used to evaluate the robustness of a network considering the uncertainties in model parameters. A case study is explored to illustrate the applicability of the developed methodology. The result reveals that model-based synthesis and Monte Carlo simulation of biochar-based CMNs allow the determination of robust system which is valuable for practical decision-making. **(Author's abstract)**

**Keywords:** *Integer-cut constraints, Biochar-based carbon management networks, Carbon, Mathematical programming, Engineering*

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2018 July,  
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NP

## Modeling adiabatic boiling in the Biliran geothermal wells using CHIM-XPT (2016)

*Reed, Mark H. , Balangue-Tarriela, Maria Ines Rosana , Mendoza, John P*

Boiling is a common process in geothermal wells where the primary water quickly ascends to the surface and liquid water is converted to steam due to depressurization and cools down (*i.e.*, no heat exchange with surrounding rocks). An assumption in the present study is that there is no heat exchange between wall rock and boiling water; thus, the process is isenthalpic. This study presents the results of changes in the chemical composition of fluid from a geothermal system as it ascends to the surface together with the description of minerals precipitating out of the solution at certain temperature conditions. The results of the study will contribute significantly to the assessment of scaling potentials in a geothermal field. Using FORTRAN Programs SOLVEQ and CHIM-XPT, adiabatic boiling was simulated for the normal enthalpy wells of Biliran geothermal field. Results of theoretical geothermometry for the wells are consistent with the reported chemical geothermometers. Aside from a steam phase dominated by water vapor and CO<sub>2</sub>, Well BN-1 formed chlorite, calcite (up to 170°C) and talc in the initial boiling model. Well BN-2 precipitated mostly talc and calcite almost all throughout its ascent. The occurrence of calcite calculated from the model is consistent with the abundance of calcite scales and veins in BN-1 while BN-2 is dominated by aragonite. Minor differences in the mineralogy of the wells is mainly due to the significant difference in the fluid and gas chemistry amongst wells in the field. The partitioning of CO<sub>2</sub> into a gas phase drives the increase in pH for both wells. Both the formation of the gas phase and the fractionated minerals reflect changes occurring in the total concentration of the aqueous phase wherein species fractionated into the gas or solid phase decrease in the total aqueous concentration. **(Author's abstract)**

**Keywords:** *Adiabatic boiling, Biliran Island, CHIM-XPT, Geothermal, Hydrothermal equilibria, Whole-system geothermometry, Engineering*

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NP

### **Modeling of sample withdrawal effects on pseudo-order batch sorption kinetics**

*Adolacion, Jay R T., Dalida, Maria Lourdes P*

Apparent sorption kinetics determined from single-run batch studies can drift significantly from true kinetics in systems where sorbent quantity remains constant with respect to sample withdrawal. This systematic error is investigated for sorption reaction models, generalized to any reaction order. The problem is formulated to quantify the bias associated with the number and volume of samples withdrawn under relatively slow equilibrium. The results are extended to rapidly equilibrating systems following the Langmuir isotherm model. (**Author's abstract**)

**Keywords:** *Pseudo-order, Sorption, Kinetics, Equilibrium, Modeling, Bias, Sampling error, Engineering*

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Philippine Engineering Journal, Volume No. 40 Issue No. 1, 1-20  
2019/06,  
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NP

### **Nanofluids: The new generation Coolantcomputational Fluid Dynamics (CFD) analysis of the heat transfer and fluid flow of copper (II) oxide-water nanofluid in a shell and tube heat exchanger**

*Yamat, Ed-Jefferson E. , Cruz, Patricia Anne D. , Soriano, Allan N., Adornado, Adonis*

Numerical analysis of the thermal and flow behavior of CuO-water nanofluid under turbulent regions in a shell and tube heat exchanger was conducted using ANSYS Fluent software. In this study 29-nm CuO nanoparticles, with water as base fluid, were used. To study the effects on heat transfer coefficient, pressure drop, and nanofluid thermal and hydrodynamic behavior, the nanofluid was simulated at different particle loading (ranging from 0.1% to 1% volume), and under three sets of Reynolds number (ranging from 17,000 to 71,000). Increasing the particle loading and the Reynolds number was found to enhance both the heat transfer rate and pressure drop. A maximum of 48% enhancement in the heat transfer was observed at the highest particle loading, but with the consequence of doubled pressure drop. Performance indices greater than 1 were attained for particle loading below 0.25% volume, regardless of the Reynolds number. The conditions that produced the highest performance index were at the lowest particle loading and the lowest Reynolds number. No significant difference in the flow behavior between water and CuO-water nanofluid was observed. However, the thermal profiles for 0.1% volume CuO-water nanofluid highlighted the enhancements in heat transfer along the shell and tube heat exchanger. (**Author's abstract**)

**Keywords:** *CuO-water nanofluid, Reynolds number, Heat transfer coefficient, Pressure, Shell and tube heat exchanger, Engineering*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 207  
2018 July,  
(Filipiniana Analytics)  
NP

### **Occupancy detection using bluetooth low energy enabled devices**

*Ong, Darvy P., Pedrasa, Jhoanna Rhodet*

Occupancy detection and monitoring has a wide variety of applications, from event attendance tracking to the optimization of energy use in buildings/rooms. Current solutions for occupancy detection provide fairly accurate results, however, most solutions require costly external hardware, complex processing and computations, or manual labor. To address this problem, this project utilizes Bluetooth low energy (BLE), an emerging wireless

technology designed specifically with low-power applications and short-range applications in mind. An application for BLE-enabled android smartphones was developed using Android Studio 3.0. The application has two modes: central mode, where it detects occupancy of a location, and peripheral mode, where it acts as a beacon that broadcasts data to the central mode. The application has also been equipped with controls for varying signal strength, range, and frequency, along with a proximity estimation mechanism to show how these can affect occupancy detection via BLE. This study proves that the use of BLE devices as a means for occupancy detection is feasible. **(Author's abstract)**

**Keywords:** *Occupancy detection, Bluetooth low energy, Android, Engineering*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 213  
2018 July,  
(Filipiniana Analytics)  
NP

0329

### **Physicochemical characterization of San Nicolas Clay for Improved Ceramic Production**

*Clemente, Jennyrose C. , Pondoc, Dionesio C. , Salamangkit-Mirasol, Emie , DoÃ±o, Andrew C. , Franco, Samuel S., Pasion, Rotsen*

San Nicolas clay has been used by local potters even in the early years of pottery production. However, they used this clay without preliminary processing and without controlling its properties, resulting in inconsistent and poor product characteristics. Likewise, consistency in the amount of additives (e.g., sand) in the mixture is not yet established. This study investigated the physicochemical characteristics of San Nicolas clay for improved ceramic production. Physical properties such as residue, total linear shrinkage (TLS), loss on ignition (LOI), and casting properties were obtained. Thermal behavior of the clay was examined using thermogravimetric analysis (TGA) technique. Phase identification and chemical analysis were also examined using x-ray diffraction (XRD) and x-ray fluorescence (XRF) techniques. The residue obtained at 325 mesh sieve is 16.36%. The TLS and LOI results using electric furnace at 900°C were 13.05% and 12.40%, respectively. The TGA curve showed two endothermic reactions at 81°C and 496.65°C with a total weight loss of 12.86%, which was close to the obtained LOI. Based on the XRD spectra and XRF analyses, the dominant minerals present in the clay were vermiculite ((Mg,Fe++,Al)3(Si,Al)4O10(OH)2•4H2O), quartz (SiO2), anorthite (CaAl2Si2O8), and rutile (TiO2). These physicochemical characteristics obtained from the San Nicolas clay are very helpful in improving the quality and maintaining the consistency of the ceramic products. **(Author's abstract)**

**Keywords:** *Clay, X-ray diffraction, Ceramics, Engineering*

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NP

0330

### **Pilot study on the development of a local candidate reference material for aerobic plate count in flour**

*Estrada, Sean, de Asis, Agnes, Aguinaldo, Marlon, Dela Cruz, Nina*

Aerobic plate count (APC) is a microbiological indicator test used to determine the level of microorganisms in a food product and is usually indicative of its sanitary conditions during processing. Several food reference materials (RMs) are available to be used for proficiency testing (PT) in order to assess the competence of a laboratory in terms of accuracy of measurement results. Philippine laboratories participate in proficiency testing provided by other countries as these RMs are not locally available. This pilot study focuses on the development of a local RM-APC for flour, which utilizes its naturally occurring microbial population. A standard procedure for the preparation of the candidate RM was established to ensure that the microbial cells were evenly distributed. Seventy

units of candidate RM was produced and was tested both for homogeneity and stability at 4°C. The homogeneity test was conducted to verify that there is no significant difference in the APC between units. Ten units were tested for APC and evaluated using Cochran's test for outliers and analysis of variance. The stability test was conducted to verify that there is no significant change in the APC of units at a specified time and storage condition. Two units were tested for APC at different days and evaluated using regression analysis. Results of homogeneity test showed that no analytical outliers were observed among units and were statistically equal across all subsamples and replicates. The results of the stability test showed that the candidate RM is stable at 4°C for 120 days. Given the short-term stability of the candidate RM-APC in flour, it has the potential to be used as PT material. **(Author's abstract)**

**Keywords:** *Aerobic plate count, microbial indicator test, microbial population, Engineering*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 215  
2018 July,  
(Filipiniana Analytics)  
NP

0331

### **Preliminary radiological survey on high rare-earth containing area in San Vicente, Philippines**

*Kanda, Reiko , Feliciano, Chitho P. , Tokonami, Shinji , Enriquez, Eliza B. , Hosoda, Masahiro , Dela Cruz, Fe M. , Mendoza, Christopher O. , Palad, Lorna Jean H. , Iwaoka,*

Erawan Beach area in San Vicente, Palawan Island, Philippines contains rare-earth elements and natural radioactive nuclides at high levels. If the development of mineral resources starts, environmental impacts will be a significant concern for residents in the area. In this study, a preliminary radiological survey on ambient dose equivalent rate and dust concentration was performed in the Erawan Beach area. The ambient dose equivalent rates in each site ranged from 0.060 to 0.81  $\mu\text{Sv h}^{-1}$ . External gamma radiation exposures estimated from these values were lower than the reference level range (1–20  $\text{mSv y}^{-1}$ ) for abnormally high levels of natural background radiation described in the ICRP Publication 103. The dust concentrations in each site ranged from 0.40 to 0.76  $\text{mg m}^{-3}$ , which were relatively higher than the typical dust concentration in air (0.05  $\text{mg m}^{-3}$ ). Based on estimation from the results of the ambient dose equivalent rates and dust concentrations, inhalation radiation exposure due to natural radioactive nuclides in dust will likely be less than external gamma radiation exposure. **(Author's abstract)**

**Keywords:** *dose rate, high-level environmental radiation areas, natural radioactive nuclides, Engineering*

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2019/09,  
(Filipiniana Analytics)  
NP

0332

### **Preparation and characterization of lead in water in-house reference material**

*Encarnacion, Elyson Keith , Laurio, Christian D. , Guerrero, Jan-Er*

Reference materials (RMs) are vital to evaluate the performance of laboratories. It is also useful for the quality control of analytical procedures. However, RMs are not locally available and are expensive. Therefore, preparation and initial characterization of an in-house RM containing significant amount of lead (Pb) in water was conducted. Expired Pb standards and previously used Pb calibration curve solution were collected, homogenized, poured into acid-washed Nalgene™ bottles, and stored at 2–6°C. For the homogeneity study, 10 bottles selected through stratified random sampling were analyzed in duplicates and the results were interpreted using Cochran's test and tests for sufficient and adequate homogeneity. The calculated assigned value was 177.28  $\text{mg L}^{-1}$ . The inhouse RM will be used as QC for analyzing Pb in water and wastewater samples. Stability test were conducted

quarterly for two quarters and will be continued for two years to ensure stability. The prepared in-house RM were found stable for three months after statistical evaluation. **(Author's abstract)**

*Keywords: In-house reference material, Homogeneity, Lead, Engineering*

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NP

0333

### **Process design of Virgin Coconut Oil (VCO) production using low-pressure oil extraction**

*Quilinguen, Vanessa Ferl A. , Pestaño, Lola Domnina B., Ferrer, Patricia Janelle D. , Rosario, Jeremiah*

Virgin coconut oil (VCO) has become one of the most prominent high-value coconut products in coconut-producing countries because of its versatility. In this study, the low-pressure oil extraction method was used to produce VCO and a centrifuge was used to reduce the settling time of the oil after extraction, which usually takes 1–2 weeks. Different parameters, such as drying temperature, centrifuge speed, and centrifugation time were varied and analyzed. The experiment's results show that the best setting of VCO production using the modified method is at a drying temperature of 70°C and at 2,700 rpm and 60 minutes of centrifugation, as it produced the clearest oil with a yield of 92.84% v/v and a recovery of 18.43%. The produced VCO was tested for free fatty acid (FFA), moisture, and volatile matter, color, peroxide value, and iodine value and the results are 0.03%, 0.11%, 0.03Y, 0, and 5.77, respectively, which all passed the Philippine National Standards for VCO. **(Author's abstract)**

*Keywords: Centrifugation, Fresh dry process, Low pressure oil extraction, Settling time, Virgin coconut oil (VCO), Engineering*

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NP

0334

### **Production and characterization of cellulose nanocrystals from *Ceiba pentandra* (L.) Gaertn.**

*Manalo, Ronniel , Razal, Ramon , Borines, Myra , Guerrero, Gino Apollo , Varilla, K*

This study dealt with the potential of *Ceiba pentandra* (L.) Gaertn. or kapok fibers as a source of cellulose nanocrystals (CNC). The fibers were pre-treated with chloroform and hot water to remove the extractives. Holocellulose and alpha-cellulose were then produced using 20% (w/v) sodium chlorite and 17.5% (w/v) sodium hydroxide, respectively. Cellulose nanocrystals were then isolated through acid hydrolysis by varying the sulfuric acid concentration (46% and 50% v/v), reaction time (30 min and 45 min), and temperature (40°C and 50°C). The effects of the different combinations of the parameters on the yield was determined. Morphological characteristics of the CNC were observed using atomic force microscopy (AFM). Chemical transformations of raw kapok to CNC were analyzed using Fourier transform infrared spectroscopy. Results of the experiment showed that treatment combination of 46% acid concentration, 45 min, and 50°C gave the highest yield of 53.64% among the samples. Results of the spectroscopic analysis indicate that nanocrystals were obtained from kapok. Results of the AFM revealed that the average length and width of CNC with the highest yield were 105.50 nm and 27.22 nm, respectively. **(Author's abstract)**

*Keywords: Acid hydrolysis, Nanocellulose, AFM, FTIR, Engineering*

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0335

### **Skewered cyano-bridged cobalt naphthalocyanine polymer: an electron transport engineering**

*Tan, S.M.D. , Ang, P.T. , Janairo, G.C. , Gacho, E.H. , Yu,*

Naphthalocyanines (Nc) are ideal molecular conductors due to their flat and fully-conjugated structures. Attachment of a central metal (Co) and dicyano (CN) axial ligands to Nc produced CN-bridged cobalt naphthalocyanine, a skewered-type polymer complex. The polymeric species enabled intra-chain electron transport through the CN bridge by which, coupled with the interchain  $\pi$ - $\pi$  overlaps, produced a multi-dimensional electronic system. This molecular design has decreased the electrical resistivity by 5 orders relative to the monomeric Co(Nc) with di-axial CN complex. **(Author's abstract)**

**Keywords:** *Molecular conductors, Naphthalocyanine, Molecular engineering, Engineering*

0336

### **Solid state synthesis of bulk lithium lanthanum titanate lithium ion conducting solid electrolyte**

*Cervera, Rinlee Butch M. , Doño, And*

Lithium lanthanum titanate (LLTO)  $\text{Li}_{3-x}\text{La}_{2/3-x}\text{TiO}_3$  bulk sample with  $x \approx 0.12$  was synthesized via solid state reaction and initially investigated for its potential as a lithium-ion conducting solid electrolyte for an all solid state Li-ion battery application. Thermogravimetric differential thermal analyzer (TG-DTA) was used to examine the thermal behavior of the as-prepared sample via LLTO powders. Structural properties of the sintered LLTO samples were examined using x-ray diffraction (XRD) technique. As seen from the XRD spectra, a pure LLTO phase with cubic perovskite  $\text{Pm}3\text{m}$  space group structure. Scanning electron microscopy was used to examine the morphology of the sintered LLTO samples and a high density bulk pellet sample was observed. Using electrochemical impedance spectroscopy analysis, LLTO's potential as a Li-ion conductor was investigated. The prepared LLTO with  $x \approx 0.12$  in this study exhibited a high total ionic conductivity compared to those reported in previous literature. The total conductivity ( $\sigma_T$ ) obtained was about  $1.7 \times 10^{-3} \text{ S}^{-1}$  at room temperature. **(Author's abstract)**

**Keywords:** *Lithium lanthanum titanate, Solid electrolyte, Solid state sintering, Conductivity, Engineering*

0337

### **Swat modeling in Mt. Makiling Forest Reserve - Asean Heritage Park**

*Tiburan, Jr., Cristino L. , Bantayan, Nathaniel C. , Briones, Romel U. , Carada, Carl Earvin D. , Montecillo, Ma. Ericha V. , Avellano, Jeannette A. , Israel, Kyle Pie*

Most watersheds in the Philippines are ungauged, making it difficult to model the water yield. Using the semi-distributed SWAT model, the study estimated the streamflow of three ungauged watersheds of the Mount Making Forest Reserve-ASEAN Heritage Park (MMFR-AHP). Model regionalization using spatial proximity approach was employed to compensate for the absence of observed data for calibration. Simulated streamflow for Molawin-Dampalit, Cambantoc, and Tigbi watersheds were 0.065 m<sup>3</sup>s<sup>-1</sup>, 0.036 m<sup>3</sup>s<sup>-1</sup>, and 0.001 m<sup>3</sup>s<sup>-1</sup>, respectively. Rainfall and streamflow correlation yielded R-squared values of 0.599 and 0.514 for Molawin-Dampalit watershed and Cambantoc watershed, respectively. Meanwhile, the R-squared value generated for Tigbi watershed is 0.128. The simulated streamflow in Molawin-Dampalit and Cambantoc watersheds showed relatively moderate variation in response to changes in rainfall. The results are indicative of the hydrologic trends but future calibration using observed data is still imperative. **(Author's abstract)**

**Keywords:** *SWAT model, Ungauged watershed, Mount Makiling, Regionalization, Streamflow, Engineering*

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 (Filipiniana Analytics)  
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0338

### **Synthesis and characterization of silver nanoparticles as a potential sensor for volatile organosulfides**

*Tiangco, Cristina , Espineli, Clarisse A. , Tapit, Charlene May V. , Motol, Rich Ke*

Garlic, one of the most popular spices used in manufacturing many food products, is subjected to fungal and bacterial diseases resulting to substantial losses in quantity and quality. Specific detection tools for garlic spoilage will be an asset in relieving these losses during postharvest storage. In this study, garlic spoilage was monitored by detecting the release of volatile organosulfides evolved during spoilage via the stable yellow-colored silver nanoparticle colloidal solution. The nanosilver particles were synthesized by the chemical reduction method where silver nitrate is taken as the metal precursor and sodium borohydride as the reducing agent. These silver nanoparticles were characterized by UV-Vis spectroscopy and Scanning Electron Microscope. The spectral analysis shows that the absorption peak of the silver nanoparticles solution was around 390 nm and the SEM images indicated that the silver nanoparticles had spherical shape with size ranging from 3 to 4 nm. The visual changes during the spoilage was monitored for ten days during which time the yellow color of the nanosilver solution changed to orange, pink and finally turned transparent. **(Author's abstract)**

**Keywords:** *Postharvest, Silver nanoparticle, Volatile organosulfide, Engineering*

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 (Filipiniana Analytics)  
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0339

### **Synthesis and characterization of transition metals and metal oxides as potential electrocatalysts for hydrogen and oxygen evolution reaction**

*Gorospe, Alloyssius E.G. B. , Balela, Mary Donnabelle , Flores, Charles Lois , Dahonog, Luigi , Acedera, Ros*

Electrochemical water splitting is an effective way of producing hydrogen fuel. Platinum (Pt) group metals are commonly used as electrodes for hydrogen evolution reaction (HER) and oxygen evolution reaction (OER). However, its high cost limits the use of the material in the said applications. In this study, metal oxides (MnCo<sub>2</sub>O<sub>4</sub>, CuCo<sub>2</sub>O<sub>4</sub>, and NiCo<sub>2</sub>O<sub>4</sub>) were prepared using hydrothermal method followed by annealing as catalysts for OER. Pure metallic nickel (Ni) and cobalt-nickel (Co-Ni) were grown on carbon fiber paper via an in situ chemical reduction method as catalysts for HER. SEM analysis showed that NiCo<sub>2</sub>O<sub>4</sub> and MnCo<sub>2</sub>O<sub>4</sub> have a spherical morphology with an average diameter of 3µm and 2µm, respectively. Needle-like morphologies were observed



for  $\text{CuCo}_2\text{O}_4$  with an average diameter of 77nm and length of up to 2.53 $\mu\text{m}$ . Ni particles with an average diameter of 2 $\mu\text{m}$  were observed after in situ chemical reduction method, while Co-Ni particles had an average size of 0.263 $\mu\text{m}$ . The morphologies of the as-prepared samples can provide a large electrochemical surface area for gas evolution reactions which can be used as electrodes for electrocatalysis. (**Author's abstract**)

**Keywords:** *Electrocatalyst, Nickel, Copper, Cobalt, Manganese, Engineering*

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NP

0340

### **The use of microneedles in glucose binding protein-based fiber optic biosensor on monitoring transdermal glucose**

*Tolosa, Leah , Rao, Govind , Sevilla, III, Fortunato , Andar, Abhay , Tiangco, Cr*

In previous work, a painless, noninvasive method of collecting glucose passively diffusing through the skin was developed. The transdermal glucose (TG) collected in this way has a concentration in the micromolar ( $\mu\text{M}$ ) range, thus a sensitive glucose biosensor that can measure glucose at these levels was developed. The fiber optic biosensor for  $\mu\text{M}$  glucose was based on the glucose binding protein (GBP) labeled with BADAN in the H152C position and immobilized on Ni-NTA agarose beads via metalhistidine interaction. GBP is highly specific and sensitive to glucose at  $\mu\text{M}$  concentrations. Microneedles are used in transdermal drug delivery studies. In this study, microneedles were used to facilitate a faster diffusion of transdermal glucose. A Franz cell with porcine skin as a membrane was employed as the main setup for in vitro passive diffusion studies. Real time monitoring of the diffusion of glucose was done using a fiber optic biosensor with GBP immobilized on Ni-NTA agarose beads as sensing membrane. Three glucose concentrations that mimic the hypo-, normo- and hyperglycemic conditions in the neonate (2, 5, and 20mM, respectively) were investigated against porcine skin with microneedles and uncompromised skin. Results showed faster (about 10 $\times$ ) diffusion rates with the use of microneedles compared with uncompromised skin and the TG concentrations were also increased. This showed that microneedles could be a promising tool for noninvasive transdermal glucose sensing, in terms of faster diffusion rates. (**Author's abstract**)

**Keywords:** *Microneedles, Transdermal glucose, Fiber optic biosensor, Engineering*

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2018 July,  
(Filipiniana Analytics)  
NP

0341

### **Utilization of rice hull silica as filler in ceramic body formulations**

*Salamangkit-Mirasol, Emie, Bulong, Levie John*

Silica ( $\text{SiO}_2$ ) is an indispensable material in many industries, including ceramic manufacturing. Ceramic body formulations consist mainly of three major components: clays as binder,  $\text{SiO}_2$  as filler, and feldspar as flux. Silica obtained from a quarry is most commonly used in industries but it can also be sourced from agricultural wastes, such as rice hull (RH). In this work, the physical properties of local ceramic body formulations utilizing RH  $\text{SiO}_2$  as filler was investigated. Five varying ratios of local white clay (55 wt. %), RH  $\text{SiO}_2$  (10–30 wt. %), and local feldspar (15–35 wt. %) were prepared. Ten test specimens per formulation were formed and fired at 1,100°C. Physical properties, such as total linear shrinkage (TLS), water absorption (WA), apparent porosity (AP), bulk density (BD), and strength by modulus of rupture (MOR) test were determined following ASTM standard test methods. Test results show that the mixture containing 55 wt. % local white clay, 10 wt. % RHS, and 35 wt. % local feldspar exhibited the best performance in ceramic artware body application. The following trends were also observed: % TLS decreases and % WA and % AP increase with increasing amounts of  $\text{SiO}_2$ ; and BD and MOR increase with increasing amounts of feldspar against silica in the formulations.

Generally, the resulting properties exhibited by the specimens and the ceramic artware prototypes that were formed using local materials suggest that the rice hull, an agricultural waste, RH can be an alternative source of SiO<sub>2</sub> for ceramic body formulations. (**Author's abstract**)

**Keywords:** *Agricultural waste, Rice hull, Ceramic, Silica, Formulations, Engineering*

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2018 July,  
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NP

0342

### **A validation study on the performance of a horizontal axis tidal turbine (HATT)**

*Abuan, Bi*

A Computational Fluid Dynamics (CFD) model of the Sheffield HATT, a tidal turbine designed to perform better in varying flow velocity, was created in order to predict its performance in unsteady flow using ANSYS FLUENT. Several mesh independence tests were performed to determine a suitable mesh for the problem under study. The final CFD model was used to do simulation of a full tip-speed ratio (TSR) sweep to determine the performance curve of the turbine. It was shown that at Reynolds number, Re=125,000 (which is the same Re at the wind tunnel experiment), the shape and the trend of the performance curve has the same shape when compared to that of the initial Re at 1,350,000. Lower values of CP were obtained which agreed with a separate Blade-Element Momentum study where CP values go down as Re decreases. Brake torque experiments (using spring balance) in the wind tunnel were conducted at Re=135,000 to obtain a power curve that is plotted against the CFD simulation results. It was shown that there is good correspondence between the experimental results and the CFD results which in turn gives more confidence for the numerical data obtained from CFD simulations. (**Author's abstract**)

**Keywords:** *Brake torque experiment, CFD, Sheffield HATT, Validation, Engineering*

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2019/06,  
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NP

## **ENVIRONMENTAL SCIENCE**

0343

### **Analysis of water property rights and responsibilities of rights holders in Tigum-Aganan Watershed, Philippines**

*Hall, Rosalie Arcala , Rola, Agnes C. , Espinosa, Teresita S. , Lizada,*

The fragmentation of rights between water permit holders who exercise authority to access, exclude, and withdraw and other institutions with only shared responsibility over watershed management inhibits effective water-related decision making, resulting in conflicts that may lead to unsustainable water supply. This paper analyzes the nature and type of property rights that govern the surface water in the Philippines employing the property rights and responsibility nexus framework – using the Tigum-Aganan watershed (TAW) as a case. It explains the failure in addressing the sedimentation problem as a representation of the weak link among institutions which has adversely affected surface water supply. In addressing sustainability challenges, water property rights and the corresponding responsibilities should be clarified across the institutional hierarchy and coordinated among actors. (**Author's abstract**)

**Keywords:** *Institutions, Philippines, Property rights, Surface water, Tigum-Aganan Watershed, Watershed, Environmental science*

### **Assessment of the marine macrofouling community in Naval Base Heracleo Alano, Cavite City**

**Sia Su, Glenn L. , Ramos, Gliceria B. , Lim, Brian M. , Mangulabnan, Jezzah R. , Ocampo, Melody Anne B., Vallejo, Benjamin M**

Ports and naval bases play a significant role in understanding marine macrofouling and the associated transport of species across boundaries. Structures on ports and piers become habitats of foulers, whether indigenous or non-indigenous. There is a paucity of literature on species composition of foulers in ports in the Philippines. Naval Base Heracleo Alano in Cavite City, formerly known as Sangley Point, is a potential habitat for non-indigenous species.

The study assessed benthic biofoulers at four areas in close proximity at Naval Base Heracleo Alano, Cavite City, using artificial collectors. Fouler collector design was adapted from the North Pacific Marine Sciences Organization (PICES). Fouler collectors were deployed in 4 sampling points from November 2015 and retrieved in February 2016. Collected fouling organisms were identified using taxonomic keys. Species diversity (H) through Shannon Wiener Index, Species Evenness (H'/H'max), and Simpson's Index were determined.

A total of 6203 organisms belonging to 20 families was collected. Common macrofoulers were bivalves, polychaetes, decapods, amphipods, and barnacles. Shannon-Wiener index values as well as species evenness were relatively consistent. Values of the Simpson's index indicated the presence of dominant species, *Balanus* sp. The macrofouling community contained 7 non-indigenous species, *Mytella charruana*, *Brachidontes*, *Mytilopsis sallei*, *Hydroides*, *Stylochus*, *Sabella*, and *Membranipora membranacea*. The macrofouling organisms present in the area may pose problems in submerged equipment and cause some financial loss to the facility; the non-indigenous maybe potential threats to the local ecosystem. All seven non-indigenous species are potentially invasive, although their abundances suggest otherwise.

A baseline listing of species was generated and showed various species of foulers in the naval base, with *Balanus* being the dominant species, which is the same as other studies in the Asian region. Seven non-indigenous species were detected. There is a need to monitor the non-indigenous species, as *Mytilopsis sallei* (origin: Caribbean) has been reported to in huge numbers in the Indo West Pacific region, particularly in Singapore, Hongkong, Thailand, India, Taiwan, China, Malaysia, Japan, and Australia; *Brachidontes* (Origin: Indo- Pacific) has spread to the Mediterranean and Red Sea. (**Author's Abstract**)

**Keywords:** *marine macrofouling, post and naval base, Philippines, Shannon Weiner Index, Balanus, Environmental science*

### **Bird composition, diversity, and richness in Canticol, Doña Telesfora, Tubay, Agusan Del Norte, Philippines**

**Seronay, Romell A. , Lador, John Erick O. , Lador, Ric**

The birds in the forested areas of Canticol, Brgy. Doña Telesfora, Tubay, Agusan del Norte was assessed on November 13–19, 2017. This study is part of the Protected Area Suitability Assessment (PASA) toward the establishment of the Lake Mainit Protected Area implemented by the Center for Research in Environmental Management (CREME) in collaboration with the Department of Environment and Natural Resources (DENR)

Caraga. A participatory resource assessment using a 2-km transect walk done at 5-9AM and 3-6PM detected 48 species from 25 families. Of these, 75% (38 species) are endemic to the Philippines and 21% (10 species) are restricted to the Mindanao faunal region. Eight species fall are listed as threatened in the IUCN Red List. These results provide an update to those recorded by Paz *et al.* (2008) with 31 Philippine endemics, of which four are threatened, and three Mindanao-endemic, of which one is threatened. The existence of these birds, however, are continuously threatened by human activities. Forest clearings due to wild abaca harvesting are apparent while timber cutting to support gold mining tunnels in the nearby ridge is evident. The presence of unique and threatened species of birds signify the importance of Canticol as a key biodiversity area essential in the establishment of the protected area. (**Author's abstract**)

**Keywords:** *Birds, Richness, endemic, Threatened, Protected area, Environmental science*

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2018/07,  
(Filipiniana Analytics)  
NP

0346

### **Characteristics of the soil seed bank of a long-term monitoring plot in Mt. Makiling Forest Reserve**

*Maldia, Lerma SJ. , Luna, Amelita C. , Cruz, Rex Victor O. , Aguilon, Dianne Joy D. , Cama, Claire*

In this study the characteristics of the seed bank of a relatively undisturbed 4-ha long-term monitoring plot in the Mt. Makiling Forest Reserve (MMFR) and its relationship with its immediate standing vegetation was investigated. Whereas several related studies have been conducted in many tropical forests, limited investigation has been conducted in Philippine rainforests. This study revealed that the long-term monitoring plot had poor soil seed bank despite its high species diversity. There was generally very weak relationship, in terms of species composition, between the seed bank and its immediate standing vegetation (regeneration and trees). The standing vegetation in the long-term monitoring plot did not reflect the characteristics of its soil seed bank, and vice versa. Therefore, the standing vegetation does not necessarily shape the structure of a seed bank. Across soil layers, the highest seed abundance and species richness was the 0–10cm layer, suggesting that the richness of the soil seed bank in MMFR is limited to this soil layer. However, since the species generally found in the seed bank were not tree species, intervention may be needed to restore the standing vegetation in the future. (**Author's abstract**)

**Keywords:** *4-ha long-term monitoring plot, Seed bank, Environmental science*

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NP

0347

### **Characterization of mangrove forests using remote sensing and field sampling in Zambales, Philippines**

*Bantayan, Nathaniel , Tiburan, Cristino Jr. , Malabrigo, Pastor Jr. , Barua, Edlyn , Ugat, Beth Zaida , Israela, Kyle Pierre , Gabriela, Marie Jessica , Bayangos,*

Similar to global trends, the mangrove forests of Zambales have declined over the years despite their importance to coastal communities. This study characterized the mangroves of Zambales using remote sensing and field survey. The mangrove extent was estimated using Landsat images for four periods (1996, 2005, 2015, and 2017). Mangrove diversity was characterized using quadrat sampling. Two 30m x 30m quadrats were established and surveyed in each site in the municipalities of Palauig, Masinloc, and Santa Cruz. The number of individuals for each quadrat was noted and used to compute for importance values. Diversity indices (Shannon, Simpson's, and Evenness) were also computed. Results from remote change analysis showed that the mangrove extent had a decreasing trend until 2015, but slightly increased in 2017. The estimated mangrove area in 2017 is about

297.10ha. In the 2017 classification and field survey, the midward and landward zones are already denuded and only the seaward zone is left to protect the coastal areas. The findings of the field survey also revealed that Zambales mangrove forests are composed of 12 mangrove species from five families. *Rhizophora apiculata* and *R. stylosa* have the highest importance values. Meanwhile, Santa Cruz has the highest values for both Simpson's and Shannon, while Masinloc, the municipality with the lowest number of species, obtained the highest evenness index. Palauig has the lowest values for all the diversity indices. In general, results of this study showed that immediate actions are needed to prevent further degradation and rehabilitate the mangroves of Zambales. (Author's abstract)

**Keywords:** *Mangroves, Remote sensing, Quadrat sampling, Change analysis, Environmental science*

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NP

0348

**Comparative study of the ecotoxicological and histopathological impacts of effluent, sludge water, and commonly used inorganic fertilizers on juvenile *Oreochromis niloticus* (Linnaeus, 1758)**

*Espinas, Jay Roy , Dumo, Joan Ruby , Sy, Lara Anne , Hernandez, Maria Larisse , Alba, Vince Jethro , Guzman, Maria Aileen Leah G., Espiritu, Emilyn Q. , Unson, Jewel Racquel*

Wastewater treatment systems, designed to treat domestic wastes, produce effluents and sludge that are high in organic matter and nutrient content. These effluents and sludge are now being used as organic fertilizers because such nutrients and organic matter are vital to plant growth. However, without proper treatment, these substances may eventually find their way into bodies of water through run off and/or infiltration with potentially dangerous consequences. This study, therefore, investigated the potential toxic effects of effluents and sludge produced from wastewater treatment facilities against commonly used inorganic fertilizers to an aquatic species. Toxicity tests (expressed as mean 96-hr LC50 in mg/L) and histopathological examinations of the liver were conducted using juvenile *Oreochromis niloticus* (Linnaeus, 1758) exposed to varying concentrations of effluent, sludge, and inorganic fertilizers (i.e., urea and complete fertilizer) to assess both acute and sublethal effects. The results of the acute toxicity tests show concentrations (expressed as mean 96-hr LC50 in mg/L or ppm) arranged in decreasing order of toxicity to tilapia: complete fertilizer 14-14-14 (1,396ppm) > urea (16,152ppm) > sludge (145,900ppm) > effluent (465,000ppm). Histopathological examinations of liver tissues showed that exposure to the two inorganic fertilizers resulted to blood congestion and degeneration in comparison to those exposed to the sludge. Furthermore, results for fishes exposed to the lowest concentrations of the effluent also showed alterations in the liver tissue. These results demonstrate that the sludge and effluent are less toxic by several orders of magnitude than the inorganic fertilizers. It is suggested that further chronic toxicity and histopathological studies be done to determine their long-term impacts to receiving aquatic organisms to establish their potential for agricultural applications. (Author's abstract)

**Keywords:** *Ecotoxicology, Effluent, Histopathology, Inorganic fertilizers, Oreochromis niloticus L., Sludge water, Environmental science*

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NP

0349

**Diversity and abundance of aquatic macrophytes and its relationship with nutrients levels in Lake Mainit, Caraga, Philippines**

*CaA.,izares, Lutess P., Seronay, Romell A*

Aquatic macrophytes are the key members of wetland communities and their distribution and growth are greatly affected by nutrient enrichment. This study aims to examine the diversity and abundance of aquatic macrophytes and their relationship with the level of nitrogen and phosphorus in the substrate and water in Lake Mainit. Four stations were established using belts transect to determine the diversity and abundance of aquatic macrophytes. Percent cover and abundance were evaluated using the DAFOR scale (d for dominant, a for abundant, f for frequent, o for occasional, r for rare). Total nitrogen and total phosphorus in the substrate and water were analyzed using the Kjeldahl and Vanadomolybdo phosphoric acid method. Diversity measurement revealed that Tapian station had the highest diversity ( $H'=1.411$ ) while Bansayang station has the lowest diversity ( $H'=0.503$ ). Correlation analysis unveiled that aquatic macrophytes diversity are positively highly correlated with nitrogen in the substrate and negatively correlated with the nitrogen in water. Similarly high correlation pattern was noted between aquatic macrophyte abundance and nitrogen level in the substrate. Based on the findings of the study, nitrogen concentration in the substrate could greatly influence the diversity and abundance of aquatic macrophytes. (**Author's abstract**)

**Keywords:** *Macrophytes, Diversity, Nutrient enrichment, Wetland ecosystem, Environmental science*

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2018/07,  
(Filipiniana Analytics)  
NP

0350

### **Environmental factors affecting distribution and abundance of larval fish assemblages in Taal Lake, Philippines**

*Faminialagao, Charice , Gacu, Nereen Y. , Majam, Jude , Nochete, Charmane , Merilles, Ma. Lourdes , Muyot, Myla , Mutia, Maria T*

Larval fishes are sensitive to environmental changes; hence their abundance and distribution in relation to environmental conditions are crucial in fishery and resource management, ecological monitoring, and establishing fish sanctuaries. This study conducted a monthly sampling of ichthyoplankton and quantification of 15 water parameters in 16 stations in Lake Taal from January 2015 to September 2017. A total of 16,749 fish larvae collected were morphologically identified to nine families, most of which were numerically dominated by Blenniidae (35.02%) and Gobiidae (33.27%). Analysis of variance showed that overall fish eggs and larval abundances, as well as abundance of Blenniidae, Gobiidae, and Atherinidae, differed very significantly among stations. Pre-flexion gobiid and blenniid larvae were ubiquitous in the lake while other larval fish families were present in certain areas only. In terms of temporal distribution, larval fish abundances of the families Gobiidae, Atherinidae, and Syngnathidae varied very significantly among months. Blenniidae, Clupeidae, and Atherinidae showed significant interannual variations. Redundancy analysis revealed that the larval fish assemblages differed significantly among months, and that water temperature is the major environmental factor structuring the larval fish assemblages. This information can be used as basis for establishing a new fish sanctuary in Lake Taal, and can serve as evidence for the potential impacts of climate change (increasing water temperature) to freshwater fisheries. (**Author's abstract**)

**Keywords:** *Fish sanctuary, Climate change, Water temperature, Ichthyoplankton, Environmental science*

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2018/07,  
(Filipiniana Analytics)  
NP

0351

### **Hydrological assessment and geomorphological characterization of Sawaga Watershed in Bukidnon Province**

*Puno, George R. , Toledo-Bruno, Angela Grace , Marin, Rico A. , Butic, Regin*

The study aimed to assess the geomorphologic and hydrologic characteristics of Sawaga watershed. The methodology focused on the readings of stream flow during the occurrence and absence of rainfall events. Four rainfall events were considered in the analysis. The highest occurrences of rainfall and stream flow were used to construct the hydrograph of Sawaga watershed. Results revealed that the Sawaga watershed is elongated, highly permeable, and has homogeneous subsoil condition. The said watershed has an average slope of 15.61% and mean elevation of 789.99 m. Most parts of the area are cultivated and planted with corn. Based on the data obtained in the area, the recorded maximum discharge of the watershed is 37.00 m<sup>3</sup>s<sup>-1</sup> as against the base flow of 13.42 m<sup>3</sup>s<sup>-1</sup> and a lag time of three hours and 30 minutes. This indicates that the hydrograph of the Sawaga River exhibits a high peak discharge and steep rising limb. Findings of the study can help to determine whether or not an evacuation is necessary once intense rainfall events occur in the area. **(Author's abstract)**

**Keywords:** *Hydrology, Geomorphology, Sawaga River, Watershed, Environmental science*

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NP

0352

**Inventory of atmospheric pollutants in the Philippines from 1970 to 2010**  
*Perdigones, Begie , Sanchez, Henrison , Tolentino, Jerome , Baldomero, Munir, Madalipay, Jasper ,  
Bagtasa, Ge*

A long-term emission inventory of selected air pollutants in the Philippines was accomplished to aid in air pollution studies. From the Emission Database for Global Atmospheric Research (EDGAR version 4.3.1 and 4.3.2), the sources of several gaseous (SO<sub>2</sub>, NO<sub>x</sub>, and CO) and particulate (PM<sub>2.5</sub> and OC) air pollutants and a major greenhouse gas (CO<sub>2</sub>) in the Philippines from 1970 to 2010 were determined. Plots of regional concentrations for each pollutant in the Philippines were generated and the time series of atmospheric pollutant emissions in the country for the same period were analyzed. From the results, the highest emissions of CO<sub>2</sub> in the 40-year period were from stationary sources (building or facility emitting any air pollutant, e.g., manufacturing, chemical plants), with a total of 1.2 million tons; the lowest were from area sources (relatively large areas of specific activities generating significant amounts of air pollutants, e.g., open burning, agricultural activities) at only 209,000 tons. Highest SO<sub>2</sub> emissions were also from stationary sources, amounting to 14,000 tons. Majority of CO, PM<sub>2.5</sub>, and OC emissions were from area sources while NO<sub>x</sub> emission was primarily from mobile sources (combustion of carbon-based or other fuel in vehicles). Among the regions in the Philippines, Metro Manila is the leading contributor to the emission of all six studied atmospheric pollutants. Generally, emissions from stationary and area sources have increased over the 40-year period, however, emissions from mobile sources abruptly increased in the early 1990s and significantly decreased in early 2000s. **(Author's abstract)**

**Keywords:** *Air pollutants, Inventory, Emission, Sources, Time series, Environmental science*

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0353

**Land use/land cover change analysis of selected watersheds of Mt. Makiling Forest Reserve using landsat images.**

*Bantayan, Nathaniel , Tiburan, Cristino Jr. , Montecillo, Ma. Ericha , Avellano, Jeannette , Carada, Carl*

Mt. Makiling Forest Reserve (MMFR), an ASEAN Heritage Park, is home to a large number of endemic flora and fauna species. Several watersheds can be found in MMFR, and they drain mostly toward the Laguna de Bay, the largest freshwater lake in Southeast Asia. To properly manage these areas in a long-term scenario, observing the dynamics of its land use/land cover is essential. Hence, this study analyzed the land use/land cover change of

selected watersheds in MMFR. Three watersheds are involved: Molawin-Dampalit Watershed (4,166.43 ha), Cambantoc Watershed (1,966.09 ha), and Tigbi Watershed (1,944.61 ha). Different Landsat images were used, namely, Landsat 5 Thematic Mapper™, Landsat 7 Enhanced Thematic Mapper Plus, and Landsat 8 Operational Land Imager. Different periods were also chosen: 1993, 1998, 2002, 2006, 2010, and 2015. Images were preprocessed and classified using the Maximum Likelihood Algorithm. These were further analyzed to determine trends and patterns across different periods. Results showed that there is an increasing trend in built-up areas from 1993 to 2015, and this was mainly concentrated on the northern portions of the watersheds. Likewise, there was a fluctuation in the forest cover within the watershed area. Overall, despite the changes in some of the land cover classes (e.g., built-up and agriculture), forest cover in MMFR did not experience significant decline. The results of the study can be utilized to further enhance the management of MMFR. (**Author's abstract**)

**Keywords:** *land use/ land cover, Watershed, Landsat, Maximum likelihood, Environmental science*

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NP

0354

**Leaf litter fall production of natural and reforested mangrove forest of *Sonneratia alba* (Sm.) in barangay white beach, Pagadian City, Zamboanga Del Sur**  
*Ediza, Marilou , Lumista, Hannah , Galan, Gloria , Cudal, Ma*

Mangrove forests serve as natural barriers in coastal communities like Barangay White Beach, Pagadian City and play a vital role in ecosystem productivity because of their leaf litter fall. This study assessed the daily leaf litter production of a mixture of natural and reforested mangrove forest of *Sonneratia alba*, which is the most dominant species in the area. This study also serves as a formal documentation of the mangrove species composition of the area. Litter fall data were collected for 31 days (Sept-Oct. 2011) in a natural mangrove forest (remnant of old growth trees about <50 years old) and a reforested mangrove forest (<20 years old) of *S. alba* using nylon litter traps (2-mm mesh) set-up randomly in three zones of each forest type: Z1 (seaward), Z2 (between Z1 & Z2), and Z3 (landward). The content of the litter traps were collected daily, sorted, dried, and weighed. A higher rate of leaf litter production was observed in the natural forest with a mean of 109.25 g oven dry weight per m<sup>2</sup> (ODW/m<sup>2</sup>) compared to the reforested area (58.49 ODW/m<sup>2</sup>) with a total mean of 83.87 ODW/m<sup>2</sup>. The natural and reforested forest of *S. alba* showed significant difference in terms leaf litter production. However, leaf litter production between zones were not significantly different. In terms of species composition, nine mangrove species were recorded: *Avicennia marina*, *Rhizophora apiculata*, *Rhizophora mucronata*, *Ceriops tagal*, *Bruguiera gymnorhiza*, *Sonneratia caseolaris*, *Sonneratia alba*, *Nypa fruticans*, and *Acrostichum aureum*. Of these, all nine mangrove species were found in the natural mangrove forest while only five (*A. marina*, *R. apiculata*, *S. alba*, *N. fruticans* and *A. aureum*) were found in the reforested mangrove forest. (**Author's abstract**)

**Keywords:** *Leaf litter fall, Productivity, Mangrove forest, Environmental science*

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(Filipiniana Analytics)  
NP

0355

**Levels of heavy metals in six aquaculture commodities collected from various landing sites of Manila Bay: relationships with size and seasonal variation**  
*Montejo, Ulysses , Abendanio, Camille , Cambia, Flordeliza , Perelonia, Karl Bryan , Benitez, Kathlene*

This study determined the levels of heavy metals in Manila Bay landing sites and its relationship with size and with seasonal variation in six aquaculture commodities (i.e., tilapia, milkfish, crab, shrimp, mussel, and oyster). Samples were collected in 11 pre-identified landing sites of Manila Bay for two seasons: dry season in March



2016 and wet season in September 2016. Homogenized flesh samples were digested using microwave digester (ETHOS One) and were determined using Atomic Absorption Spectrophotometer (AA-7000, Shimadzu). All commodities passed the regulatory limit set by the Bureau of Fisheries and Aquatic Resources Fisheries Administrative Order 210 s. 2001 and the European Commission No. 1881/2006 for lead and cadmium. Conversely, 2 out of 98 (2.04%) tilapia and 4 out of 80 (5.00%) shrimp samples collected failed to pass the regulatory limit set for mercury. The comparisons made between metal concentrations and fish size parameters demonstrated negative relationships in most cases, and these are mostly found in cadmium and lead. Positive correlations were mostly found in mercury. Using t-test, the commodities tested had significantly higher level of accumulation during wet season. From the standpoint of food safety, there is a need for risk assessment and regular monitoring of the said commodities. (**Author's abstract**)

**Keywords:** Heavy metals, Manila Bay, Landing sites, Aquaculture commodities, Environmental science

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(Filipiniana Analytics)  
NP

0356

### **Macrofouler community succession in South Harbor, Manila Bay, Luzon Island, Philippines during the northeast monsoon season of 2017–2018**

*Ocampo, Melody Anne B. , Vallejo, Benjamin M. Jr. , Valenzuela, Rafael Lorenzo G. , Trinidad, Cla*

Manila Bay is one of the most important bodies of water in the Philippines. Within it is the Port of Manila South Harbor, which receives international vessels that could carry non-indigenous macrofouling species. This study describes the species composition of the macrofouling community in South Harbor, Manila Bay during the northeast monsoon season. Nine fouler collectors designed by the North Pacific Marine Sciences Organization (PICES) were submerged in each of five sampling points in Manila Bay on 06 Oct 2017. Three collection plates from each of the five sites were retrieved every four weeks until 06 Feb 2018. Identification was done via morphological and CO1 gene analysis. A total of 18,830 organisms were classified into 17 families. For the first two months, *Amphibalanus amphitrite* was the most abundant taxon; in succeeding months, polychaetes became the most abundant. This shift in abundance was attributed to intraspecific competition within barnacles and the recruitment of polychaetes. Diversity and richness values increased across all sites, which are commonly observed in primary succession events, while evenness values were low due to the dominance of *Amphibalanus amphitrite* and polychaetes. New macrofouling species in Manila Bay were reported: *Barbatia foliata*, *Membranipora* sp., a stylochid flatworm, a venerid clam, and hesionid, phyllodocid, and cirratulid polychaetes. More importantly, non-indigenous species were observed: *Mytilopsis* sp., *Mytella charruana*, *Brachidontes pharaonis*, *Hydroides elegans*, and the North Pacific giant flatworm *Kaburakia excelsa*. These species are potentially invasive and may alter the ecosystem of Manila Bay. Thus, it is recommended to further monitor the seasonally variable macrofouling community of South Harbor to observe annual succession patterns and to use DNA barcoding techniques more extensively for identification of macrofoulers—especially the polychaete taxa—to the species level and rapid early detection of potentially invasive species. (**Author's abstract**)

**Keywords:** Bbiological invasion, DNA barcoding, Fouling, Species abundance, Species diversity, Species evenness, Species composition, Environmental science

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(Filipiniana Analytics)  
NP

0357

### **Malacofaunal diversity of Lubayat Riverine Ecosystem in Real, Quezon Philippines**

*Relos, Dara Chelsie Jade R., Elazegui, Erwin P. , Tabares, Ma. Leonely Karol V. , Rebamba, Pamela Joy N*

This study aimed to identify and determine the malacofaunal diversity of the Lubayat riverine ecosystem in Real, Quezon. Physicochemical parameters (i.e., temperature, pH, turbidity, dissolved oxygen, biological oxygen demand, total suspended solids, nitrate, and phosphate) were also assessed. Findings revealed 24 species of mollusks. Species from the family Neritidae, such as *Clithon corona*, *Clithon* sp., *Nerita* sp., and *Septaria porcellana* were the dominant species. *Nertina* sp. was the most abundant species. The Shannon-Wiener diversity ( $H'$ ) index, which varied based on monthly field surveys, ranged from 2.21 to 2.78. The Sorensen index of similarity in the three established sites was calculated as 63.75% (site 1 and site 2), 93.9% (site 2 and site 3), and 57.7% (site 1 and site 3). Based on the IUCN Red List, the identified species belong to the not evaluated (NE) category. Some parameters of water quality in the Lubayat riverine ecosystem were within the standard for Class C surface freshwater, except for nitrates and phosphates. The study also found that there was no significant difference in the physico-chemical parameters vis-à-vis the abundance of malacofaunal species. Conservation efforts must focus on protecting the Lubayat riverine ecosystem to guarantee the continuous existence of mollusc species. (**Author's abstract**)

**Keywords:** *Malacofaunal diversity, Physico-chemical parameters, Shannon- Weiner index, Sorensen index of similarity, Lubayat riverine ecosystem, Environmental science*

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NP

0358

### **Risk assessment of alien amphibians: guiding Philippine biosecurity programmes for sustainability and biodiversity conservation**

*Diesmos, Mae Lowe L., Pili, Arman N., Diesmos, Arvin C*

The negative ecological, evolutionary, and socio-economic impacts of invasive alien species have prompted the world's nations to develop and implement sound biosecurity programs in response to current and future biological invasions. Here, we assessed the risk of invasion of currently occurring alien frogs in the Philippines, as well as potential amphibian invaders. By analyzing geographical and historical data, the invasion history of the six currently occurring alien frogs was reconstructed and their current status and distribution updated. Invasion hotspots were mapped and the geographic risk of key conservation areas was assessed using an ensemble of ecological niche models. Potential amphibian invaders were horizon scanned using three factors of invasion success: history of invasion elsewhere, climate match, and propagule pressure. The origin and pathways involved in alien frog introductions into the Philippines were identified. Geographical distribution maps showed that all major Philippine islands, except for islands in Batanes Province, have been invaded by at least one alien frog. The invasion hotspot map showed that most key conservation areas are at risk of invasion, with eight in the hottest of invasion hotspots. Horizon scanning showed that 138 alien amphibian species pose high risk of invasion into the Philippines. Our study provided the much-needed science-based information that can help guide the development and implementation of sound biosecurity programs for amphibian invasions, contributing to the Philippines' international commitments to sustainability (Target 9-Aichi Biodiversity Targets) and biodiversity conservation (Goal 15-Sustainable Development Goals). (**Author's abstract**)

**Keywords:** *Invasive alien species, Invasion history, Geographic distribution, Ensemble modelling, Horizon scanning, Environmental science*

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2018/07,  
(Filipiniana Analytics)  
NP

### Scanning electron microscopy (SEM) investigation of polystyrene damage due to colonization by locally isolated *Xylaria* sp.

*Tavanlar, Mary Ann , Egloso, Mary Bernadette V. , Abecia, Janine Erica D. , Santiago, Anna There*

Colonization of microorganisms on pollutants is the first indication of the potential ability of microbes to utilize plastic pollutants as a carbon source by sequential biodegradation into usable form for sustenance. The Philippines is considered as the third highest country contributing to global mismanaged plastic waste. To locally manage and find a natural and innovative solution to this worldwide concern, this study aims to evaluate the capacity of *Xylaria* sp. SDM (sterile dark mycelia) wild type, which was previously reported to colonize polyethylene plastic, and mutant strains to colonize polystyrene, which is among the widely produced plastic pollutants in the world. Assessment of the ability of local *Xylaria* sp. strains to grow, penetrate, and damage the surface and inner structures of polystyrene was investigated using scanning electron microscopy (SEM).

*Xylaria* sp. strains were cultured in a pH 5.0 mineral medium with 0.5% glucose as carbon source and polystyrene as a co-carbon source, and stored at 250°C for 50 days. At the end of the incubation period, due to irremovable fungal strains on the surface of the polystyrene strips, samples of polystyrene from each strain were subjected to SEM.

On the 20th day of incubation, the presence of mucilaginous sheaths and fungal growth were observed on the surface of treated polystyrene strips. At the end of 50-day incubation period, scanning electron microscopy (SEM) confirmed fungal growth and colonization, through the presence of mycelial mats and hyphae, of the wild type and mutant strains on the surface and subsurface structure of polystyrene except the control. Moreover, physical surface damage in the form of holes, cracks, and crevices on polystyrene demonstrated the active burrowing action of *Xylaria* sp. strains further supporting the potential of this fungus to damage polystyrene plastic.

Whereas fungal growth on a polymer surface is necessary but not sufficient to conclude the process of carbon assimilation as the final biodegradation step, the initial colonization of *Xylaria* sp. strains on polystyrene supports its ability to establish itself and physically damage the pollutant. Hence, this study extends the existing knowledge on the colonizing ability of *Xylaria* sp. on plastic making it a potential candidate organism to biodegrade plastic waste, which is one of the topmost environmental waste hazards in the world today. (**Author's Abstract**)

**Keywords:** *Xylaria* sp., biodegradation, polystyrene, plastic, scanning electron microscopy, Environmental science

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Philippine Journal of Health Research and Development, Volume No. 23 Issue No. 1, 64-70  
2019/03,  
(Filipiniana Analytics)

### Seashells taken and sold in the beaches of Babak, Samal Islands, Davao Del Norte

*Prevendido, Ha*

This research focused on identifying rare, threatened, and endangered seashell species taken or sold in the beaches of Babak, Samal Island, Davao del Norte. This is to provide information to policy makers to locally strengthen conservation measures, especially because of accelerating negative impacts of population growth and tourism on the aquatic biodiversity of the island. Two research areas were established (i.e., the coastal village area and a souvenir shop of a well-known beach resort) on the island. Seashell species were documented and their conservation statuses were identified in accordance with existing conservation laws. Results revealed that three threatened shell species (*Tridacna squamosa*, *Tridacna gigas*, and *Cassis cornuta*) are found in the village area and consumed as food and used as ornaments. One rare species (*Lyncina aurantium*) was found in the souvenir shop, which was used as raw material for shell crafts. There must be strict conservation measures and monitoring in coastal village communities as well as in souvenir shops. Particularly, seashell monitoring in the community is very crucial as they serve as the frontliners of biodiversity conservation of seashells and shell-dependent organisms. (**Author's abstract**)

**Keywords:** *Seashells, Samal Island, Threatened species, Biodiversity, Environmental science*

### **Seasonal variation in the diversity and species richness of phytoplankton in a tropical oligotrophic lake: an update in Lake Mainit, Philippines**

*Seronay, Romell A. , Jumawan, Joyce*

Phytoplankton diversity and species richness was carried out in the dry and rainy seasons in Lake Mainit, a tropical oligotrophic lake shared by Agusan and Surigao del Norte in the Philippines. Species richness and diversity (Shannon-Wiener, H') were measured at two-month (September and November 2016) intervals in four stations within the lake. Results show the presence of 36 phytoplankton species. Bacillariophyta (diatoms) dominated the phytoplankton species composition (47%) followed by Chlorophyta (17%) and Cyanophyta. The diatom *Aulacoseira granulata* and the green algae *Botryococcus braunii* were the most abundant species, comprising 30.29% and 28.3%, respectively, of the total phytoplankton biomass. A higher phytoplankton density and diversity was observed during the wet season for all stations, of which a rise in phytoplankton density was significantly pronounced in Station 7 and Station 8. The diatom *A. granulata* is a known species to dominate eutrophic waters whereas *B. braunii* is a known macroalgae that often causes algal blooms with elevated dissolved phosphorus. About 53 phytoplankton species from four phytoplankton groups were reported in a 2004 limnological assessment. While this previous assessment had similarity to this study's results in the major algal group composition, some species were noticeably absent or different from what were identified in this study. There is a necessity to closely monitor the biomass of plankton in the lake while keeping track of other physico-chemical parameters as the higher phytoplankton density during the rainy season was dominated by *B. braunii*—a chlorophyte known to cause algal blooms and fish kills. **(Author's abstract)**

**Keywords:** *Algal bloom, Algae, Fish kills, Environmental science*

### **Soil erosion of an ecotourism site in Bukidnon**

*Casas, Jupiter V., Marin, R*

Soil erosion is very common in developing countries where large tracts of forest lands are converted to other land uses. Mt. Musuan, one of the landmarks in Bukidnon province and a promising ecotourism site, is not spared of this phenomenon. Its magnificent beauty will be at risk if its degradation will continue to destroy its landscape. This study was conducted to assess and to quantify the soil erosion rates of the various land cover across its landscape. These are the forest area, grassland, and the agroecosystem components. Soil erosion plots were established in various slope gradients of the three vegetative/land cover. Erosion bar method was used in measuring the soil erosion rates. Findings show that agro-ecosystem had the highest soil losses at 41.43  $\text{tha}^{-1}\text{yr}^{-1}$ , followed by grassland with 26.39  $\text{tha}^{-1}\text{yr}^{-1}$ , and forest area had the least with 13.98  $\text{ton ha}^{-1}\text{yr}^{-1}$ . In terms of slope gradient, although non-significant, the slope greater than 20% had the highest soil loss of 35.37  $\text{tha}^{-1}\text{yr}^{-1}$ , followed by slope gradient between 10% and 20%, with 29.17  $\text{tha}^{-1}\text{yr}^{-1}$ . The slope less than 10% had the least soil losses, with 17.35  $\text{tha}^{-1}\text{yr}^{-1}$ . The soil erosion rates of Mt. Musuan are beyond the tolerable limit, and thus need immediate actions, particularly in the agro-ecosystem. Rehabilitation like planting of perennial crops in these areas needs to be prioritized. **(Author's abstract)**

**Keywords:** *Infiltration, Land cover, Mt. Musuan, Soil erosion, Environmental science*

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### **Spatio-temporal variability of zooplankton in Manila Bay in 2017**

*Barral, Jezzalyn Gloria R. , Bugtong, Rizza Mae T. , Tobias, Marvin M. , Gatdula, Norvida C. , Furio, Elsa F. , Borja, Valeriano M. , Jose, Ella*

Manila Bay is one of the most important bodies of water in the Philippines because of its socioeconomic impact. Zooplanktons are major food source for fishes. Studies have been done on the pollution of Manila Bay, especially on its water quality and harmful algal bloom issues. However, only a very few studies are available on the zooplankton community of the bay. Zooplankton samples and physico-chemical data were collected every two months within one year. Samples were subjected to microscopy. Individual zooplankton was identified to lowest possible taxa. *Paracalanus* sp., *Oithona* spp. and copepod nauplii dominated the zooplankton community in Manila Bay during the sampling period in 2017. The highest concentration of zooplankton was recorded in Station 14 in the month of September, with a density of 610,050 ind m<sup>-3</sup>. The lowest density of zooplankton was recorded during the sampling in May in Station 14, with a density of 5,945 ind m<sup>-3</sup>. Canonical Correspondence Analysis revealed that there is a significant correlation between zooplankton composition and abundance and physico-chemical parameters such as temperature, nitrate, dissolved oxygen, and salinity. A change in the environmental conditions of the bay brought a corresponding change in the zooplankton community. (**Author's abstract**)

**Keywords:** *Environmental factors,, Zooplankton community, Manila Bay, Canonical correspondence analysis, Environmental science*

### **Surface water characteristics in the vicinity of abandoned mercury mine site in Puerto Princesa City, Philippines**

*Costa, Ma. Azileira V. , Tanciongco, Alexandria M. , Rastrullo, Rasty M. , Gibaga, Cris Reven L. , Samaniego, Jes*

This study was part of an ongoing research project aimed to trace the pathways of possible mercury (Hg) contamination in an abandoned Hg mine site formerly operated by Palawan Quicksilver Mines, Inc. (PQMI) in Puerto Princesa City, Palawan. This mined-out area has been identified as the possible cause for the recent reported Hg poisoning cases among the residents living near the vicinity. To evaluate the water quality in the area, water samples collected from pit lake, river, coast, other nearby streams, leachate from landfill, and hot spring were analyzed for physicochemical parameters and heavy metal concentrations. Results showed that the physicochemical characteristics of freshwater (pit lake and river) and coastal water were generally within the water quality guidelines. Heavy metals in pit lake and river—except for Mn and Ni, Fe, and Mn—were measured within the guidelines, respectively. Hg concentrations in pit lake and river were not detected while low Hg concentrations were measured in coastal water near the jetty (0.001 mg/L) and in hot spring (≤0.0004 mg/L). A landfill near the pit lake was releasing partially-treated leachate with high total suspended solids (TSS) and heavy metal concentrations that contribute to the pollution in the area. (**Author's abstract**)

**Keywords:** *Abandoned mine, Heavy metals, Mercury, Physicochemical properties, Pit lake, Environmental science*

## **Synergy in the urban solid waste management System in Malolos City, Philippines**

*Moya, Tolentino B. , Tinio, Marion Micah R., Rollon, Analiza P*

The paper demonstrates through system dynamics modelling how the following variables work together in the urban solid waste management (USWM) system: population, city income, public participation, composting and recycling, and greenhouse gas emissions. Malolos City, Philippines, is used as a case study for three ten-year model scenarios: (1) USWM with no composting and recycling, (2) USWM with an operational materials recovery and composting facility (MRCF), and (3) USWM with operational MRCF and incorporated effects of public participation towards solid waste management practices. The operation of the MRCF in Scenario 2 reduced total volume of disposed solid waste by about 25,000 tons but increased total expenses for solid waste management by about PhP 37M. The incorporation of the effects of public participation in Scenario 3 further reduced the volume of disposed solid waste by about 103,900 tons; reduced the volume of generated solid waste by around 101,000 tons; and allowed the informal collection of 9,966 tons of recyclables. Estimates of CH<sub>4</sub> and CO<sub>2</sub> emissions also decreased in Scenario 3. The results revealed how composting and recycling and public participation affects the USWM through reduced waste volumes and increased savings. (**Author's abstract**)

**Keywords:** *System dynamics, Urban solid waste, Environmental science*

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2019/03,

(Filipiniana Analytics)

NP

## **Tree legume: microbial symbiosis and other soil amendments as rehabilitation strategies in mine tailings in the Philippines**

*Cadiz, Nina M. , Anarna, Julieta A. , Aggangan, Ne*

A field experiment was conducted to develop rehabilitation protocols for rehabilitating mine tailings areas using arbuscular mycorrhizal fungi (AMFs) and nitrogen-fixing bacteria (NFBs) as microbial biofertilizers. *Narra* (*Pterocarpus indicus*) seedlings were inoculated during pricking with AMF with or without NFB *Azospirillum* spp. After four months in the nursery, the seedlings were planted in a barren, mined-out area in Barangay Capayang, Mogpog, Marinduque, Philippines. During field planting of *narra* seedlings, vermicompost and lime were mixed with the excavated soil prior to back-filling the 30 cm<sup>3</sup> planting hole. Uninoculated *narra* seedlings were also planted without any amendments, thus serving as the negative control. After one year, 96% (control) and 99% (AMF±NFB) seedling survival were observed with amendments as compared to only 50% in the negative control. The negative control had height and stem diameter of 2.2x and 1.65x, respectively – lower than the control with no biofertilizer but with soil amendments. With soil amendments, mycorrhizal seedlings gave height increases ranging from 98 to 139% and stem diameter from 67 to 87% relative to the uninoculated plants. Mycorrhizal inoculation gave the highest (418 cm<sup>3</sup>) wood volume while the lowest was the control (50 cm<sup>3</sup>). The results clearly showed the beneficial effects of microbial biofertilizers and soil amendments for the rehabilitation of mined-out area in Mogpog and could have potential applications for rehabilitation of other mined out areas with similar conditions. (**Author's abstract**)

**Keywords:** *Mycorrhizal inoculants, MYKOVAM®, Narra, Nitrogen-fixing bacteria, Pterocarpus indicus, Environmental science*

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(Filipiniana Analytics)

NP

**Aspects on ecology and biology for the development of captive breeding of the white teatfish (*Holothuria fuscogilva* (Cherbonnier 1960)) in Lopez Jaena, Misamis Occidental**

*Molina, Dionel L. , Roa, Lyndon L. , Navarro, Victor R. , dela Peña, Jusua D. , dela Peña, Geralyn D. , Gorospe, Jocelyn N. , Joy Guisando, Miahnie P. , Tubio, Emilie G. , de Guzman, Asuncion B. , Quiñones, Mariefe B. , Lumasag,*

The biology and ecology of *Holothuria fuscogilva* (white teatfish) in Capayas Island Marine Reserve is being characterized monthly since October 2014. Transect surveys outside the reserve boundary reflect the demand of trepang, as population density is 7 ind ha<sup>-1</sup>. However, protection inside the reserve has increased the mean population density to 183 ind ha<sup>-1</sup>. The species is abundant in shallow seagrass and algal flats in coarse sand or rubble. Body size ranges between 0.016 kg and 2.9 kg. In hatchery conditions, white teatfishes spawn either naturally or induced. In all 10 spawning induction attempts and natural spawning runs, only male white teatfishes release their gametes. Examination of gonads from eviscerated gut showed that females are present in the induced broodstock, as indicated by their visible oocytes through translucent tubules. (**Author's abstract**)

**Keywords:** *Sea cucumber, White teatfish, Biology, Ecology, Fisheries*

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2018/07,  
(Filipiniana Analytics)  
NP

**Assessment of postharvest losses of sardines in Dipolog City, Zamboanga del Norte**  
*Montejo, Ulysses , Narida, Camille , Peralta, Deserie , Juliano, Marizka , Dela Cruz, Lea Mae , delos Santos, Virginia , Obinque, Ado*

Postharvest losses (PHL) in the fishery industry are inevitable due to the highly perishable characteristic of fish. Zamboanga Peninsula is the top producer of sardines in the Philippines, with 516,233.95 MT of combined *Sardinella fimbriata* and *S. lemuru* production from 2013 to 2015. Reports on the quantity of PHL in the Philippines have been largely attributed to physical loss, with limited to no in-depth study as to the nature of losses. Thus PHL of sardines were evaluated in the different supply chain in Dipolog City, Zamboanga del Norte to generate baseline data. The physical, quality, market force, and financial losses in landing, wet and dry market, and processing areas were estimated using a modified method described by Ward and Jeffries (2000) that adopted and incorporated local conditions. The postharvest handling practices were assessed to identify where the highest losses occurs. A total of 219 respondents were interviewed to obtain PHL indicators. Total volume loss from 2016 to 2017 in all the supply chain was recorded at 13% or 270 MT out of 35,991 MT total volume assessed, which is equivalent to PHP 2,041,926.63 in value. PHL were way below the estimated 40% maximum loss indicated in the 2016 Comprehensive National Fisheries Industry Development Plan. The highest average total percentage losses attained were in wet market at 24% and 19.6% in commercial fish landing. Physical loss was the most minimal PHL in the sardine supply chain at a range of 0–2.3%; quality loss was at 0–10% while market force loss at 0–21%. Non-usage of ice and other low temperature preservation techniques, insufficient supply of salt, long trading time, picking method, and use of fine-meshed nets were observed as factors in the occurrence of PHL. (**Author's abstract**)

**Keywords:** *Sardines, Postharvest losses, Dipolog City, Fisheries*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 84  
2018/07,

### **Climate change in the Philippines: vulnerability assessment of capture fisheries and aquaculture sectors**

*Santos, Mudjekeewis , Santos, Sherwin , Calderon, Gilda J*

The fishery sector is one of the sectors in the Philippines that is highly affected by and vulnerable to the impacts of climate change. Sector-based Fisheries Vulnerability Assessment Tool (Fish VOOL) for capture fisheries and aquaculture sectors have been described to evaluate the vulnerability of primary fishery commodities. This study assessed three commodities of capture fisheries, namely tuna, sardines, and blue swimming crab; and three commodities from the aquaculture sector, namely, tilapia, milkfish and seaweeds. In the tuna sector, four provinces were assessed to have low vulnerability, whereas nine provinces have medium vulnerability. In the sardines sector, six provinces have low vulnerability, seven provinces have medium vulnerability, and one province is highly vulnerable. In the blue swimming crab sector, three provinces were assessed to have low vulnerability and two provinces have medium vulnerability. In the milkfish sector, eight provinces have low vulnerability and four have medium vulnerability. In the seaweeds sector, four provinces have low vulnerability and five have medium vulnerability. Lastly, in the tilapia sector, 14 provinces have low vulnerability and 8 provinces have medium vulnerability. Results of the assessment also showed the high vulnerability rating of the sectors was due to their weak adaptive capacity to climate change. Thus, developing programs (e.g., promoting climate change awareness) or support systems on climate change will help to reduce the areas that were assessed to have high vulnerability. **(Author's abstract)**

**Keywords:** *Climate change, Fisheries vulnerability assessment tool, Adaptation, Capture fisheries, Aquaculture, Fisheries*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 86  
2018/07,  
(Filipiniana Analytics)  
NP

### **Comparative advantage using extruded floating feeds for tilapia (*Oreochromis niloticus*) and milkfish (*Chanos chanos*) cage culture in Taal Lake**

*Mutia, Maria Theresa M. , Caunan,Paul John , Muyot, Freder*

This study was conducted to compare the culture performance of tilapia and milkfish fed with extruded floating feeds with the conventional slow sinking and sinking feeds used in cage farming and to serve as baseline information for cage regulations. This initiative was conducted to support the Taal Volcano Protected Landscape- Unified Rules and Regulations for Fisheries (TVPL-URRF) policy on the use of floating feeds for cage aquaculture as part of good aquaculture practice in Taal Lake. Results of the study showed that floating feed type is more efficient than slow-sinking and sinking feeds in terms of growth, biomass harvest, and feed conversion ratio. Floating feed treatment also had better size distribution at harvest, with 84.07–84.22% of fish attaining target marketable size. Using floating feeds also decreases feed use by 19.64–30.0% and lessens feed cost by 17.91–29.44%. This results in better economic profitability and contributes to the attainment of an ecologically sound lake water environment. The results of the study revealed the comparative advantage of floating feeds over slow-sinking feeds and sinking feeds. This feed type is therefore recommended for cage farming in the lake. **(Author's abstract)**

**Keywords:** *Extruded floating feeds, Slow sinking feeds, Sinking feeds, Growth performance, Cage aquaculture, Fisheries*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 87  
2018/07,



### **Compressor fishing practices among fisher-divers of lampirong (*Placuna placenta*) and their associated health risks in a coastal municipality in Panay, Philippines**

*Bañez, Ma. Ar*

Compressor fishing is a strategy adopted by small-scale artisanal fishers of coastal communities in Panay, Western Visayas. The practice persists among subsistence lampirong fisher-divers whose livelihood depends on seasonal fishing. *Placuna placenta* known locally as lampirong is valued for its shells, which are made into shell craft like the famous capiz window. Related studies which examined traditional diving practices and compressor fishing identified risks factors such as the inappropriate dive training and use of unsuitable diving gears.

The study aims to investigate the plight, and the health risks associated with common malpractices among lampirong fishers-divers who utilize the compressor fishing strategy.

In this ethnographic study, five (5) lampirong fisher-divers narrated the health risks and managing practices that they have adapted to survive compressor fishing. Primary data from field observation and interviews with the fisher-divers as well as secondary data from related studies were utilized for comparison and analysis. Considering the health risks compressor fishing poses to fisher-divers, I attempted a reflexive position drawing from the principle of ecological public health.

The health risks of compressor fishing are known to fishers- divers, thus, they have developed managing practices which include the observance of certain clear- cut rules (the do's and don'ts) meant to ensure underwater survival. Improvised diving gears are worn but barely protect the lampirong fishers-divers from decompression illness or sickness. Related studies validated these symptoms such as nose bleed, dull pain in the ears, blood dripping from the ears, headache, and physical fatigue from prolonged dives. They rationalized the practice of lampirong compressor fishing as a means to bring food to the table for families in fishing communities.

Philippine law prohibits or regulates compressor fishing, thus, there is still a need for a policy or program addressing the health risks of compressor fishing. (**Author's Abstract**)

**Keywords:** *compressor fishing, decompression illness (DCI) or decompression sickness (DCS), lampirong fisherdiver, health and well-being, ecological public health, Fisheries*

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Philippine Journal of Health Research and Development, Volume No. 23 Issue No. 3, 31-38  
2019/09,  
(Filipiniana Analytics)

### **On conserving endemic fish: a case on the morphology of *Glossogobius giuris* (Hamilton,1882) in Lake Mainit, Northeastern Mindanao**

*Rigor, Melchor R. , Dela Peña, GERALYN D. , Eballe, Rustan C. , Samson, Jeantte J. , Roa, Rey L. , Gaid, Ruth D. , Salarda, Marissa Y. , Roa, Elnor C. , Vedra, Sonnie A., Baclayon, Michael James O*

Changes in the water quality of any body of water pose threats to the morphological attributes of endemic fishes since such change can create geographic barriers and habitat restrictions. This study collected a total of 526 male and 527 female *pijanga* (*Glossogobius giuris*) from Lake Mainit for morphometric and meristic analyses. Samples were collected quarterly for a year using a modified cast (i.e., *laya/laja*). Results showed that male *pijanga* (mean TL of 147.99±10.67 to 149.30±7.93 mm) were relatively bigger than the females (mean TL of 144.33±14.62 to 145.92±18.18 mm). The morphometric and meristic characters measured were not significantly different, signifying that a relatively similar stock of *pijanga* inhabits the lake. Male and female *pijanga* did not exhibit sexual dimorphism, which signifies that there were no signs of habitat restrictions and geographic isolation within the lake. Likewise, the samples had well-proportioned body structures, which may signify a favourable habitat and available food sources. Hence, the presumed changes in water quality did not adversely affect the

morphology of *pijanga*. However, it is still imperative to enforce the regulatory and nonregulatory measures of the local governments surrounding the lake in order to protect and conserve the endemic *pijanga* and the water quality of the lake for intra- and intergenerational equity and benefits, especially for the fishing communities whose survival depend on the lake resources. **(Author's abstract)**

**Keywords:** *Lake Mainit, Sexual dimorphism, Glossogobius giuris, Fisheries*

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2018/07,  
(Filipiniana Analytics)  
NP

0373

### **Development of database system for fisheries vulnerability assessment tool (Fishvool)**

*Santos, Mudjekeewis , Calderon, Gilda Joannah , Santos, S*

The country through the Climate Change Act of 2009, recognizes the potential dangerous consequences of climate change that could damage the ecosystems and biodiversity which in return can result to the country's loss in environment and economy. In response to the emerging detrimental effects and impacts of climate change to the fisheries sector, the National Fisheries Research and Development Institute (NFRDI) has developed the Fisheries Vulnerability Assessment Tool (FishVool) that measures the sensitivity, exposure and adaptive capacity using interview survey metrics and analytics. FishVool has already been piloted in selected municipalities of all regions in the Philippines by BFAR Regional AMIA Focal Persons. Here we describe the design and development of database to store and analyze data from the regions. It is consistent with the questionnaire and rubrics for scoring i.e. survey data input is divided into three (3) different assessment factors, namely sensitivity, exposure, and adaptive capacity. One of the outputs of FishVool is the creation of color-coded vulnerability maps. Areas marked with red have high vulnerability, orange with medium vulnerability, and yellow with low vulnerability. FishVool will be able to aid in identifying areas that are highly vulnerable to climate change, which will be important support in instituting an adaptive and mitigation measures and an important platform and tool for Climate Change-related information and planning in the Philippines. **(Author's abstract)**

**Keywords:** *Climate change, Sensitivity, Exposure, Adaptive capacity, Vulnerability, Fisheries*

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2019 July,  
(Filipiniana Analytics)  
NP

0374

### **Distribution and abundance of ichthyoplankton in Lagonoy Gulf in relation to oceanographic conditions**

*Acosta, Renalyne P. , Furio, Elsa F. , Gatdula, Norvida C. , Borja, Valeriano M. , Tobias, Mar*

Lagonoy Gulf is one of the country's major fishing grounds and considered as one of the largest and most important fishing ground for tuna, tuna-like, and elasmobranch species in the Bicol region. It is situated in Southern Luzon and is bordered by the three provinces of Camarines Sur, Albay, and Catanduanes. Investigation on the distribution and abundance of phytoplankton and ichthyoplankton in Lagonoy Gulf were carried out onboard on wet and dry season basis. A total of 23 pre-determined sampling stations were established in Lagonoy Gulf with an average distance of 7-9 nautical miles apart from each other. Results showed that highest concentration of phytoplankton communities for the month of May 2013 was observed in the southwestern part of the Gulf with an average density of 560 cell/100m<sup>3</sup>. For November 2013, phytoplankton amassed in the northwestern and southeastern part of the gulf predominantly in stations near the coastal areas. For the succeeding year, high abundance was again observed during May (2014) survey in the southwestern and southern part of the gulf with a density of 730 cell/100m<sup>3</sup> while much lower density was observed in November survey with only 430 cell/100m<sup>3</sup>. Both surveys were dominated by filamentous cyanobacteria *Tricodesmium erythraeum* accounting to

92% of the total phytoplankton densities. Fish eggs were more abundant during the May 2014 and May 2013 survey with 580 ind/100 m<sup>3</sup> and 380 ind/100 m<sup>3</sup> with centroid of egg distribution tends to be found in the middle moving towards the mouth of the gulf which showed a clear offshore transport. This is in contrast with the November 2014 and 2013 surveys during which the density observed was lower with only 280 ind/100 m<sup>3</sup> and 200 ind/100 m<sup>3</sup>. (**Author's abstract**)

**Keywords:** *Phytoplankton, Ichthyoplankton, Lagonoy Gulf, Fisheries*

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NP

0375

**Efficacy of different hormones in inducing spawning of mudfish, *Channa striata***  
*Hilario, Joyce , Danting, Ma. Jodecel , Oclos, Ma. Theresa , Pedroso, Fiona , Magbanua, Faith Loraine, Choresca, Jr., Casi*

Mudfish (*Channa striata*), locally known as dalag, is an important indigenous fish for aquaculture. The aquaculture of this species in the Philippines has not yet been fully developed despite its potential for culture due to its high market price and tolerance to adverse environmental conditions. Induced breeding of indigenous species is one of the options to increase seed stocks and production. This study determines the efficacy of commercially available hormones to induce spawning of *C. striata*. A total of eighteen mature male and female *C. striata* weighing 200-300 grams were used in this study. Each spawner was injected intramuscularly using human chorionic gonadotropin (HCG), leuteinizing hormone releasing hormone analogue (LHRHa+), and salmon gonadotropin releasing hormone (S-GnHRHa) (Ovupin). After injection, each spawning pair (1 female: 1 male) was placed in hapa net. Latency period and incubation period observed in all treatments ranged from 21-23 hours and 20-26 hours at 26-28°C, respectively. Highest mean values of relative spawning fecundity of  $39.07 \pm 0.77$  gram of body weight, fertilization rate of  $97.31 \pm 0.06\%$  hatching rate of  $89.70 \pm 0.04\%$  were obtained using 0.5 ml/kg of Ovupin. Thus, *C. striata* can be successfully induced in captivity using commercially available natural and synthetic hormones with higher spawning success rate using Ovupin. (**Author's abstract**)

**Keywords:** *Mudfish, Channa striata, Induce spawning, Hormones, Fisheries*

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NP

0376

**Factors affecting composition, distribution and abundance of ichthyoplankton in Manila Bay**

*Gatdula, Norvida C. , Borja, Valeriano M. , Acosta, Renalyn P. , Barral, Jezzalyn Gloria R. , Bugtong, Rizza Mae T. , Jose, Ellaine C. , Tobias, Marvin L., Furio, Elsa*

Manila Bay is a semi-enclosed body of water and was once considered as one of the major fishing grounds in the Philippines. The continuous changing environment, human activities such as destructive fishing practices, reclamation, and domestic waste influx lead to the decline of fish population in the bay. Fish larvae collection was carried out to determine the ichthyoplankton assemblages in the bay, CTD multi parameter was also lowered to obtain environmental data that might affect the distribution and assemblages of fish eggs and larvae in the area. Eight established sampling stations were placed throughout the bay with an average distance of 5-6 nautical miles and sampled every other month from January 2017 to November 2018. Horizontal towing of bongo net with attached calibrated flowmeter was used in collecting fish larvae. A total of 1,240 fish larvae were collected which belongs to 36 families. The results show that more fish eggs and fish larvae were observed during March 2018 survey, a representative of northeast monsoon with 711 ind/100 m<sup>3</sup> fish eggs and 268 ind/100 m<sup>3</sup> fish larvae and

followed by March 2017 survey, also a representative of northeast monsoon with 688 ind/100 m<sup>3</sup> fish eggs and 255 ind/100 m<sup>3</sup> fish larvae, respectively. Since fish eggs were drifters and move along the surface currents, they can be found throughout the bay. The concentration of fish larvae were mostly found in the northern and eastern part of the bay. Small pelagics dominate the total composition of fish larvae family in Manila bay such as sardines, slipmouths, anchovies, and mullets. The most dominant fish families were Clupeidae, followed by Leiognathidae and Nemipteridae. Other families that complete the top five were Mugilidae and Gobiidae. (Author's abstract)

**Keywords:** Ichthyoplankton, Manila Bay, Mugilidae, Gobiidae, Fisheries

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2019 July,  
(Filipiniana Analytics)  
NP

0377

### **Food and feeding habits of *Sarotherodon melanotheron* (black-chin tilapia) in selected areas in Manila Bay**

**Lopez, Grace V., Barrameda, Alyssa A., Santos, Mudjekeewis D., Rivera, Emman**

*Sarotherodon melanotheron* (Black-chin Tilapia) inhabits fresh to brackish water environments (Mireku *et al.* 2016), and is characterized by extreme euryhalinity. Due to its characteristics that are shared by many successful invasive species, *Sarotherodon melanotheron* can be considered as an invasive species that deserves aggressive intervention. This study determined the food items, food preferences, and feeding patterns of *Sarotherodon melanotheron*. The diets of black-chin tilapia were investigated using frequency of occurrence and numerical method of 295 stomach samples collected over one year. From both percent occurrence and numerical percentage method, results indicated that the most important food items of the *S. melanotheron* obtained from Manila Bay were Diatoms (77.01%) comprised mainly of *Coscinodiscus* (24.55%), followed by *Pseudonitzschia* (16.16%), Cyanobacteria (7.77%), and Dinoflagellates (4.39%). *S. melanotheron* can be considered as a generalist or omnivorous fish that can feed on a wide range of food resources. Its diet is dominated by phytoplankton species and detritus materials. (Author's abstract)

**Keywords:** Black-chin tilapia, Diatoms, *Sarotherodon melanotheron*, Fisheries

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2018/07,  
(Filipiniana Analytics)  
NP

0378

### **Genetic diversity of *Sepioteuthis lessoniana* (bigfin reef squid) in Asia using mitochondrial DNA control region (CO1)**

**Santos, Mudjekeewis D., Acosta, Renal**

*Sepioteuthis lessoniana* is one of the most commercially important cephalopods in Asia. *In silico* analysis was done in this study to generate data using mitochondrial DNA Region (CO1) on the genetic diversity of bigfin reef squid. Genetic variations and population differentiation of this commercially important cephalopod is important for the design and implementation of appropriate fisheries management. Out of 83 sequences from 6 locations, a total of 40 haplotypes were observed. These consisted of 26 unique haplotypes, while the remaining were shared by two or more populations. High haplotype diversity (Hd) with a mean value of 0.956 ( $\pi$ ) and mean nucleotide diversity of 0.02 were observed. These indicate that there might be a bottleneck effect due to the overfishing of this cephalopod. High expected heterozygosity was also observed, while mean FST was 0.34. This indicates that there might be panmixing between populations due to the higher level of gene flow. These squids are highly mobile; they use such large oceanographic features as spawning grounds. There are many other factors to consider on the genetic differentiation of this highly valuable cephalopod. (Author's abstract)

Keywords: Genetic diversity, Mitochondrial DNA region (CO1), *Sepioteuthis lessoniana*, Fisheries

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(Filipiniana Analytics)  
NP

0379

**Growth response of glass eels, *Anguilla* sp. FED with different diets in captivity**  
*Oclos, Melvin , Oclos, Ma. Theresa , Magbanua, Faith Loraine , Danting, Ma. Jodecel , Choresca, Jr.,  
Casiano , Hilario,*

Glass eels, *Anguilla* sp. are intensively traded internationally due to escalating demand for intensive culture resulting to a progressive decline of captures. Information on the captive culture process is scarce and limited success in the culture period was mainly due to inaccurate feeding and unsuitability of the diet. Thus, a feeding experiment was conducted to evaluate the potential of three different diets (*Tubifex* sp., paste formulated diet and granulated commercial feed) on the growth and survival of glass eels reared in tanks. Glass eels with initial body weight and length of  $0.1310 \pm 0.03$  g and  $4.88 \pm 0.20$  cm, respectively were kept in 0.63 cubic meter circular tanks and fed with experimental diets over a period of 90 days. At the end of the feeding trial, the final body weight of  $2.216 \pm 0.19$  g, total length of  $10.28 \pm 0.49$  cm and survival rate of  $94.44 \pm 3.03$  was obtained from the treatment fed with *Tubifex* sp. which is significantly higher than the rest of feeding treatments. Feed conversion ratio (FCR) was lower and specific growth rate (SGR) was significantly higher for fish fed with *Tubifex* sp. with value  $3.39 \pm 0.12\%$ /day than fish fed with formulated and commercial feeds with values  $1.96 \pm 0.17\%$ /day and  $1.35 \pm 0.55\%$ /day, respectively. Therefore, *Tubifex* sp. is the most suitable feed for glass eels in captivity to achieve high survival rate and to attain maximum growth in shortest possible time. (Author's abstract)

Keywords: Glass eels, *Anguilla* sp., Culture, Feeding, *Tubifex* sp., Fisheries

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NP

0380

**Hatchery production and juvenile restocking of the white teatfish sea cucumber,**  
***Holothuria fuscogilva* (Cherbonnier, 1960)**  
*Molina, Dionel L. , Roa, Lyndon L. , Navarro, Victor R. , dela Peña, Jusua D. , dela Peña, GERALYN D. ,  
Gorospe, Jocelyn N. , Joy Guisando, Miahnie P. , Tubio, Emilie G. , de Guzman, Asuncion B. , Quiñones,  
Mariefe B. , Lumasag,*

The decline of *Holothuria fuscogilva* due to indiscriminate exploitation demands the urgent development of hatchery techniques in captive breeding to help increase its natural population. The successful spawning induction of broodstock from Lopez Jaena, Misamis Occidental produced juveniles in hatchery conditions. Survival was 0.38% after three months, which decreased to 0.04% after 10 months. Restocking of this cohort of juveniles back to Lopez Jaena showed rapid average growth from 0.76 g during the first month to 11g after three months. (Author's abstract)

Keywords: Sea cucumber, White teatfish, Hatchery, Production, Fisheries

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NP

### Ichthyoplankton assemblages in Manila Bay

*Gatdula, Norvida C. , Borja, Valeriano M. , Barral, Jezzalyn Gloria R. , Jose, Ellaine C. , Bugtong, Rizza Mae T. , Tobias, Marvin L., Furio, Elsa F.*

Manila Bay used to be one of the major fishing grounds in the Philippines. However, recent studies have determined that fish catches and the succession from valuable to lesser valuable fish being caught in the bay have been declining steadily. Fish larvae collection was carried out in the study to determine the ichthyoplankton assemblages in the bay. Eight established sampling stations were placed throughout the bay, with an average distance of 5-6 nautical miles and were sampled every other month from January to November 2017. A total of 860 fish larvae belonging to 28 families were collected. Results showed that there were more fish eggs and fish larvae during the March 2017 survey, a representative of northeast monsoon, with 530 ind/100m<sup>3</sup> fish eggs and 255 ind/100m<sup>3</sup> fish larvae. This was followed by the November 2017 survey, also a representative of northeast monsoon, with 529 ind/100m<sup>3</sup> fish eggs and 197 ind/100m<sup>3</sup> fish larvae. Most fish eggs were found in the northeastern, middle, and eastern part of the bay. Since fish eggs are drifters and move along the surface currents, they can be found throughout the bay. The concentration of fish larvae were mostly found in the eastern part of the bay. Fish larvae showed a shoreward transport, as more fish larvae have been consistently found near the coast, particularly in the eastern and northwestern part of the bay. Small pelagics (e.g., sardines, slipmouths, anchovies, and mullets) dominated the total composition of fish larvae family in Manila Bay. The most dominant fish families were Clupeidae, followed by Leiognathidae, and then Nemipteridae. Other families that complete the top five were Mugilidae and Gobiidae. (**Author's abstract**)

**Keywords:** *Ichthyoplankton, Manila Bay, Fisheries*

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NP

### Mesh size selectivity of surface and mid-water gill net for catching freshwater sardines *Sardinella tawilis* (Herre, 1927) in Taal Lake, Batangas

*Rubia, Marnelli C. , Alba, Elmer B., Perez, Marco A.*

Technical information on the mesh size selectivity for tawilis fishery in Taal Lake was still largely unknown or undocumented at present and various mesh sizes are employed to exploit the species in a variety range of sizes. The study investigated the mesh size selectivity involving gillnet fishery for *S. tawilis* using four differing mesh sizes (12.5K, 12K, 11K and 10K). Fishing trials were conducted in Taal Lake, Philippines from October 2014 to September 2015. A total of 4,456 *S. tawilis* was caught with the size range (total length) of 8.0-14.0cm. The seasonal changes in the gonadosomatic index (GSI) showed that *S. tawilis* spawns between March-May and August. Length at 50% maturity (L50) estimated as 11.66cm, was used as the criterion for selecting desirable mesh size. The optimal length was estimated for each mesh size employing Baranov-Holt method with the model for various mesh sizes. The estimated optimal lengths of *S. tawilis* were estimated at 10.6, 11.08, 13.07 and 14.53cm for the mesh sizes of 12.5K, 12K, 11K and 10K, respectively. Hence, the desirable gillnet mesh size for *S. tawilis* corresponding to length at 50% maturity was determined to be 11K. (**Author's abstract**)

**Keywords:** *Optimum mesh size, Selectivity, Sustainable exploitation, Gill net, Endemic, Fisheries*

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NP

### **Molecular identification of nematodes in rabbitfish (*Siganus guttatus*) from selected cage cultured areas in the Philippines**

*Garcia, Gemerlyn G. , Furio, Elsa F. , Gente, Angelie A. , Choresca, Jr., Casiano H. , Ca-as, Christine Grace P., Oculos, Ma. Theresa*

The rabbitfish, *Siganus guttatus*, popularly known as samaral or kitong, is widely cultured in brackishwater ponds, pens and cages as well as in sea pens and cages in several regions in the country. It is also been considered as a good mariculture species in terms of its desirable production traits and an excellent food fish that commands a high market price hence a greater profit margin. However, massive mortality was observed in some areas in the Philippines which was caused by parasitic infestation. A total of 55 individuals of *S. guttatus* were collected and samples were transported to the laboratory for parasitological analysis. Three (3) species of parasites were isolated in the study namely: *Anisakis pegreffii*, *Contracaecum ogmorhini* and *Spirocamallanus philippinensis*. DNA sequence and phylogenetic analysis confirmed the 99%, 82% and 99% similarity of the parasite DNA isolates to *A. pegreffii*, *C. ogmorhini* and *S. philippinensis*, respectively. The identified parasites were different species of nematodes with 25.45% prevalence and mean intensity of 3-5 parasite individuals per host. (Author's abstract)

**Keywords:** *Rabbitfish, Nematode, Molecular identification, Prevalence, Fisheries*

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NP

### **Optimization and validation of analytical method for sensitive analysis of histamine in fish using ultra high pressure liquid chromatography (UHPLC) with pre-column derivatization**

*Montejo, Ulysses M. , Cambia, Flordeliza D. , Perelonia, Karl Br*

This study optimized and validated a pre-column derivatization ultra high performance liquid chromatographic (UHPLC) for determining histamine in fish. The homogenized samples were extracted with trichloroacetic acid solution and derivatized with o-phthalaldehyde. Histamine was separated using C18-ODS (250 × 4.6mm, 5µm) with low pressure gradient elution, was determined through UHPLC with fluorescence detector, and was quantified through standard addition method. The linear calibration range was 10–60µg mL<sup>-1</sup> with a correlation coefficient of 0.9993. The average recoveries of histamine at different spiking concentration levels were found in samples with greater than 89% and precision smaller than 8.46%. The detection and quantification limit were 2.7 and 8.3µg g<sup>-1</sup>, respectively. The uncertainty was estimated to be ±0.45. The performance of the proposed method was checked with a proficiency test sample from the Food Analysis Performance Assessment Scheme as an external quality control. The resulting z-score was -0.2, which was found within the acceptable range of -2 ≤ z ≤ 2. The results indicated that this method was reliable, sensitive, reproducible, and practical for the routine analysis of histamine in fish. (Author's abstract)

**Keywords:** *Histamine, Liquid chromatography, Method validation, Proficiency test, Fisheries*

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**First record of bluenose large-eye bream fish *Gymnocranius superciliosus* (Sparoidea: Lethrinidae) in the Philippines**

*Dionisio, Jin Kevin S., Santos, Mudjekeewis, Carpenter, Kent, Williams, Jeff, Flores, Nick*

The Philippines is known to be the center of marine shore fish diversity in the world and has been the focus of extensive ichthyological studies since the early 1900s. However, there are still a number of fish species that are thought to be unrecorded. The National Fisheries Research and Development Institute has been collaborating with the National Museum of Natural History of the Smithsonian Institution, USA and the Old Dominion University, Virginia, USA since 2011 to inventory and DNA barcode commercially important fish species sold at the markets around the country. Three voucher specimens of Bluenose Large-Eye Bream, Lethrinid, *Gymnocranius superciliosus*, a first record for the Philippines, were obtained in Olongapo City and Tabaco City markets on July 15, 2016 and October 31, 2017, respectively. The specimens obtained were positively identified by P Borsa through our photograph and was further validated through clustering analysis using DNA barcode CO1. These Large-Eye Bream specimens have standard lengths ranging from 22.5 cm to 34.1 cm. Market vendors claimed it was caught in South China Sea and Lagonoy Gulf. This species is so far only known from Southwest Pacific: New Caledonia, Chesterfield Is., and Fiji. The discovery of this species in the Philippines adds to the knowledge and evidence that the country has indeed one of the richest fish fauna on the planet. (**Author's abstract**)

**Keywords:** *First Record, Gymnocranius superciliosus, Philippines, Fisheries*

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**Reproductive biology of big eye scad *Selar crumenophthalmus* (Bloch, 1793) from Manila Bay, Philippines**

*Santos, Mudjekeewis D., Rivera, Eleanor L., Bognot, Eunice DC., Lopez, Grace DV.*

This study investigated the biological aspect of *Selar crumenophthalmus* (Bloch, 1793) to help raise its protection and conservation in Manila Bay, Philippines. A minimum of 50 fresh samples were randomly collected from 16 selected sites in Manila Bay. The collected samples came from fishing gears such as gillnets (e.g., bottom gillnet, drift gillnet), stationary lift net (SLN), and trawl (T). A total of 728 individuals were sampled from January to December 2017. The total length of *S. crumenophthalmus* ranged from 13–24.6cm for females and 9.4–24cm for males. Hence, body weight ranged from 23.79–191.61g for females and 13.85–225g for males. The overall ratio between males and females conformed to the expected 1:1 sex ratio. Spawning was observed in various months, with high occurrence from January to March and August to October in females, and from August and December in males. An evident peak of Gonadosomatic index (GSI) in females was observed in February, with accounted mean GSI value of (1.99+0.23); and in January in males, with mean GSI value of (3.62+0.60). The estimated length at first maturity (Lm50) in female big-eye scads was at midlength of 20.25 cm and at midlength of 21.25 cm in males. To prevent the overfishing of this species, it is important to study its reproductive biology for management intervention. (**Author's abstract**)

**Keywords:** *Selar crumenophthalmus, Sex ratio, Spawning season, Gonadosomatic index, Length at first maturity, Manila Bay, Fisheries*

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## Reproductive biology of bigfin squid (*Sepioteuthis lessoniana*) in Western Visayas

Marjes, Mariel , Bognot,

The study investigated the reproductive characteristics of the commercially important squid *Sepioteuthis lessoniana* in Western Visayas in order to assess the status of this species and to generate scientific data that would serve as basis for the development of possible conservation and management measures in the region. A total of 584 squids (293 female and 291 male) from Estancia, Iloilo; Roxas City, Capiz; and Enrique B. Magalona, Negros Occidental were analyzed from February to September 2017. The mantle length size of the samples collected ranged from 7.8 to 34.4cm. Sex ratio of the samples was not significantly different ( $p>0.05$ ) from the expected ratio of 1:1, except for those collected during the month of July. Spawning season, as depicted in the maturity stages and in the Gonado-somatic Index (GSI) of the sexes, was between May to July, with peak at June. Mature individuals were observed throughout the months of collection. The reproductive characteristics of *S. lessoniana* showed changes in terms of sex ratio, maturity stages, and GSI; thus, spawning season can be predicted. If overexploitation occurs, then there would be decrease in spawning individual, thereby reducing the reproductive capacity of the population. **(Author's abstract)**

**Keywords:** *Sepioteuthis lessoniana*, Reproductive biology, GSI, Fisheries

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## Reproductive biology of Japanese thread fin bream, *Nemipterus japonicus* (Bloch, 1791) in Manila Bay, Philippines

Santos, Mudjekeewis D. , Torres, Jr., Francisco SB. , Rivera, Eleanor L. , Lopez, Gra

Information on the reproductive biology of *Nemipterus japonicus* (Bloch, 1791) in Manila Bay was investigated from 2017-2018. Monthly collection was conducted from selected sites of the bay. Collected samples came from various fishing gears such as bottom gillnet, bottom set long line, motorized dredge, multiple hook and line, and trawl. A total of 1,463 samples were collected with total length ranging from 6.5 cm to 23.2 cm for the female and 10.9 cm to 27.3 cm for the male. The weight ranged from 16.95 g to 168.52 g and 21.88 g to 276.04 g, respectively. Female species was the most abundant in the collected samples, particularly during the month of June. Overall mean sex ratio was 2:1 (F: M) which departed from the expected ratio of 1:1. This species showed a continuous reproduction with peak of spawning during the last quarter, particularly during November and December. This coincides with the result of the Gonadosomatic Index (GSI). The estimated length at first maturity ( $L_{m50}$ ) was at midlength of 16.25 cm for the female and 18.75 cm for the male. Fecundity ranges from 14,285 to 298,080 with size ranges 13.6 cm to 22.5 cm. **(Author's abstract)**

**Keywords:** *Nemipterus japonicus*, Sex ratio, Spawning season, Gonadosomatic Index (GSI), Length at first maturity ( $L_{m50}$ ), Fisheries

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## Saving mameng: A scientific approach towards sustainability thru NDF

Ventolero, Minerva Fatimae , Santos, Mudjekeewis D. , Dela Cruz, Lea

Considered as an endangered species by the Convention on International Trade Species of Wild Flora and Fauna (CITES) Appendix II and IUCN Red List, Napoleon wrasse (*Chelinus undulatus*), locally known as Mameng, is protected under RA 8550 as amended by RA 10654 wherein the law states “the ban on fishing of rare, threatened and regulated species”. With the ban in place for the species, fisherfolks in Tawi-Tawi raised their concern on its effect since their livelihood is also dependent on the species. In order to address the problem, NFRDI, together with other agencies composing the CITES Scientific Authority, decided to conduct a Non-Detrimental Findings (NDF) assessment which could support claims that the existing fishery practices do not impact the fish stocks and consecutively allow the ban to be lifted. The Method includes development of the localized NDF criteria, conduct of review, workshops and consultations, and on-site field validation. The results of the conducted NDF were presented during an organized public consultation with representatives from different groups of stakeholders in the different municipalities of Tawi-Tawi. The results showed a negative NDF, hence, the ban is still in place to protect the species. However, discussions on the results between the stakeholders and the CITES Management and Scientific Authorities were deemed to be positively accepted by the participants. Thus, they decided to create a Technical Working Group (TWG) for Mameng to carry-out activities that will address sustainability issues of the fishery. **(Author's abstract)**

**Keywords:** Mameng, NDF, Tawi-tawi, Fisheries

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NP

0390

### **Seed production and grow-out culture of the blue swimming crab *Portunus pelagicus***

*Badocdoc, Kimberly A. , Cabacaba, Non*

This study conducted four experiments that aimed to develop systems for crab grow out culture and evaluate the possibility of using hatchery-reared crabs for soft-shell production. The first experiment evaluated feed types in terms of survival of *P. Pelagicus* from megalopa to crab instar stage. The highest survival rates were observed in *Artemia* in the two trials conducted ( $31.0 \pm 3.0$  and  $40.0 \pm 3.8$  %). This study also evaluated and compared the survival and growth of day 20 crab juveniles in wooden tanks and in hapa net cages at three stocking densities. The highest survival rate was observed in wooden tanks at 75 ind.m-2 ( $20.7 \pm 3.8$  %), while the highest growth rate was observed in hapa net cages at 100 ind m-2 ( $20.6 \pm 2.7$  %). However, in terms of the different stocking densities in both the rearing mediums, no differences in survival, growth and carapace width were found, except at 50 ind m-2 stocking density in wooden tanks where there was significantly faster growth of crabs compared to the two other stocking densities. For the survival and growth of ~5 g crab juveniles reared in B-net cages, three stocking densities were tested. As of the 30th day of the experiment, the crab juveniles stocked at 15 ind m-2 had the highest survival ( $46.7 \pm 0.0$  %), while the crab juveniles stocked at 5 ind m-2 had the fastest growth ( $26.83 \pm 10.83$  %). This study also used hatchery-reared *P. pelagicus* crabs to produce soft-shell and evaluate its economics and profitability. Out of the 30 crabs placed individually in perforated boxes, 11 crabs with a total weight of 1.05 kg were harvested. Although only 37.0% of the crabs had achieved good quality soft-shell, the projected profit would still be 41% of the total investment after 10 harvests per year. **(Author's abstract)**

**Keywords:** *Portunus pelagicus*, *Megalopa*, *Stocking density*, *Soft-shell*, *Fisheries*

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0391

### **Seed production of sea cucumber growth, development and survival of *Holothuria scabra* larvae and juveniles in different rearing treatments**

*Cabacaba, Nonita , Campo, Crist*

This study investigated microalgal diets, seaweed diets, and water treatments to determine their effects on the seed production of *Holothuria scabra*. Results showed that combined-species feed of *Chaetoceros gracilis* and *Chaetoceros calcitrans* (*Cgr-Cc*) yielded the best survival rate ( $3.22 \pm 2.26\%$ ) compared with single-species feeds. *Cgr* yielded maximum survival rate of  $2.84 \pm 2.19\%$ , whereas *Cc* yielded  $2.12 \pm 1.97\%$ . Microalgal concentration of 50,000 cells mL<sup>-1</sup> of *Cgr-Cc* rendered remarkable final growth ( $3766 \pm 523 \mu\text{m}$ ) of the larvae; however, survival was minimal in the setup. Larvae were stunted in setups maintained at 10,000 cells mL<sup>-1</sup>. *Laurencia papillosa* (*Lp*), *Gracilaria bailinae* (*Gb*), and *Sargassum* sp. (*Srg*) were studied as feeds for juveniles. *Lp* rendered the highest survival rate of  $56.78 \pm 3.39\%$  in May 2016 and  $53.22 \pm 6.85\%$ . *Gb* rendered the lowest with  $8.87 \pm 1.68\%$  and  $19.44 \pm 1.24\%$ . The performance of dried seaweeds as feeds were also tested and compared with that of fresh seaweed diets. Survival was higher with fresh seaweeds than with dried seaweeds (fresh *Lp* =  $25.33 \pm 1.92\%$  vs dried *Lp* =  $16.67 \pm 12.02\%$ ; fresh *Srg* =  $22.33 \pm 4.21\%$  vs dried *Srg* =  $21.00 \pm 20.50\%$ ), although the mean differences in the survival rates were not significant ( $p > 0.05$ ). Feeding rates of seaweeds were also investigated. Results showed that juveniles had better growth and survival when fed with 7.5 Ld<sup>-1</sup> ( $19.00 \pm 0.76\%$ ) and 9 Ld<sup>-1</sup> ( $18.67 \pm 0.93\%$ ) than when fed with 4.5 Ld<sup>-1</sup> ( $17.17 \pm 3.44\%$ ) and 6 Ld<sup>-1</sup> ( $14.50 \pm 1.76\%$ ). However, the means were not significantly different ( $p > 0.05$ ). Water treatments for larval rearing were also studied. Sand-filtered seawater rendered highest survival rate of larvae ( $13.59 \pm 2.89\%$ ) followed by UV-treated seawater ( $4.40 \pm 1.23\%$ ); chlorinated seawater yielded the lowest survival rate ( $2.47 \pm 1.85\%$ ). The mean survival rates of the three treatments were significantly different ( $p < 0.05$ ). (**Author's abstract**)

**Keywords:** *Sea cucumber, Holothuria scabra, Seed production, Seaweeds, Specific growth rate, Fisheries*

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0392

### **Spatial and temporal variations of eutrophication in Manila Bay from 2017 to 2018**

*Jose, Ellaine C. , Gatdula, Norvida C. , Tobias, Marvin L. , Borja, Valeriano M. , Furio, Elsa F. , Bugtong, Rizza Mae T., Barral, Jezzalyn Gloria*

Eutrophication or the excessive nutrient enrichment of water bodies is a growing problem around the world. For the past years, it has become a serious environmental problem in Manila Bay and has continuously degraded its ecological integrity. In this study, the current state of eutrophication in the bay was documented to determine its spatial and temporal variations. Thus, 16 stations were sampled every two months from January 2017-November 2018. Based on the results, Manila Bay was still extremely contaminated with high nitrogen species, particularly nitrate ( $41.38 \mu\text{M}$ ), in the near-bottom waters. Other inorganic nutrients, such as nitrite ( $11.13 \mu\text{M}$ ), phosphate ( $0.62 \mu\text{M}$ ) and silicate ( $208 \mu\text{M}$ ), reached their highest concentrations near tributaries and coastal areas of the bay. Meanwhile, chlorophyll a-enriched areas were more noticeable in the northern part. This was in agreement with previous observation that eutrophication intensifies through time, especially during wet season (July to September). This resulted from the influx of elevated freshwater from rivers and surrounding coastal areas, mostly in the northern half of the bay, and was aggravated by contaminated wastewater effluent from anthropogenic activities. It also formed stratification in the water column, resulting in nutrient-enriched but dissolved oxygen-depleted near-bottom waters. Thus, this study proposed a closer attention to the areas identified to be the main contributor of excessive nutrient fluxes and develop effective mechanisms that will reduce the inputs of nutrients in the coastal waters, thereby preventing further undesirable changes in the ecosystem of Manila Bay. (**Author's abstract**)

**Keywords:** *Eutrophication, Inorganic nutrients, Manila Bay, Nitrate, Fisheries*

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### **Spatio-temporal distribution of heavy metals (Pb, Cd, and Hg) and hydrogen sulfide (H<sub>2</sub>S) in Manila Bay from 2017-2018**

*Tobias, Marvin , Jose, Ellaine , Gatdula, Norvida , Borja, Valeriano , Furio, Elsa , Barral, Jezzalyn Gloria, Bugtong, Rizza*

To appraise the extent of pollution in Manila Bay, heavy metal and hydrogen sulfide concentrations in 16 pre-established sampling stations were determined from 2017-2018, representing the different seasonal winds (Southwest and Northeast monsoons and Tradewinds or Easterlies). Trace amounts of these two physical parameters are naturally occurring in the marine environment. However, at high concentrations they can pose a significant risk to both the aquatic biota and man. Surface water and sediment samples collected from the bay were analyzed for heavy metals (Pb, Cd, and Hg) using atomic absorption spectroscopy (AAS) while H<sub>2</sub>S concentrations were determined by 4500-D Methylene Blue Method. Results revealed that Cd concentration in March 2017 reached a peak of 3010 µg/L, 301 times the critical value recommended by the DENR and ASEAN (10 µg/L). This dramatic spike was recorded on northern half of the bay, suggestive of irregular inputs from anthropogenic sources in the area. Very high Pb (196.9±105.6 µg) and Hg (0.14±14.54 mg/kg) levels were also reported to exceed their respective permissible limits, marking the bay as moderately heavy to heavy polluted with these metals. H<sub>2</sub>S concentration ranged from <0.49 mg/kg to 2.757 mg/kg all throughout the sampling months and stations, showing a sharp decline from the 2015-2016 data. The presented findings form the basis for future monitoring since alarmingly high heavy metal levels in Manila Bay were reported in 2017 and 2018. **(Author's abstract)**

**Keywords:** *Heavy metals, Hydrogen sulfide, Manila Bay, Sediment, Fisheries*

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### **Stock assessment of commercially important fish fauna in Manila Bay, Philippines (2012-2015)**

*Santos, Mudjekeewis D. , Torres, Francisco SB. , Lopez, Grace DV. , Bigalbal, Noimie R*

The study aimed to assess the status of Manila Bay, particularly on the commercially important fish fauna, and to determine the extent of their exploitation. Data collection through fish landing information (e.g., total catch per fishing operation, species composition, type of fishing gear, and its specific efforts, size measurements of selected fish species, and total number of fishing boats that landed per sampling day) started from January 2012 to December 2015 from 16 landing sites surrounding the bay. Twenty-seven types of fishing gears were observed. Ring net, trawl, and drift gillnet had the highest production among the gears. Fish catch were composed of 218 species of fish and invertebrates, and these were dominated by small pelagic species: *Sardinella gibbosa*, *S. fimbriata*, *Rastrelliger brachysoma*, and *Portunus pelagicus*. Tilapiine species, *Sarotherodon melanotheron*, were also observed in the landed catch but previous studies showed no record of the species in the bay. **(Author's abstract)**

**Keywords:** *Manila Bay, Fish fauna, Tilapiine, Exploitation, Fisheries*

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NP

## Supply and value chain analysis of maliputo *Caranx ignobilis* in the Philippines

Muyot, Myla C. , Balunan, Rielyn L. , Mutia, Maria Ther

Value chain analysis of *Caranx ignobilis*, a highly prized food and one of the specialty commodities of the Philippines, was conducted from January to December 2017 in nine regions of the country. The study aimed to identify the actors in the chain; evaluate value additions; and identify issues, concerns, and interventions in order to improve its market industry. A semi-structured questionnaire was administered to purposively selected respondents. Despite being a specialty commodity, *C. ignobilis* is simply an incidental catch-based and wild-dependent industry. Moreover, it is not an export commodity; thus, market is limited to domestic consumption, which is less a competitive industry. The key chain actors were fishermen, fish cage operators, and middlemen. Middlemen are further divided into small-scale (local vendors and peddlers) and large-scale intermediaries (commission agents, wholesalers, and restaurants). The study showed that production of *C. ignobilis* is still small, and culture of this species in fish cages needs to be improved so that it can be more profitable. Limited supply of fingerlings and lack of knowledge on how to culture properly limit the production of fish farmers. Most of the intermediaries were small entrepreneurs serving local markets. A wide range of intermediaries contribute to marketing inefficiency rather than adding real value to the product. Moreover, being a potential high-value aquaculture species, the following upgrading strategies are suggested to boost the industry: (1) conduct studies on its breeding to grow-out culture along with its technology transfer; (2) develop programs that increase awareness that *C. ignobilis* is a high-value species; (3) conduct market-to-market matching; (4) introduce *C. ignobilis* culture, especially to regions where it is not practiced to avoid pressure on wild stocks and improve its production; and (5) identify possible export market. (**Author's abstract**)

**Keywords:** *Caranx ignobilis*, Value chain analysis, Stakeholders, Fisheries

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## Technical efficiency analysis of red tilapia aquaculture farms in selected areas in the Philippines and Thailand: an application of stochastic frontier analysis

Vera Cruz, Emmanuel M., Rayos, Joseph Christop

The study analyzed the factors influencing the technical efficiency of red tilapia production in the Philippines and Thailand. Total enumeration of red tilapia cage farms were surveyed using face-to-face interviews. Data were collected through a structured questionnaire; the information was coded and analyzed through descriptive statistics and stochastic production frontier based on the Cobb-Dougllass production function. Generally, technical efficiency results showed that all fish farmers in the study areas were operating below the production frontier. Hence, there is need to investigate extensively the sources of inefficiencies in the socioeconomic variables and farm characteristics in order to increase production and efficiency. The maximum likelihood estimation of the stochastic production frontier showed that the mean technical efficiencies in the Philippines and Thailand were 0.32 and 0.78, respectively. Results of the model further revealed that red tilapia cage production in selected areas in the Philippines and Thailand is explained by area, feeds, and dissolved oxygen level. The policy implication is that there are still more opportunities to raise the present level of technical efficiency of red tilapia production in the two countries. (**Author's abstract**)

**Keywords:** Technical efficiency, Red tilapia, Frontier, Fisheries

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## Vulnerability assessment of selected fishery sectors in the Philippines using fishvool

*Santos, Mudjekeewis, Calderon, Gilda Joannah, Santos, Sher*

Climate change (CC) is one of the major threats to the Philippine fisheries. Studies have shown a decreased volume in the total fish production. In response to this, the National Fisheries Research and Development Institute (NFRDI) developed a sector-based Fisheries Vulnerability Assessment Tool (FishVool) for capture fisheries and aquaculture sectors. The collection of data was done through key informant interviews to assess the vulnerability score whether low, medium, or high by identifying three parameters namely sensitivity, exposure, and adaptive capacity. This study showed the assessments of these parameters of three capture fisheries sub-sectors namely: tuna, sardines and round scad fisheries and three aquaculture sub-sectors namely: tilapia, milkfish, and seaweeds. The assessed data of tuna sub-sector are medium for sensitivity, medium for exposure, medium for adaptive capacity and medium for vulnerability. The assessed data of sardine sub-sector are medium for sensitivity, medium for exposure, medium for adaptive capacity and medium for vulnerability. The assessed data of round scad sub-sector are medium for sensitivity, medium for exposure, medium for adaptive capacity and medium for vulnerability. The assessed data of milkfish sub-sector is medium for sensitivity; low for exposure, medium for adaptive capacity and low for vulnerability. The assessed data of seaweeds sub-sector are medium for sensitivity, medium for exposure, medium for adaptive capacity and medium for vulnerability. The assessed data of tilapia are medium for sensitivity, low for exposure, medium for adaptive capacity and low for vulnerability. These assessments were done to analyze the areas that need improvement based on the identified “weaknesses” of commodities. Such weaknesses can be improved by conducting training on adaptation strategies to decrease the vulnerability scores. **(Author's abstract)**

**Keywords:** *Climate change, Sensitivity, Exposure, Adaptive capacity, Fisheries*

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NP

## FOOD SCIENCE AND TECHNOLOGY

### Development of instant sinigang powder from katmon fruit (*Dillenia philippinensis*)

*Laborde, Gladys, Estrada, Miriam, Balagtas, Maribel, Tappy, Marchelita, Malabonga, Teejay, Dellosa, Sophiya, Oasan, Ruc*

This study was conducted to develop an instant *sinigang* mix using katmon fruit (*Dillenia philippinensis*), shiitake mushrooms, garlic, iodized salt, and sugar. Katmon, shiitake mushrooms, and garlic were dehydrated using the multi-commodity heat pump dryer for 13 hours. These were then ground and mixed with iodized salt and sugar. One sachet of the instant sinigang powder (45g) contains 191 kcal, 2.9 g of protein, 1g of fat, 42.2 g of carbohydrates, 141 mg of calcium, 47 mg of phosphorus, 1.1 mg of iron, 18 µg of vitamin A, 0.12 mg of thiamine, 0.07 mg of riboflavin, 1.4 mg of niacin, and 19 mg of vitamin C. The product was evaluated by 30 individuals from three age groups. The evaluation showed that the product was *liked very much* by evaluators ages 19 and above (color 53%, texture 53%, taste 33%, aroma 40%, and appearance 46%). The instant *sinigang* powder is stored in an 8.5x14cm polyethylene metallized zip lock packaging, and in the two months of observation, the quality of the product remained unchanged at room temperature. The cost of the product per 45g pack is PhP37.50. The instant *sinigang* powder from katmon fruit was found to be cheaper and more nutritious compared to similar products in the market. **(Author's abstract)**

**Keywords:** *Sinigang powder, Katmon fruit, Shiitake mushrooms, Food science and technology*

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### **Development of linear optimized fiber rich biscuits corn husk powder**

*Orcullo, Oliver James , Maximo, Angela Mae , Pineda, Dwight Krystienne , Marcelo, Maria Gabrielle , Castigador, Loren Christian , Maceda, Cyrus Junior , Leyva, Francine*

Corn is widely consumed and the husk is commonly regarded as waste. The study aimed to utilize corn husk as a material for the development of fiber-enriched biscuits that will provide one-third of the recommended dietary fiber for adults. Corn husk powder (CSP) and the corn husk biscuit (CHB) were analysed for proximate composition using AOAC Official Methods. CHB was formulated using linear optimization to obtain proportion of the raw materials. Proximate components of the CSP include moisture (6.67%), ash (1.91%), protein (1.55%), fat (<0.10%), total carbohydrates (89.87%). CSP has total dietary fiber (89.67 %) of which insoluble fiber (87.44 %) was considerably higher than Soluble Fiber (2.23%). Microbiological testing done on CSP showed salmonella was absent in 25g, TPC of 70CFU/g, yeast and mold count was <10 CFU/g, of which the levels are considered acceptable in Philippine FDA standards. The nutrient of content of CHB from the results of laboratory testing expressed as g/100g are 12.72 g of moisture, 2.31 g of ash, 6.81 g of protein, 20.70 g of fat, 57.46 g of carbohydrates, and 12.55 g of dietary fiber. CHB contains 34.5 g of carbohydrates, 4.1 g of protein, 12.4 g of fat and calorie content of 266 kcal per 60 grams. CHB was also subjected to sensory evaluation using 7-point Hedonic Rating Scale. CHB were generally liked in terms of appearance  $5.03 \pm 1.11$ , aroma  $5.36 \pm 1.12$ , flavor  $5.01 \pm 1.36$ , aftertaste  $4.70 \pm 1.39$ , and general acceptability  $5.11 \pm 1.23$  but was neither liked nor disliked for its texture  $5.10 \pm 1.23$ . It is recommended that the CHP and CHB be further studied for its digestibility and be further optimized for pilot scale production. **(Author's abstract)**

*Keywords: Linear optimization, Dietary fiber, Corn husk powder, Corn husk biscuit, Food science and technology*

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### **Development of low-calorie dark chocolate bars from Philippine cocoa (*Theobroma cacao* L.) beans**

*Santiago, Jianessa , Fortuna, Jenny , Corpuz, Verna , Juvinal*

This study was conducted to produce low calorie dark chocolate bars using Philippine cacao beans with stevia as sugar replacer. Sensory evaluation using consumer acceptance testing (n=50) determined the acceptability of the produced dark chocolate bards with stevia at different concentrations (3%, 4.5%, and 6%) in comparison with the locally available dark chocolate in the market (Valor and Hershey's). Bioassay was conducted to determine the glycemic index and effect on blood sugar level of the most acceptable treatment from the consumer test with commercial samples. Results showed that among the treatments with stevia, dark chocolate bar with 4.5% stevia was the most acceptable sample but with significantly lower ( $p < 0.05$ ) than commercial chocolates. Chocolate bar with 4.5% stevia had the lowest glycemic index compared with the commercial chocolates and the control with sucrose based on the blood glucose level of laboratory mice. This proves the low caloric value of the chocolate sample with stevia. Penalty analysis revealed that smoothness and flavor need to be improved in the product to further increase acceptability in a 9-point hedonic scale. Nonetheless, consumer testing showed that the product has a high market potential and can be one of the pioneering products to fully harness the Philippine cacao and will pave the way for quality, healthy, and truly Filipino chocolate products. **(Author's abstract)**

*Keywords: Chocolate, Philippine cacao, Stevia, Sensory evaluation, Penalty analysis, Food science and technology*

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0401

**Effect of alginate-calcium coating combined with natural antioxidants on quality of flying fish (*Cheilopogon intermedius*) fillets during refrigerated storage**

*Babaran, Ricardo P. , Monaya, Karmelie Jane M. , Simora, Rhoda*

Edible coating is a promising food packaging technology for reducing the degree of microbial spoilage and chemical changes in highly perishable foodstuffs like fish. The effect of alginate-calcium coating with added natural antioxidants such as vitamin C,  $\alpha$ -tocopherol, and tea polyphenol to maintain the shelf-life of flying fish (*Cheilopogon intermedius*) fillets was evaluated over a 21-day storage at refrigerated temperature ( $4\pm 2^{\circ}\text{C}$ ). Fillets were left untreated (control) or were treated with alginate-calcium coating (T1), alginate-calcium coating with 5% vitamin C (T2), alginate-calcium coating with 5%  $\alpha$ -tocopherol (T3), or alginate-calcium coating with 0.1% tea polyphenol (T4). Samples were analyzed periodically for microbiological (total viable count); chemical [pH, total volatile basic nitrogen (TVB-N), histamine, thiobarbituric acid, and *K* value]; and sensory attributes such as odor, color, flavor, and texture. The results indicated that coating treatments preserved the quality of flying fish fillets compared to the uncoated samples. Alginate-calcium coating combined with vitamin C (T2) more efficiently inhibited the growth bacteria as revealed by fewer total viable counts and reduced chemical spoilage—as reflected in pH, TVB-N, and *K* value than the other treatments ( $p<0.05$ ). Results of this study suggest that edible coatings could be possible alternatives to synthetic materials in maintaining or improving the quality of refrigerated fish. (Author's abstract)

*Keywords:  $\alpha$ -tocopherol, alginate-calcium coating, Flying fish, Tea polyphenol, Vitamin C, Food science and technology*

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NP

0402

**Effect of food additives on the quality of yacon (*Smallanthus sonchifolus*) syrup**

*Gervacio, Rose-Ann , Gandia, Angenica , Gantioque, Geraldine, Magatalas, Mayb*

Effects of different food additives combination on the quality of vacuum evaporated yacon syrup were evaluated in this study. The treatments applied were: Control: pure yacon syrup; T1, direct addition of 0.5% citric acid + 0.5% ascorbic acid solution to the extracted juice of yacon; T2, blanched and peeled yacon was soaked to 0.5% citric acid + 0.5% ascorbic acid + 0.1% calcium chloride solution; T3, blanched and peeled yacon was soaked to 0.5% citric acid + 0.5% ascorbic acid + 0.2% potassium sorbate solution; T4, direct addition of 0.1% sodium metabisulfite solution to the extracted juice of yacon. Findings showed that yacon syrups treated with food additives were insignificantly ( $p>0.05$ ) different with the control in terms of water activity and pH, but positively ( $p<0.05$ ) influenced its total soluble solids and viscosity. Yeast and molds count exhibited satisfactory result implying microbiological safety and stability of the produced yacon syrup. Sensory evaluation using consumer acceptance testing ( $n=50$ ) determined the acceptability of yacon syrup. The produced yacon syrup was evaluated in terms of its sensory attributes (taste, color, aroma, mouthfeel, and aftertaste). Pure yacon syrup (control) was the most liked ( $p<0.05$ ) by the panelists in all its attributes. To further increase the acceptability and marketability of T3, color, sweetness and aftertaste should be improved based on the result of penalty analysis. (Author's abstract)

*Keywords: Yacon syrup, Blanch, Overall acceptability, Vacuum evaporation, Food science and technology*

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### **Optimization of taro (*Colocasia esculenta*) and rice (*Oryza sativa* L.) as flour in the production of premix by d-optimal mixture design**

*Valerio, Jhomar , Taganap, Christine , Santiago, Elyss , Gantioque, Geraldine, Manaois, Rosaly , Morales, Ame*

This study aimed to utilize the taro tubers as flour in the production of a chocolate crinkle premix with standardized formulation using D-optimal mixture design. In addition, this study evaluated the influence of flour blends and their interactive effects, to obtain an optimal formulation with desirable characteristics, and assess the acceptability and formulation cost of optimized product produced. Dried taro and rice (NSIC Rc222) were collected and pulverized. Ten (10) formulations of different concentrations of taro flour (30-50%, TF), rice flour (10-20%, RF) and all-purpose flour (30-50%, APF) were used to produce chocolate crinkle premix. Responses observed in determining the effect of the varying percentage of flour blends are as follows: bulk density, water activity, moisture content, amylose content, water holding capacity and oil holding capacities were analyzed using the D-optimal mixture design. Results showed that the TF had positive effects in all responses. RF had minimum effect in all responses because of its concentration (10-20%). APF had positive effects in bulk density, water and oil holding capacity but negative effect on water activity, moisture content and amylose content. The optimum formulation obtained was 49.5% of taro flour, 16.99% of rice flour and 33.51% of all-purpose flour with 0.32 g/ml bulk density, 0.41 water activity, 9.59% moisture content, 22.60% amylose content, 62.04% water holding capacity and 107.18% oil holding capacity. **(Author's abstract)**

*Keywords: Taro flour, Rice flour, d-optimal mixture design, Optimization, Premix, Food science and technology*

### **Performance evaluation of some Philippine food testing laboratories through proficiency testing scheme on processed meat**

*Adona, Jr., Prudencio E. , Casuga, Jessel May D. , Caampued, Jennifer F. , Guerra, Melissa O. , Climaco, Jolly C. , Dajay, L*

The Proficiency testing (PT) is an effective tool for the determination of participants' performance through interlaboratory comparison and demonstration of the validity of the analytical results for global acceptability. The Food and Nutrition Research Institute, being the only ISO/IEC 17043:2010-accredited food PT provider in the Philippines, provides assistance to local testing laboratories in generating quality and reliable data through organization of PT schemes. A PT scheme on proximates (moisture, fat, protein, ash); minerals (calcium, sodium, potassium); saturated fatty acids; and cholesterol in a "sufficiently" homogenous and stable processed meat proficiency test item was provided to 28 registered government and private local testing laboratories. The assigned values (xpt) were derived as consensus of PT participants' results, calculated as the robust average ( $x^*$ ) from algorithm A or median ( $\text{med}(x)$ ) of the participants' results considering the number of data, based on ISO 13528:2015. PT participants' performance were evaluated based on  $z$  or  $z'$ -scores depending on the suitability of the consensus value. The xpt (per 100g) and the percentage of laboratories with "satisfactory" performance (i.e.,  $|z|, |z'| \leq 2.0$ ) were: moisture at 72.96 g (88%); fat at 5.20 g (80%); protein at 9.83 g (78%); ash at 4.37 g (82%); calcium at 13 mg (47%); sodium at 1,343 mg (81%); potassium at 262 mg (80%); saturated fatty acids at 2.18 g (50%); and cholesterol at 24 mg (83%). Participants that obtained "warning" and "action" signals were encouraged to conduct selfinvestigation and perform preventive and/or corrective actions to prevent recurrence of the problem and improve their performance. **(Author's abstract)**

*Keywords: Proficiency testing, Interlaboratory comparison, Assigned value, Proximates, Food science and technology*

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NP

0405

### **Phytochemical content and antioxidants capacity of locally cultivated vegetables in the Philippines**

*Manaois, Rosaly V., Zapater, John Edward I., Morales, Amelia V.*

The body of epidemiological evidence suggests the association between high intake of vegetables and fruits and lowered risks of life threatening diseases. However, consumption of vegetables among Filipinos remains low. Establishing the antioxidant profiles of locally grown plant foods is essential in recommending measures for maintaining or improving the health status of Filipinos. This work assessed the phytochemical content and antioxidant capacity of locally cultivated vegetables in raw and edible forms. The vegetables were evaluated for their total phenolic content (TPC) and antioxidant capacities using the 2,2-diphenylpicrylhydrazyl (DPPH) and 2,2-azinobis (3-ethylbenzothiazoline-6-sulfonic acid)-diammonium salt (ABTS) assays. The levels of phenolic compounds, namely, chlorogenic acid (CGA), quercetin, and cyanidin-3-glucoside (C3G) were assessed for vegetables with high TPC, DPPH, and ABTS values. The TPC of raw vegetables ranged 1.04–55.30mg gallic acid equivalents g-1, while antioxidant capacities ranged 0.58–380.57  $\mu$ mol Trolox equivalents (TE) g-1 and 1.38–180.88 $\mu$ mol TE g-1 for DPPH and ABTS, respectively. Boiling generally reduced the antioxidant capacities, but red coral lettuce, water spinach (lowland), and chili leaves consistently displayed the highest TPC and antioxidant capacities (raw or boiled). Red coral lettuce contained 12.78mg g-1 CGA and 0.37mg g-1 C3G, while chili leaves had detectable levels of quercetin ( $\leq$ 0.03mg g-1). These vegetables can serve as dietary sources of antioxidants to maximize intake by Filipinos for health promotion and disease prevention. (**Author's abstract**)

*Keywords: ABTS, Antioxidant capacity, DPPH, Total phenolic content, Vegetables, Food science and technology*

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0406

### **Quality evaluation of gluten-free loaf bread made with sweet potato flour, corn meal, and rice flour**

*Pante, Christopher V., Lagana, Arielle Marie, Pangan, Hyaci*

The lack of gluten in bread forms a structure that does not hold carbon dioxide produced by the yeast during fermentation. This results in a harder, drier, crumbling texture of the bread. This study aimed to characterize the physical, proximate and microbiological properties of the gluten-free loaf bread made with the combination of sweet potato flour, rice flour, and corn meal. There are evidences that show the possibility of sweet potato flour to be used in loaf baking. Rice flour and corn flours are commonly used because of their taste, texture, starch present, and other factors. Results show that according to the sensory evaluation, the best formulated gluten free loaf bread (F8) is made from 50% rice flour, 30% sweet potato flour, and 20% corn meal. The panelists preferred samples with light yellow color, slightly to moderately recognizable bread-like smell, slightly to moderately soft texture, barely to slightly coarse texture, and barely to slightly buttery flavor. F8 had a rather high specific volume with small air cells. Protein, fat, carbohydrate, starch, dietary fiber, moisture, and ash content of F8 based on the proximate analysis are 3.15 g/100 g, 4.07 g/100 g, 59.94 g/100 g, 43.43 g/100 g, 2.09 g/100 g, 31.70 g/100 g, and 1.14 g/100 g, respectively. F8 had acceptable yeast and mold count, while APC was classified as acceptable but in marginal class. Marginal classification does not mean that F8 contains pathogens and that the bread is unacceptable. It is recommended to incorporate substances that may prolong shelf life. Moreover, amount of

hydrocolloids should be greatly considered in GF bread making. In comparison with gluten-free loaf breads available in the supermarket, the experimental gluten loaf bread made with sweet potato, rice, and corn meal is significantly cheaper and more affordable than the commercial. **(Author's abstract)**

**Keywords:** *Gluten-free, Rice flour, Sweet potato flour, Corn meal, Quality evaluation, Food science and technology*

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2019 July,  
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0407

### **Relationship of frying temperature with frying life of selected oil types**

*Sigue, Alexandra Marie S. , Sagsagat, Maria Stephanie Jean D. , Malipot, Jessa Joy C. , Landicho, Venz Timothy Wesley C. , Romero, Kyle Maxinne R., Bullecer, Ernani*

Cooking oils used for long periods of frying are subject to oil deterioration. Total polar compounds (TPC) is the general parameter used to quantify oil deterioration wherein the maximum allowable TPC of cooking oil is 25%. The time it takes to reach 25% TPC was defined as the frying life of oil. This study was undertaken to determine the effect of oil type and frying temperature on frying life. The frying lives of coconut, canola, and palm oil as well as the oils heated at 150°C, 170°C, and 190°C were determined. Spectrophotometric analysis was performed and TPC values were calculated from absorbance using the equation:  $y = -2.7865x^2 + 23.782x + 1.0309$ . The mean frying lives were 20.24h, 10.80h, and 13.49h for coconut, canola, and palm oil, respectively. Regardless of oil types, the mean frying lives were 16.23h, 11.93h, and 13.82h at the following frying temperatures namely; 150°C, 170°C, and 190°C, respectively. Two-way ANOVA showed a significant difference in the frying lives of the three oil types and those of the three frying temperatures. Coconut oil had a longer mean frying life than both palm and canola oil. In terms of frying temperature, the longest mean frying life was observed in the oils heated at 150°C, followed by the oils heated at 190°C. There was a significant interaction between oil type and frying temperature observed in the study. **(Author's Abstract)**

**Keywords:** *frying life, oil type, coconut oil, canola oil, palm oil, frying temperature, Food science and technology*

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0408

### **Roasted local fruits seeds as coffee alternative**

*San Diego, Chiedel Joan , Palongpalong, Alfer , Larubis, Esmael , Cabanday, Jaspher, Layna, Joed , Valero, Deza*

This descriptive-experimental study aimed to identify the fruit seeds that can be utilized as alternative coffee bean and to determine the level of acceptability of the roasted local fruits seeds drink using the validated researcher-made checklist. The respondents were the 80 coffee drinkers- students of La Salle University and 3 baristas of the 2 coffee shops. The selected local fruit seeds had undergone sun-drying and the number of days differs according to the size of the seed. Autoclaving and boiling processes were done to eliminate the toxins of some seeds before roasting. Grinding of the seeds followed until it had coarse and fine texture. Laboratory study was done to identify its nutritive value and caffeine content of the drink. Drink tasting was then conducted. It was found that among the sensory characteristics, the appearance got the highest weighted mean and verbally interpreted as highly acceptable while the aroma got the least mean but still rated as highly acceptable. The roasted local fruit seeds drink contained high in potassium, calories, protein, sodium, and carbohydrates and had no sugar content. The researchers concluded that the appearance plays an important factor in accepting the roasted drink. The drink had no caffeine content. Through food/drink innovation, waste fruit seeds can be made as an alternative to the coffee drink. **(Author's abstract)**

**Keywords:** *Coffee, Roasted seeds, Alternative, Local seeds, Food science and technology*

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0409

**Sensory evaluation of calabash ice cream fortified with natural prebiotics**  
*Larubis, Esmael, Layna, Joed, Jomuad, Ma. Darielle Lou, Daloyoc, Kaisey Jien Marion, Aballe, Jes*

The purpose of this study is to formulate a French style ice cream flavoured with Calabash and fortified with prebiotics, coming from Yacon and Jicama. Sensory evaluation is conducted to determine the level of acceptability of the formulated Calabash ice cream. An experimental and descriptive method of research is used to quantitatively analyze the amount of nutrients present in the Calabash ice cream and the significant differences between the three samples conducted. The first sample with one cup of Calabash and one cup of prebiotic extracts has 10.59% fat, 3.27% protein and 14.83% carbohydrates. The second sample, with one-half cup of Calabash and one-half cup of prebiotic extract has 12.50% fat, 2.09% protein, and 17.92% carbohydrates. The third sample which contains one-fourth cup Calabash and one-fourth cup prebiotic extract has 13.54% fat, 1.57% protein and 20.03% carbohydrate. Based from sensory evaluation among 70 respondents, it shows that the most acceptable fortified Calabash ice cream must contain the highest amount of fat and carbohydrate. This is implied to the highest acceptability and satisfaction of the respondents to Sample 3. Analysis of variance (ANOVA) shows that there are significant differences to the means of the three Samples being analyzed. The amount of Calabash extract is inversely proportional to its level of acceptability. It is also noteworthy to stress-out that respondents aged 22-30 years old would prefer samples with highest calabash volume. It is then recommended that the stakeholders will take part in the formulation of this new and healthy Calabash ice cream fortified with prebiotics. (**Author's abstract**)

**Keywords:** *Calabash ice cream, Yacon and jicama, Calabash extract, Prebiotic formulated ice cream, Food science and technology*

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## FORESTRY

0410

**Canopy dynamics of typhoon-disturbed mahogany stand in the Mt. Makiling Forest Reserve**  
*Soriano, Merlyn S., Reyes, Jans Nexus I., Nicmic, Jean C., Israel, Kyle Pierre R., Alegre, Aldin C., Agudilla, Mary*

The study was carried out to analyze the bio-invasiveness and coexistence of big-leaf mahogany (*Swietenia macrophylla*) with native species after a typhoon disturbance in the Permanent Forest Laboratory Area 3 in the Mt. Makiling Forest Reserve. The study was conducted by strategically laying five 10-m×10-m quadrats. Canopy gaps were measured using hemispherical photographs with different exposure settings. Normalized difference vegetation index (NDVI) was employed as a prediction model to determine the silvicultural pathways. The five plots yielded a total of 293 individuals of 23 tree species which represent 21 genera under 15 families. Mahogany is the most dominant (93.4) and the most ecologically important (171.95) species. Seven new species were observed to coexist with mahogany plantation. These are narra (*Pterocarpus indicus*), amamali (*Leea aculeata*), Pará rubber (*Hevea brasiliensis*), lanutan (*Mitrephora lanotan*), tambalau (*Knema glomerata*), kapulusan

(*Nephelium ramboutan-ake*), and magabuyo (*Celtis luzonica*). The mahogany population structure shows a reverse J-shaped population curve, which reveals that future communities may be sustained. Hemispherical photographs revealed that light can still penetrate because the forest canopy is not totally closed, such that understory layers composed of seedlings and saplings may grow abundantly. *Arenga pinnata* serves as intermediate subcanopy. NDVI findings showed a drop in vegetation cover in 2006 and 2014, which can be attributed to typhoons Milenyo and Glenda. Recovery of vegetation after the disturbance is attributed to natural recruitment and regeneration. This study provides scientific understanding of natural canopy dynamics and silvicultural pathways, which may aid in forest management and conservation of the mahogany stand. (**Author's abstract**)

**Keywords:** *Bio-invasiveness, Coexistence, Silvicultural pathways, Forestry*

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0411

### **Changes in plant community structure of successional and mature secondary forest in Mt. Makiling Forest Reserve after two decades**

*Maldia, Lerma SJ. , Aguilon, Dianne Joy D., Cruz, Rex Victor O. , Luna, Amel*

To date, an estimated 875 studies have been conducted in the Mt. Makiling Forest Reserve (MMFR) but most were either short term in nature or without follow up studies. In this study a 4-ha long-term monitoring plot established in 1992 through the collaboration of the College of Forestry and Natural Resources, UPLB and the Japan International Research Center for Agricultural Sciences was re-surveyed for trees (>10cm diameter at breast height) tagged in 1992 and those that recruited beyond, including current regenerations. This was done to determine community dynamics of component tree species and assess recruitment strategies of forest trees in MMFR. Growth parameters, in terms of standing volume, as well as change in species diversity are discussed. Over time, the composition of the MMFR was consistently formed by numerous non-dipterocarp tree species, maintaining a species-rich secondary tropical rainforest. The three most occurring taxonomic families were Cannabaceae, Meliaceae, and Rubiaceae, while *Celtis luzonica* (Cannabaceae), the most dominant species recorded in 1992, is still the dominant species present in the standing canopy vegetation and regeneration. The smaller presence of dipterocarp species, which were the dominants in the original flora, indicated that the species have suffered heavy utilization in the past, with the result that numerous non-dipterocarp tree species now form the species-rich secondary tropical rain forest. This study is useful in understanding the dynamics of a particular forest ecosystem over time. (**Author's abstract**)

**Keywords:** *Community dynamics, Non-dipterocarp, Plant community structure, Forestry*

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0412

### **Characterization of mangrove forests of Surigao del Sur**

*Bantayan, Nathaniel , Tiburan, Cristino Jr. , Malabrigo, Pastor Jr. , Barua, Edlyn , Ugat, Beth Zaida , Israel, Kyle Pierre , Bayangos, Aldrin , Gabrie, Marie J*

Mangrove forests are important in carbon sequestration and other vital ecosystem services, such as protection from strong typhoons and storm surges. Studies have also revealed that a decrease in the mangrove area was observed in different parts of the globe. This study assessed the trends and characterize the diversity of mangrove forests in Surigao del Sur. Change analysis was employed using Landsat images in 1996, 2000, 2015, and 2017. Municipalities with persistent mangrove forests were also visited and transect lines were established covering

three major zones: seaward (0–100m), midward (101–300m), and landward (beyond 300m). In each zone, two 30m x 30m plots were set up and the number of mangrove trees were recorded. These data were used in the computation of relative frequency, relative abundance, relative density, and importance values. Consequently, biodiversity indices (i.e., Shannon, Simpson) and evenness were also obtained. Based on the analysis, mangrove areas in Surigao del Sur have decreased in 1996–2000 and 2015–2017 periods but increased in the 2000–2015 period. It was found that in 2015–2017 around 1,418.12ha of mangrove forests persisted, located in San Agustin, Hinatuan, Lianga, Lingig, Carrascal, and Bislig City. In terms of biodiversity, it was found that around 11 species from seven families were present in the area. *Rhizophora apiculata* (99%) and *Rhizophora stylosa* (81%) have the highest importance values. The landward zone in Caguyao, Bislig City turned out to have the highest Shannon (1.54) and Simpson indices (0.75). Results of the study can be used in improving the management of mangrove forests and in identifying critical areas that may need immediate intervention in the province. (**Author's abstract**)

**Keywords:** *Mangrove, Change analysis, Quadrat sampling, Diversity, Forestry*

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0413

### **Chemometric differentiation of Dipterocarpaceae wood species based on colorimetric measurements**

*Abasolo, Willie P. , Sevilla, Fortunato III , Kalaw, Justine M. , Gibe,*

The international trade of illegal timber often involves the misdeclaration of the wood species. A simple and reliable means for the differentiation of wood species could contribute to the control of this fraud. In this study, eight (8) commercially important and endangered dipterocarp timber wood species and mahogany were differentiated through colorimetric measurements carried out on hot water and ethanol extracts from the samples. Colorimetric measurements were done using a fabricated colorimeter that measured the absorption of blue, green, and red radiation. Chemometric analysis of the colorimetric data using principal component analysis (PCA) and hierarchical cluster analysis (HCA) revealed clustering, which enabled an efficient differentiation of the wood species. (**Author's abstract**)

**Keywords:** *Dipterocarps, Optical absorption, Pattern recognition, Wood extractives, Wood species differentiation, Forestry*

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NP

0414

### **Native trees on Mount Lantoy Key Biodiversity Areas (KBA), Argao, Cebu, Philippines**

*Rosales, Raamah , Nuevo, Ritchie U. , Alcazar, Steve Michael T. , Malaki, Archiebald B. , Lillo, Edga*

The forest cover of Cebu Island was now less than 1% of its total land area. The almost complete deforestation of Cebu Island has apparently led to the extinction of many native trees, birds, and other wildlife. Assessing native trees on Mount Lantoy key biodiversity areas (KBA) was important in providing materials to support the human decision-making process in the management of the area. Permanent plots with 20m x 100m dimension were established both in lower and upper elevations of Mount Lantoy KBA. A total of four plots were established in highly stratified vegetation to generate information in all vegetation classes. A total of 112 species, classified into 64 families and 84 genera, were recorded. Out of 112 species, 88 were native trees, 10 shrubs, three ferns, three herbs, four vines, and four epiphytes. Majority of the species were recorded in Plots 1, 2, and 4. Seventeen native trees were categorized as threatened—with two species considered as critically endangered, three endangered, nine vulnerable, and three other threatened species identified. Mount Lantoy KBA has high species diversity ( $H=3.5$ ),

dominated by the species of *Parishia malabog* Merr. (15.287%) in terms of diameter, richness, and density per hectare. Majority of the native trees have a diameter of 10–19 cm (66%) and basal area of 8 m<sup>2</sup>/ha. Native trees of Mount Lantoy were threatened by illegal cutting, hunting, and the rampant conversion of forests to agriculture, with disturbance index value of moderately disturbed. All this information on native trees were essential for decision making, particularly in the rehabilitation and conservation of Mount Lantoy KBA. (**Author's abstract**)

**Keywords:** Argao, Cebu Island, Key biodiversity areas (KBA), Mount Lantoy, Native trees, Forestry

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NP

0415

### **Nursery management techniques of four indigenous premium timber species propagated through wildlings** *Samsam, Charito L., Garma, Sergi*

The lack of quality seed supply and quality planting stocks are among the major impediments in scaling-up the rehabilitation of denuded forests. Wildlings can be used as a potential source of planting material; however, its survival rate in the nursery is very low. Hence, a study was conducted (1) to determine the best propagation techniques that could enhance root growth potential (RGP), seedling quality index (SQI), and survival using wildlings and (2) to assess the economics of producing quality planting material (QPM) by adopting the best management techniques. Four timber species were used: *Hopea plagata*, *Anisopthera thurifera*, *Shorea guiso*, and *Sindora supa*. Three nursery techniques were evaluated using different parameters: (1) IBA concentrations and dipping time (DT), (2) potting media combinations, and (3) applications of GA3 and fertilizer treatments. Results showed that growth and RGP of *A. thurifera* and *H. plagata* were maximized by 10 seconds DT in 50 ppm IBA. Wildlings of the four timber species grown in ordinary garden soil (OGS)+river sand (RS) at 2:1 ratio obtained higher height and diameter growth, RGP, and survival rate than the other potting media combinations used. Moreover, height and diameter growth of *S. supa* and *S. guiso* were also enhanced by the application of GA3. However, survival rate of *S. guiso* was higher without GA3 application. Likewise, the application of 5g 14-14-14 increased growth, RGP, SQI, and survival rates of both species. At a selling price of PHP 15.00 seedling-1, a net return of PHP 1.65–3.03 could be realized for every peso invested. It can be deduced that 10 seconds DT in 50 ppm IBA is ideal to enhance root development and growth of potted *H. plagata* and *A. thurifera* wildlings. The four premium timber species could be raised in the nursery using OGS+RS at 2:1 ratio. The application of 5g 14-14-14 is also essential to promote growth, RGP, SQI and survival rates of *S. supa* and *S. guiso*. (**Author's abstract**)

**Keywords:** Wildlings, Quality planting material, Root growth potential, Shoot-root ratio, Seedling quality index, Forestry

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 127  
2018/07,  
(Filipiniana Analytics)  
NP

0416

### **Properties and utilization of young-age yemane (*Gmelina arborea* Roxb.) for lumber production** *Cortiguerra, Emelyne C. , Bondad, Elvina O. , Alipon, Marina A., Alcachupas, Pablito L*

This paper presents the lumber recovery and lumber grade yields; strength properties, namely modulus of rupture, stress at proportional limit, and modulus of elasticity in static bending; compression parallel- and perpendicular-to-grain; shear; hardness; and toughness, including the cost-benefits, of 4-, 6- and 8-year old yemane (*Gmelina arborea* Roxb.) for lumber production. The study was conducted to evaluate the effects of age and sites on these

properties, recommend its end-uses, and evaluate the cost-benefits of converting the species at different ages for lumber production. The experimental materials consisted of three trees each from three sites in Caraga Region, Philippines, namely: Pating-ay, Prosperidad, Agusan del Sur (Site 1); Nong-nong, Butuan City (Site 2); and Las Nieves, Agusan del Norte (Site 3). Standard procedures for testing the abovementioned properties were followed. In the absence of lumber grading rules for industrial tree plantation species, individual boards were graded in green condition based on the U.S. National Hardwood Lumber Association standards. On the average, the 8-year-old trees obtained the highest average percent lumber recovery with 55.78%, 56%, and 54.89% for Site 1, Site 2, and Site 3, respectively. The trend of lumber recovery among sites also held true, with the 4- and 6-year old trees with values of 52% and 53.67% for Site 1, 51% and 53.33% for Site 2, and 51% and 52.11% for Site 3. Generally, the mechanical properties of 4-, 6-, and 8-year olds fell under moderately low (Class IV). All indicators show the viability of processing yemane from different diameters, ranging from 16.29 cm to 20.64 cm, belonging under 6- and 8-year-olds. (**Author's abstract**)

**Keywords:** *Cost-benefit, Lumber recovery and grades, Mechanical properties, Young-age Gmelina arborea Roxb., Forestry*

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Philippine Journal of Science, Volume No. 148 Issue No. 2, 237-248  
2019/06,  
(Filipiniana Analytics)  
NP

## GENERAL WORKS

0417

### **Assessing the state of professional practice of midwifery in the Philippines** *Hipolito, Josephine H. , Canila, Carmel*

Midwives have been the country's frontline health care providers in communities. Their role was expanded from largely providing maternal and child care services in the 1920s to provision of basic Primary Health Care services since 1970s. Despite their extensive roles, there has been no comprehensive enquiry on the professional practice of midwifery in the Philippines since it formally started in 1901. This study was conducted to (1) describe the evolution of midwifery education and regulation; (2) describe professional practice of midwifery and the midwives' role in the local health system; (3) identify gaps in the current midwifery practice, and; (4) recommend to improve and standardize the competencies of practicing midwives.

The study is qualitative with a grounded theory approach using face-to-face Key Informant Interview (KII), Focus Group Discussion (FGD), and document review. The study, conducted from January to December 2015, purposively sought experts from different fields of midwifery, including midwifery-service providers, birthing home managers from public and private sector, academe, Department of Health (DOH), development partners, the country's three leading midwifery organizations, and the Board of Midwifery (BOM) of the Philippine Professional Regulation Commission (PRC).

Changes in midwifery education, scope of practice and standards were in response to the country's health challenges in maternal and child health. Public midwives were frontline implementors of 57 DOH programs. Despite their vital role and expanded workload, the tenure or plantilla positions of government midwives continued to have the same salary grade promulgated in 2000 while others, although the numbers are unknown, do not have security of tenure. There were no learning and development initiatives designed to enable midwives to become implementors of multiple programs. Regulation of midwifery practice was not cohesive. The standards of practice were program-based and were scattered in different policies.

The study recommends that the DOH, PRC, and midwives' organizations review and revise the scope of midwifery practice in line with global standards, as well as to implement a competency-based career development pathway that is integrated with the regulatory system. (**Author's Abstract**)

**Keywords:** *professional practice, midwifery, primary health care, General works*

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### **The assessment of the of e-waste management generated from cellular phones, laptops, and personal computers in the Philippines**

*Alam, Z*

This study focuses on the management of e-waste generated by the disposal of personal computers, laptops, and mobile phones because of the extraordinary growth in the use of these products over the past few years by the Filipino population. The aim was to explore the current methods of disposal of the aforementioned gadgets and to gather baseline data in terms of the disposal methods of these three electronic gadgets within the geographical boundary of Metro Manila and the suburbs of Manila, Philippines. An attempt to find the level of awareness of the respondents about the hazards of e-waste was also made. The Filipino population largely stores three electronic gadgets, namely, cellular phones, laptops, and personal computers, once the models become old and obsolete. The other most popular disposal method is selling the gadgets to junk shops. A very low percentage of people actually recycled their products. Sixty-nine percent of the respondents did admit that they were actually concerned about the impact of improper disposal of e-waste on human health and environment. All of the respondents admitted that they had no idea about the final fate of the discarded electronic gadgets. Based on the results of the survey, a review of overall management of e-waste generated from these three gadgets in Philippines is recommended. These surveys and data are collected to arrive at an estimation of e-waste generated by the disposal of these three gadgets as well as help the stakeholders and the government agencies to formulate legislations and policies to manage e-waste effectively and efficiently in the Philippines. (**Author's abstract**)

**Keywords:** *E- Waste Assessment, Philippines, Toxic Electronics, E-Waste Management, Pollution, Recommendations, Health Impact, General works*

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2016,  
(Filipiniana Analytics)  
NP

### **Association of childcare practices and stunting among children beneficiaries of the pantawid pamilyang Pilipino program: a nested case-control study**

*Develos, Maribel M*

Childcare is a challenging task particularly for caregivers in urban slums. The Pantawid Pamilyang Pilipino Program (4Ps) aims to improve the beneficiaries' caregiving practices, which could compensate for the negative effects of poverty on children's nutritional status. The study was conducted to determine the association of childcare practices (CCP) and stunting among children beneficiaries residing in Pasay City. This nested case-control study included 7 to 9 year-old children cohorts who were enrolled in the 4Ps in 2008, comprising of 82 stunted and 97 normal children. The outcome and predictor variables were the child's height-for-age z score (HAZ) and household CCP, respectively. Multiple logistic and linear regression analyses were performed to determine the association between the desirability of HH CCP and stunting, and HH CCP score and HAZ, respectively. Six out of 10 beneficiaries had "desirable" CCP. Stunting was more likely observed among children whose households have undesirable CCP; who were enrolled in 4Ps at a younger age; had low birth weights; male; whose primary caregivers are less than 40 years old; whose maternal heights are less than 151 cm; whose primary caregivers had less than 7 years of education; and whose monthly household income is less than PhP 9,000. Undesirable CCP is associated with stunting, and the HH CCP score had a positive relationship with HAZ score among children. Desirable CCP decrease the likelihood of stunting among children. Therefore, improving the childcare practices of beneficiaries could decrease the prevalence of childhood stunting. (**Author's Abstract**)

**Keywords:** *children practices, childhood stunting, pantawid pamilyang pilipino program, well-being, General works*

### **Building resilience and poverty alleviation through tilapia-based skills and livelihood development in Northern Mindanao**

*Navarro, Victor M. , Perpetua, Aida D. , Moleño, Eugene P. , Navarro, Mark Anthony J. , Gonzales, Daniel M. , Bagayna, Floremie , Alia, Lee-Marc , Arriescado, Elgin M. , Roxas, Proserpina G., Sabilla, Roseller G*

This project aimed to teach the target beneficiaries skills and to assist them in establishing a tilapia-based livelihood in order to help them build resilience against environmental challenges and alleviate their economic condition. A total of 13 People's Organizations, one LGU, and a fisheries school in Regions 10 and Caraga were chosen as partner-beneficiaries. They were given hands-on trainings on tilapia hatchery operations, tilanggit production, and tilapia grow-out. The project also helped them to start their own livelihoods through applying their acquired skills. Start-up materials were provided: fingerlings, cage materials, feeds, and equipment. The activities engaged the participation of the local government unit, Department of Social Welfare and Development, Department of Trade and Industry (DTI), and Bureau of Fisheries and Aquatic Resources. The beneficiaries were also given trainings on feed formulation, entrepreneurship, bookkeeping, gender and development, and climate change. A total of 104,300 fingerlings and 6,180 breeders were released. Seven organizations are already operating their hatcheries and producing fingerlings for their use and for market. The tilanggit processed by the women have already reached the markets and provincial festivals. Their grown-out tilapia is sold in retail and in bulk. For environmental sustainability, the beneficiaries planted indigenous trees in banks in exchange for free fingerlings. DTI assisted the value-adding of their products and in facilitating linkages to other agencies to scale-up their livelihood activities. **(Author's abstract)**

**Keywords:** *Resilience, Tilapia, Tilanggit, Livelihood, Climate change, General works*

### **Citations searching in literature reviews**

*Antonio, Carl Abela*

The burgeoning wealth of available scientific information aided in part by (a) expansion in the definition of literature, (b) dramatic increase in the scientific output available for the scientific community's perusal, and (c) ease of access afforded by various databases and search engines poses several challenges to researchers and to the credibility of their research findings. One method to discourage reference to fraudulent, incomplete, or obsolete data in the literature is citations searching. This paper presents a short overview of citations searching, its advantages and disadvantages, as well as its implications for stakeholders in the academic community. **(Author's Abstract)**

**Keywords:** *Information storage and retrieval/methods, Research design, Review literature as topic, General works*

## The comparison of the different adjustment factors for admission to the University of the Philippines College of Medicine

*Ignacio, Katrina Hannah D. , Sevilleja, Jesus Emmanuel AD , Canal, Johanna Patricia A. , Ignacio, Sharon D. , Catabijan, Carlo G., Cruz, Maria Katrina Diana*

Among the different criteria, the General Weighted Average Grade (PMGWAG) holds the biggest bearing on admission for the UP College of Medicine. However, GWAs are not comparable across different courses, different batches, different UP units and different schools. An Adjustment Factor is necessary to make PMGWAGs comparable and to level the playing field.

This study covering a 24-year period aimed to compare various proposed Admission Adjusted Factors of %PMGWAG (Pre-Med GWAG) in terms of Pearson's Correlation, Linear Regression Models and Mean Differences with %MGWAG (Medical GWAG), Class Rank and Board Rating as Outcome variables.

Various proposed Adjustment Factors were applied to %PMGWAG of medical students from Class 1990 to Class 2014 and Pearson's Correlation, Linear Regression Models and Mean Differences with %MGWAG, Class Rank and Board Rating were derived and analyzed.

Adjustment Factor A3 as applied to %PMGWAG correlates best with Board Rating and Class Rank while Adjustment Factor A6 with %MGWAG. On Linear Regression, A3 likewise bested other Adjustment Factors in predicting %MGWAG and %Board Rating while A6 on predicting Class Ranking. Among the various adjustments, A3 exerted the most impact on the outcome variables, based on mean differences.

The A3 Adjustment Factor is the preferred and most ideal among the various proposed adjustment factors. Its application on %PMGWAG, correlated best with, most predictive of and most influential to %MGWAG, Board Rating and Class Rating. (**Author's Abstract**)

**Keywords:** *medical college admission, medical education, academic performance, UP College of Medicine, General works*

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2020/03,  
(Filipiniana Analytics)

## Effective practices of research supervisors in handling postgraduate students

*Yanilla, Ni*

There were issues and dearth of studies on postgraduate research supervision across all fields and discipline. This study sought to describe the effective practices of university research supervisors handling postgraduate students in education and health sciences.

A descriptive qualitative design was used to understand the effective research supervision practices based on the experiences of 10 university research supervisors in handling postgraduate students in the fields of education and health sciences. All supervisors voluntarily accomplished an online questionnaire consisting of 10 open-ended items. Their responses underwent thematic analysis.

Evidence of expertise among the research supervisors was established. Data from the responses of the research supervisors were grouped into themes and analyzed according to the conceptual models of effective research supervision of Lee [7] namely functional model, emancipation model, relationship development model, critical thinking model, and enculturation model. Most of the responses on effective practices fall under the functional model wherein supervisors need to have directing and project management skills. Practices under this model were further categorized into communication, feedback, monitoring, managing and research process-related matters. Distinct findings in this study categorized under the other models include having dialogue with supervisees, respecting supervisees as thinkers, and showing respect to supervisees. Ineffective practices were also recognized. They included not reading the supervisee's work, imposing solutions to supervisees, pressuring them and not taking advising duties professionally.

Most of the effective practices of research supervisors in handling postgraduate students are founded on their supervisory functions particularly in their directing and project management activities. (**Author's Abstract**)

**Keywords:** *postgraduate supervision, research supervision, research supervisors, conceptual models, functional model, General works*

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Philippine Journal of Health Research and Development, Volume No. 24 Issue No. 2, 67-73  
2020/06,  
(Filipiniana Analytics)

0424

### **Evaluation of the University of the Philippines Manila “awakening seminars”**

*Lingdas, Charmaine A. , Alto, Anne Marie D. , Javier, Richard S. , Villamor, Cynthia M. , Sana, Erlyn A. , Samaniego, Arlene A., Jemena, Fedelyn*

Staff development is essential in sustaining organizational efficiency. In 2016, the University of the Philippines Manila started conducting the “Awakening Seminars” among administrative personnel to foster smooth interpersonal relationships and operational efficiency.

This study was commissioned to determine the value of the seminars. It evaluated the trainees' perceived reactions, learning, and overall change in behaviors towards their work at the university.

Out of 321 personnel who completed the seminars, 96 were calculated as sample size. Participants accomplished a survey questionnaire and 67 valid responses were collected. Data were analyzed using means and standard deviations according to Kirkpatrick's Evaluation Model from Level 1: Reactions, Level 2: Learning, to Level 3: Behavior. Different ratings were compared with selected variables using analysis of variance.

Seven seminars were conducted from March 2016 to January 2017. Mean ratings showed that the seminars were well organized, relevant, and helped them appreciate their work, colleagues, and their workplace environment. Participants have high morale and felt privileged being in UP. Analysis of variance tests showed that evaluation ratings did not differ significantly with monthly take-home pay, tenure, performance, and job category. While these ratings are not directly translated as operational efficiency, results suggest participants' commitment to the university's goals.

UP Manila personnel appreciated the “Awakening” staff development program and can be replicated to all support personnel of the colleges. (**Author's Abstract**)

**Keywords:** *staff development program, awakening seminars, UP Manila as a workplace, General works*

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Philippine Journal of Health Research and Development, Volume No. 24 Issue No. 2, 74-81  
2020/06,  
(Filipiniana Analytics)

0425

### **Gaps in addressing road safety in the Philippines**

*Rivera, Adovich S. , Lam, Hilt*

Road traffic injuries were the second leading cause of death due to injury in 2003 in the Philippines. In 2011, the Philippine Road Safety Action Plan (PRSAP) was instituted. Five years into the program, latest data showed that the death rate due to road injuries continue to increase despite the presence of key legislation supporting road safety. This study was aimed at identifying the gaps in addressing road safety in the Philippines. Literature review and key informant interviews of representatives of the different agencies including the Department of Transportation and Communications (DOTC), Department of Public Works and Highways (DPWH), Road Board, Philippine National Police (PNP), Metro Manila Development Authority (MMDA), and Land Transportation Office (LTO) were conducted to identify gaps in the program. Key gaps include: weak leadership at the national and local level, limited material and human resources for enforcement of laws, and fragmented information system. These gaps should be addressed to improve the road safety situation in the country. (**Author's Abstract**)

**Keywords:** road safety, safety policy, Philippines, developing countries, General works

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Philippine Journal of Health Research and Development, Volume No. 22 Issue No. 2, 18-25  
2018/06,  
(Filipiniana Analytics)

0426

**Profiling "voluntary surrenders" of oplan tokhang in Marikina City, Philippines: an emic view**  
*Estacio, Leona*

This study was undertaken in response to the lack of contextualized and grounded description of surrendered drug offenders (e.g. voluntary surrenderers) provided to the media and to the public by the law enforcement agencies on the Oplan TokHang campaign of the Duterte administration.

This paper sought to provide a profile of "voluntary surrenderers" of Oplan TokHang in 4 selected barangays in Marikina City. Specifically, it aimed to describe their socio-demographic characteristics, drug use behaviors, underlying reasons for initial and continued drug use, severity of use, and the nature and reasons behind their participation to the Oplan TokHang campaign, respectively.

A total of 56 participants were surveyed and descriptive statistics was used in the presentation and analysis of data. These were triangulated by direct observation, local studies and international studies, data from national agencies and news reports.

Most of the voluntary surrenderers in the study were drug users rather than user-pushers and were predominantly single, male, high school educated and were observed to be in their most productive years yet unemployed. They abused shabu and marijuana and started to take drug in their mid-adolescent years. Although users for 1 to 2 years, more than majority of them were mild users, taking drugs on a weekly basis that were sourced from their friends and from drug pushers. Exposed to drug- using friends and relatives, most were initiated to drugs because of peer influence, personal and family problems. They continued to use drugs because they were not able to resolve these personal and social relations issues. Being jobless, most sustained their drugtaking behavior by committing petty crimes such as selling household goods, drug-pushing and theft. Afraid to be killed and wanting to be rehabilitated, they participated in the TokHang campaign for safety and for self-change.

Voluntary surrenderers in the study were not as violent and dangerous as generally reported by media and by law enforcers. As mild users, they were not those types that were considered as "beyond redemption" but were rather capable of self-change. These primary data were reflective of national reports that 90 percent of surrenderers were mild users. Policy-wise, the study suggests that government should, through the Oplan TokHang campaign, shift more focus in providing community-based treatment and rehabilitation program that is responsive, sustainable, protective, and rights-respecting of voluntary surrenderers. (**Author's Abstract**)

**Keywords:** war on drugs, oplan tokhang, voluntary surrenderers, drug users, user-pushers, responsive and rightsrespecting community-based treatment and rehabilitation program, General works

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Philippine Journal of Health Research and Development, Volume No. 22 Issue No. 1, 1-11  
2018/03,  
(Filipiniana Analytics)

0427

**Reflections on a qualitative interview**  
*Antonio, Carl Abela*

Interviewing is one of the more commonly deployed data collection method in qualitative research. Textbooks and journal articles abound that describe the process for conducting various types of interviews. In this paper, I offer a short methodological and reflexive discussion of an interview I conducted as part of a course requirement, focusing on the potential impact of the interview process on the collection and interpretation of data. The purpose

of this paper is to draw researchers' attention to some issues that may arise in the context of a qualitative interview, and to propose possible approaches to addressing these. (**Author's Abstract**)

**Keywords:** *reflection, qualitative interview, data collection method, interviewing, General works*

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Philippine Journal of Health Research and Development, Volume No. 23 Issue No. 2, 54-58  
2019/06,  
(Filipiniana Analytics)

0428

### **Road safety performance index in Metro Manila, Philippines: 2011-2015**

*Lu, Sophia Frances*

Road safety in the Philippines has been increasingly significant with the increasing level of industrialization and urbanization over the last decade. The main objective of the study is to determine the road safety performance for Metro Manila by computing for an index based on data and variables of road traffic over the past years.

The variables for index calculation included speed, alcohol, infrastructure, vehicle defect, and other unsafe driver behavior were drawn from the Metro Manila Development (MMDA) database complemented with literature review from several sources. Equal Weighting method was utilized, as this is the simplest yet least biased measurement suitable for the data at hand.

The Road Safety Performance Index for Metro Manila remains more or less constant over a five-year period, increasing and decreasing from 0.45 to 0.59 which means that Metropolitan Manila has fared poorly in all indicators. Metro Manila has a poor road safety performance as evidenced by the road safety index. There is a need to improve on all components of road safety identified in this study for the safety of road users. (**Author's Abstract**)

**Keywords:** *road safety, road safety performance, Metro Manila, traffic condition, road mortality rate, General works*

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Philippine Journal of Health Research and Development, Volume No. 22 Issue No. 1, 28-36  
2018/03,  
(Filipiniana Analytics)

0429

### **Using participatory curriculum development for barangay health workers in a local community: a pilot study**

*Pangilinan-Behino, Cecil Margarette E., Sy, Michae*

Reforms in health professions education in the past decade entails the development of effective curricula that impact and improve health outcomes. Along with health professionals, barangay health workers (BHW) are not spared from experiencing curricular mishaps when they undergo trainings for community health work. This article described the process of a participatory approach in curriculum development for BHWs in a local community in the Ilocos Region.

An exploratory sequential mixed method design was used for this pilot study. The method was framed from six (out of ten) steps in the Research and Development Cycle; these steps were categorized in three phases: 1) needs assessment, 2) participatory curriculum development, and 3) implementation of the curriculum and evaluation.

Our findings yielded both qualitative (Phases 1 and 2) and quantitative (Phase 3) data which were analyzed separately and sequentially. Phase 1 revealed findings based on the strengths, weaknesses, opportunities, and threats found in the community's health care context which were used to determine the four potential training topics to develop a curriculum. Phase 2 generated a curriculum on hilot wellness through the participation of the local government and curriculum experts. Phase 3 produced evaluative data on the reaction, learning, and behavior of BHWs towards the implemented curriculum on hilot wellness.

The participatory curriculum development process entailed the generation and analysis of data from the community that produces a curriculum for the community. This curriculum does not only offer sustainable and longitudinal health care services but is sensitive to the values and culture of the community while considering the notion that learning is not linear. This article demonstrated that a participatory approach in curriculum development within health professions education can be pursued to address the ever changing healthcare needs of local communities. (**Author's Abstract**)

**Keywords:** curriculum, health workforce, community health service, health personnel, public health, General works

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Philippine Journal of Health Research and Development, Volume No. 24 Issue No. 2, 1-13  
2020/06,  
(Filipiniana Analytics)

0430

### **Using the ServQual scale to measure client satisfaction in a rehabilitation teaching clinic in the Philippines** *Mendoza, Kristoffer*

Teaching clinics provide low-cost health programs while offering valuable learning opportunities for student clinicians, which then contributes to increasing health care accessibility. To date, there is a paucity of literature exploring the satisfaction of patient seen in rehabilitation teaching clinics in developing countries. The Service Quality (ServQual) Scale is a valid and reliable tool that has been used to measure client satisfaction in different work settings and industries.

The aim of this study was to demonstrate the usefulness of ServQual in measuring the satisfaction of clients in a rehabilitation teaching clinic in a developing country.

A cross-sectional survey was conducted for three months among CTS-AA (Clinic for Therapy Services- Adult and Adolescent Section) clients who are at least 18 years old; have attended at least three sessions; and can read. Prior to administration in CTS-AA, the ServQual scale was translated to Filipino, validated and pilot tested for reliability.

Thirty-two respondents were included in the analysis. there was no statistically significant difference between the expectation and the perceptions of the clients for the domains of reliability ( $z=1.799$ ,  $p=0.0721$ ), responsiveness ( $z=0.839$ ,  $p=0.4013$ ), assurance ( $z=1.914$ ,  $p=0.0556$ ) and empathy ( $z=1.772$ ,  $p=0.0764$ ). However, there was a statistically significant difference between the clients' perception and expectation for tangibles ( $z=4.117$ ,  $p<0.0001$ ) and between the overall client perception and expectation ( $z=4.086$ ,  $p<0.0001$ ). The overall ServQual score for CTS-AA is -0.3782.

The ServQual has been shown to be useful in assessing the satisfaction of clients in rehabilitation clinics and the specific areas that needs improvement. The tool can still be further improved by including items on cost, relationship of students with supervisors and outcomes of treatment. (**Author's Abstract**)

**Keywords:** client satisfaction, service quality scale, ServQual, quality of service, rehabilitation, teaching clinic, General works

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Philippine Journal of Health Research and Development, Volume No. 22 Issue No. 4, 17-27  
2018/12,  
(Filipiniana Analytics)

### Allelic diversity of selected Philippine Native Maize (*Zea Mays* L.) populations resistant and susceptible to corn borer

Canama, Alma O. , Diaz, Desiree , Guevarra, Preci

Corn borer infestation is a serious constraint in maize production. Assessment of allelic diversity of maize populations will provide relevant information essential for maize resistance breeding strategies. To date, no study on allelic diversity of resistant and susceptible populations to corn borer has been done on Philippine native maize populations. This study aimed to assess the allelic diversity of simple sequence repeat (SSR) loci linked to corn borer resistance. Two SSR markers associated with corn borer resistance (CBR) were used to evaluate the three susceptible and three resistant Philippine native maize populations. SSR markers IPBSSR013 and IPBSSR752 were utilized to assess corn borer resistant and susceptible lines. Five alleles were identified from IPBSSR752 and six from IPBSSR013, with an average allele frequency of 0.167 and 0.143, respectively. A total of 182 alleles were found in IPBSSR752 and 239 from IPBSSR013. Three alleles were found to be unique in highly susceptible lines and exhibited a more diverse set of alleles using IPBSSR013. Two distinct alleles only found in highly resistant lines and one allele only found in highly susceptible lines were identified using IPBSSR752. A dendrogram was constructed at 0.73 similarity coefficient wherein nine clusters were generated. Cluster 1 was the largest group and consisted mostly of the highly resistant lines and Cluster 5 consisted of populations that are highly susceptible. A unique individual, which is only 45% similar to the rest of the samples evaluated, was identified from a highly susceptible population collected from Bukidnon. The SSR markers can be used to distinguish and screen pest-resistant maize lines. (**Author's abstract**)

**Keywords:** Allelic diversity, Philippine native maize populations, SSR analysis, Corn borer, Downy mildew, Genetics

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2018/07,  
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NP

### Genetic diversity analysis and population structure of Philippine traditional pigmented rice

Jones, Huw , Boyd, Lesley , Jarana, Annalhea , Kretchmar, Tobias , Rañeses, Mary Ann , Bulatao, Roxanne M. , Ferrer, Marilyn C. , Caguiat, Xavier Greg I. , NMBanjo,

Pigmented rice possesses exceptional nutritional qualities and health benefits. There are several traditional pigmented rice varieties in the Philippines. However, knowledge about their population structure and genetic diversity is limited. Here we explore genetic diversity and population structure of Philippine traditional pigmented rice. The collected accessions (696) were genotyped with the 6K and 7K Infinium SNP array. Nonredundant markers (1,686) were retained for downstream analyses after filtering and linkage disequilibrium pruning. Accessions of unknown origin (92) were removed from the collection. The model-based clustering substantiated by principal component and phylogenetic analyses revealed the presence of two main clusters, *indica* and *japonica*. Duplicated samples were recorded (282) and excluded. Diversity parameters assessed using 322 unique accessions revealed a moderate diversity of *indica* ( $H_e=0.26$ ), and *japonica* ( $H_e=0.21$ ) group. Across regions, diversity was higher ( $H_e=0.28$  to  $0.35$ ). Genetic differentiation between *indica* and *japonica* groups was very high ( $F_{st}=0.51$ ). At the regional level, no differentiation ( $F_{st}=-0.007$ ) and significant differences ( $F_{st}=0.30$ ) between groups were observed. The Philippine accessions were genetically distinct from Indian and Chinese accessions, but show a high genetic connectivity with accessions from Taiwan. This unique resource is a valuable asset for genetic dissection of nutritional components and identification of valuable genes, which will contribute to the improvement of the nutritional value of modern rice. (**Author's abstract**)



**Keywords:** *Diversity, Germplasm, Pigmented, Population structure, Rice, SNPs, Genetics*

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NP

0433

### **Genetic variability among full-sib progenies of orange-pigmented segregant of Philippine maize accession**

*Laude, Tonette P. , Purificacion, Marynold V. , Beltran, Ayn Kristina M. , Macasaet, John P*

Biofortification to improve provitamin A content of maize is becoming a consideration in maize breeding. This study evaluated the genetic variation and heritability for carotenoid-related compounds of the orange segregant of a Philippine maize accession, UPLBCnN68. Entries used for the experiment included yellow varieties (IPB Var 9, IPB Var 11, and IPB Var 13); UPLBCnN68(C0); and 44 full-sib progenies. ANOVA for total carotenoids and beta-carotene contents showed highly significant differences ( $P < 0.01$ ) among entries. Broad-sense heritability was observed to be high for beta-carotene (77.7%) and low for total carotenoids (27.5%). The experimental procedure to measure total carotenoids may need to be refined to improve estimates of heritability. Positive genetic gain is expected for total carotenoids and beta-carotene when these traits are selected simultaneously at 25% selection intensity. Hence, the genetic variability among full-sib progenies of the orange pigmented segregant of UPLBCnN68 showed potential to improve and develop a maize cultivar with high carotenoid contents. (**Author's abstract**)

**Keywords:** *Maize, Carotenoids, Beta-carotene, Provitamin A, Genetics*

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NP

0434

### **Insights from the genome-wide resistance gene analogs of durian: characterization, phylogenetic analysis, and RGA-linked SSR marker development**

*Latina, Romnick A. , Habunal, Rosteo R. , Lantican, Dar*

Durian (*Durio zibethinus*), widely known in Southeast Asia as the "King of fruits", has recently gained an economic importance due to its increasing demand in the global market. The recent publication of the durian genome has paved the way for the comprehensive analysis of the set of genes tightly associated to several agricultural traits, thus, maximizing durian's production potential. We present the first-ever report of the in-depth genome-scale analysis of resistance gene analogs (RGAs) in durian through state-of-the-art bioinformatics pipeline. We identified 1,164 RGA candidates using the RGAugury bioinformatics toolkit from a pool of 44,794 durian gene models downloaded from the public repository. Among other sequenced agricultural crop genomes, durian has the highest number transmembrane-coiled-coil (TM-CC) and coiled-coil-nucleotide binding site-leucine rich repeat (CNL)-containing domain RGAs. Using the information of the physical location of the RGAs and GMATA pipeline, we designed 1,642 RGA-linked SSR markers. Molecular evolutionary analysis of the core set of candidate RGAs using MEGA7 revealed conserved clustering of gene models characterized with a specific RGA domain. The molecular phylogeny constructed in this study, in addition to the RGA-linked SSR markers developed, will provide a framework for the effective gene pyramiding approach to breed for increased resistance of durian against wide range of pathogens and insect pests. (**Author's abstract**)

**Keywords:** *Durian, Resistance gene analogs, Molecular phylogeny, SSR markers, Genetics*

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**Isolation of a *CEL 1* homolog in tomato (*Solanum lycopersicum* L.) fruit as a cost-effective endonuclease source for targeting induced local lesions in the genome (TILLING) analysis**

*Galvez, Hayde F. , Lantican, Darlon V. , Naredo, Maria Elizabeth B. , Alcasid, Roche*

CEL 1, an endonuclease originally purified from celery, has been used in TILLING (Targeting Induced Local Lesions IN the Genome) analysis to cut the hairpin loop and single-strand DNA generated from heteroduplex of mutant and wild DNA molecules. However, one major limitation as with most mutation screening technologies and especially in a large-scale application is the availability of affordable sources of endonuclease. This study searched for *CEL 1* gene homologs in tomato through Basic Local Alignment Search Tool for nucleotides (BLASTn) and relevant bioinformatics analysis in public genomic databases. Results showed that the *SIENDO 1* gene (SGN Accession Number Solyc02g078910.1.1) of tomato (*Solanum lycopersicum*) has the highest homology of 78% to *CEL 1* among all the *Solanum* species. As annotated, the *SIENDO 1* gene has a genome sequence length of 2.182 Kb and consisting of eight and nine intron-exon sequences, respectively. For molecular confirmation, polymerase chain reaction (PCR) primers were designed to target the conserved gene region of *SIENDO 1*. The amplification and specificity of these primers were further verified first by *in silico* PCR prior to synthesis. The designed *SIENDO 1*-specific DNA marker has successfully amplified the target gene in five tomato varieties in actual wet-laboratory PCR experiments. Interestingly, the designed marker was able to cross-amplify orthologous regions (candidate regions of nuclease *PA3*, TIGR LOC\_Os04g54390) in Nipponbare and IR64 rice varieties. Once validated using a wide-range of crop species, the developed *SIENDO 1*-specific DNA marker can be potentially used in rapid detection of gene homologs in other plants. The isolation of the *SIENDO 1* enzyme was also done using a modified protocol for *CEL 1* isolation in celery. Through preliminary EcoTILLING with rice positive control samples, the purified *SIENDO 1* from unripe fruits of non-transgenic tomato was confirmed to have the same mutation cleavage specificity as that of the *CEL 1* endonuclease. Unlike celery, tomato fruits are readily available in any vegetable market, shop, or store in the Philippines. Likewise, they can easily be grown in greenhouse and field production. (**Author's abstract**)

**Keywords:** *CEL 1, ENDO 1, Single-point mutation, TILLING, Tomato, Genetics*

**Searching for salinity tolerant rice genotypes among hybrid parental lines**

*Jerick Viz., Pacada, Imeldalyn , Desamero, Nenita , Santiago, Jasmin II , Valida, Gelyn*

Salt stress negatively affects crop growth and agricultural productivity. To counter abiotic stress such as salinity, hybrid rice may be used because of its known genetic plasticity. In this study, the salinity response profile was revealed through salinity tolerance screening at seedling stage (SALTSSS). Using SALTSSS, the selected genotypes was evaluated through their salinity reaction using Modified Standard Evaluation Score. Na<sup>+</sup> and K<sup>+</sup> accumulated in shoot and roots were quantified through ion content determination using Atomic Absorption Spectroscopy. Results showed that three cytoplasmic male-genetic sterile, seven restorer, 15 maintainer, and 10 elite lines had tolerant to moderately tolerant genotypes for salinity. There were genotypes that had comparable, and even greater, total root length, nodal root length, lateral root length, and shoot and root biomass, as compared with the tolerant check (FL478). Also, high Na<sup>+</sup> accumulation in shoots and roots was observed in some genotypes with moderate tolerance and also exhibited less minimal injury in their leaves. The determined salinity tolerant

rice genotypes can be used as parents in the future to develop superior F1 hybrids adapted to saline environment.  
(Author's abstract)

**Keywords:** *Salinity, SALTSSS, Hybrid parental lines, CMS, F1 hybrids, Genetics*

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## HEALTH AND WELLNESS

0437

### **Academic resilience among selected students of the School of Health Sciences- Baler, Philippines**

*Sana, Erlyn A. , Salvacion, Maria Lourdes Dorothy S. , Yanilla, Ni*

Since 1976, the School of Health Sciences (SHS) in the Philippines has produced a broad range of health professionals serving depressed and underserved communities. Most researches about the SHS present the impact of its unique community-based ladder-type curriculum and only a few focus on the lived experiences of its students. This study described how the lived experiences of SHS students with their community-based curriculum manifested as academic resilience. This is an exploratory social research. Data were obtained from key informant and focus group interviews, observations of purposively chosen students, teachers, and alumni in Baler Campus, and document review. Data were analyzed using iterative terms and concepts describing respondents' patterns of activities that establish norms in SHS. Joint displays of these norms were constructed to describe the students' academic resilience. Admission in SHS requires students to undergo a stringent, often political recruitment process. While in the degree program, students go through constant financial constraints, demanding academic requirements, and challenging balance of hospital and community work with their personal and academic lives. The interplay between inner strength and external support promoted academic resilience. Studying in the SHS is a transformative learning experience. Students experienced multi-faceted problems requiring them to resiliently meet academic standards and maintain their own well-being. The culture of 'damayan' was an important source of psychosocial support. The SHS curriculum and culture are most instrumental in promoting academic resilience among its students. (Author's Abstract)

**Keywords:** *academic resilience, School of Health Sciences, ladderized curriculum, community-based curriculum, Health and wellness*

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2018/12,  
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0438

### **The Ibalois of Benguet as active agents in health negotiations**

*Achanzar-Labor, Honey Libe*

The Ibalois in La Trinidad, Benguet are witnesses to health negotiations that had been subjected to historical and material change.

To present indicators of resistance—the struggles, the apparent ambivalence, and the aspirations of the Ibaloi people in relation to health negotiations, as indicative of their being active agents in confronting change. Its ultimate objective is to show how the Ibalois have managed to not allow themselves be subjected to the biological reductionism of “medical gaze” as they assert the value of a number of traditional health and cultural practices amidst historical and material change.

A case study research design with Key Informants Interview (KII) as data collection technique is used as design for the study. To collect data, fifteen key informants were interviewed, eight from the folk medical sector and seven from the professional medical sector. Emic viewpoint was used in the presentation of data to analyze cultural phenomena from the perspective of one who participates in the culture being studied. Data from the folk medical sector were triangulated with data coming from local and international studies and with reports coming from the professional health sector: records from barangay and provincial health clinics managed by nurses and midwives as well as data coming from a local tertiary hospital and a national media news coverage.

The struggles of the Ibalois are acts of resistance as they confront both traditional health practice or change. Their ambivalent emotions manifest creative responses to the diurnal or apparently humdrum occurrences that they encounter. Their aspirations indicate their hope and constant desire for a better future, and particular to this study, better health conditions. Indeed, health negotiations in Barangay Bahong, La Trinidad, Benguet and the continued relevance given to the mambonong are not indicative of a petrified indigenous.

Amidst the various historic turns and power shifts in the Cordillera region, the Ibalois have portrayed themselves as human agents—not just as one objective force in society—who define their culture (i.e. health practices) themselves in as much as this gives meaning and relevance to their lives. (**Author's Abstract**)

**Keywords:** *mambunong (manbonong), material shift, historic turns, cosmopolitan, Ibaloi (Ibaloy), folk health sector, Health and wellness*

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2018/03,  
(Filipiniana Analytics)

0439

## **Perceptions on abuse of Filipino older persons: their safety status and treatment of their social networks**

*Constantino, Rose E. , Urgel, Elvira L. , Dela Cruz, Dorothea C. , Barcelo, Teresita I. , Cuevas, Pearl*

Filipino older persons have four important concerns namely: security in old age, health status, impact of aging, and elder abuse. Elder abuse committed to older persons in their homes or their community is alarming. How their social networks (i.e., their family, friends, relatives, and significant others) treat them plays a crucial role to their well-being. The aim of this study was to explore the perceptions on elder abuse and safety status of Filipino older persons along with the treatment afforded to them by their social networks. The study also determined such perception to be able to devise cost effective, community-based interventions to address elder abuse.

The study used mixed methods design and the Experience of Abuse Suspicion Index (EASI) tool, a questionnaire along with the demographic profile of the participants. The results were tallied and analyzed using descriptive statistics. How social networks treat them, and their safety status was explored using researcher-made open-ended questions analyzed using the qualitative approach.

Findings revealed the perceptions of Filipino older persons on elder abuse, with participants from the 60-69 age group and predominantly female, with no work and have low monthly income. The major themes generated from the qualitative findings were relationship issues with self, environment, coping, abuses, and values. Several sub-themes were also discovered and were related to the findings. An awareness campaign on the issue of elder abuse in Philippine society was recommended. Educating social networks about the perils of abuse is crucial in maintaining the safety of older persons. A monitoring system must be developed at the barangay level and policies must be put in place to address the concerns of elder abuse. (**Author's Abstract**)

**Keywords:** *elder abuse, Filipino older persons, safety status, social networks, Health and wellness*

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2020/03,  
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### **Globalization as a component of the job demands-resources model on employee work-life balance in an American BPO in the Philippines**

*Arceta, Katheri*

The sense of control that employees experience when they are able to remain competent and efficient in the workplace while enjoying a healthy personal life with enough time for leisure activities is referred to as work-life balance. In the workplace, while employees must remain focused and efficient amidst numerous tasks, it is imperative that they maintain a degree of satisfaction and contentment with regard to their personal life.

This study aims to examine the effect of globalization on employees' work-life balance in an American BPO situated in the Philippines. This was examined by testing whether the data obtained from Company X followed the Job Demands-Resources Model (J D-R Model).

Data were collected by administering an online survey using convenience sampling. Categorical Principal Component Analysis (CatPCA) was used for easier interpretation of the linear combinations of categorical variables. Cronbach's Alpha tested the reliability of the data. Bivariate relationships were then explored using the bivariate Pearson Correlation. Finally, the Path Analysis was utilized to determine how significant and to what degree are the causal relationships among the variables being investigated.

The study has proven that the J D-R model is a promising framework to establish the relationship between globalization and work-life balance. The data gathered in this study revealed that employees who are provided with increased job resources experience job satisfaction that result to positive work-life balance. Likewise, decrease in burnout is significantly related to work-life balance. Although globalization is not significantly associated with work-life balance, it is significantly correlated with role conflict, a component that is related to exhaustion.

Globalization has no direct effect to the work-life balance of employees working in Company X. (**Author's Abstract**)

**Keywords:** *work-life balance, globalization, job demands, job resources, job satisfaction, burnout, Industry*

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2019/09,  
(Filipiniana Analytics)

### **Use of biochars from biomass wastes in enhancing soil resiliency to the changing climate**

*Valdez, Walter , Villegas-Pangga, Gina, Lacayanga, Jonathan , Mozo, Michae*

This study examined the application of biochars to restore degraded sites that are often unproductive and prone to soil erosion due to the changing climate. Two consecutive pot experiments were conducted at the Agricultural Systems Institute-University of the Philippines Los Baños. Sweet corn (*Zea mays*) was used as the test crop grown in an acidic sandy loam soil (*Cumulic Hapludolls*) collected from a degraded upland area in Sariaya, Quezon. The biomass wastes charred to biochars were as follows: corn cobs, rice straws, rice hulls, and water hyacinth (*Eichhornia crassipes*). Results showed that fertilizers alone were outperformed by biochar-fertilizer combination treatments in corn dry matter yield production. The corn cob biochar combined with chemical fertilizer produced the highest dry matter yield, closely followed by water hyacinth biochar-fertilizer mix. When the biochars were mixed to organic fertilizers, the latter produced the highest biomass, followed by rice straw biochar-fertilizer mix. These findings may be due to the chemical and physisorption properties of biochars and the high heterogeneity of its micro-and nano-structures. Biochars are essential not only for modifying soil functions; they also affect various soil properties and microbial transformation of nutrient. Thus, its application may improve the productivity and fertility of degraded soils. Attempts have been made to present biochars as capable of improving the resilience

capacity of soil toward sustainability of production without adversely affecting the environment. (**Author's abstract**)

**Keywords:** *Agricultural wastes, Charcoal, Soil resiliency, Pyrolysis, Industry*

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2018/07,  
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NP

## INFORMATION AND COMMUNICATIONS TECHNOLOGY

0442

### **Evaluation of sonic fidelity of full and approximated HRTFs with reverberation from the sonic fidelity of loudspeakers**

*Ong, Clement , Kung, Edward , Gordiel, Garyl , Cullano, Archie , Chiu,*

The goal of a music playback system is to reproduce as closely as possible the sound experience of live music. Despite the excellent frequency response afforded by smaller, lighter transducers, headphones produce an unnatural "in the head" sound experience that many acute listeners find distracting.

Head-related transfer functions (HRTFs) are an individualized summarization of the direction-dependent acoustic filtering a free-field sound undergoes due to a person's head, torso, and pinna varying as a function of source position and having large intersubject variation. The common acoustical pole and zero (CAPZ) model requires far fewer variable parameters to represent HRTFs. In this study, different approximations of the CAPZ model are processed and evaluated in their ability to emulate the external sound field of loudspeakers while headphones are worn.

The subjective results show that there was no audible drop in quality when HRTFs were incorporated to the sound and that no approximation was singled out as having the best sound quality, but it was observed that the amount of balance between the poles and zeros had an audible effect to the listeners. (**Author's abstract**)

**Keywords:** *Sonic Fidelity, Head-related transfer functions (HRTFs), Common acoustical pole and zero (CAPZ), Information and Communications Technology*

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2012,  
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NP

0443

### **FIESTA: the Filipino initiative on electronic structure theory and applications**

*Chung Wilfredo Credo , Lee, Hayan, , Lee, H*

FIESTA—the Filipino Initiative on Electronic Structure Theory and Applications—a new computational chemistry software is developed. The new software is capable of doing groundstate self-consistent field (SCF) single-point restricted Hartree-Fock (RHF) calculation of polyelectronic and polyatomic systems using the Slater-type orbital basis set STO-3G. The new program implements well-known quantum mechanical theories for practical calculations. FIESTA is written using two programming languages, namely C and FORTRAN. It is accurate and user-friendly. It runs efficiently under the Linux operating system and is able to reproduce the energies calculated using well-established standard quantum chemical software products Gaussian, Firefly and Molpro. To our knowledge, FIESTA is the first and only molecular modeling software developed in the

Philippines to date. The software will be extended to calculate the properties of systems such as atoms, molecules, ions and formula units using more sophisticated basis sets and quantum mechanical techniques. (**Author's abstract**)

**Keywords:** *FIESTA, Self-consistent field (SCF), Restricted Hartree-Fock (RHF), Information and Communications Technology*

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2012,  
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0444

### **Ideal flow traffic analysis: a case study on a campus road network**

*Saloma, Czarina , Gardon, Roselle Wednesday , Teknomo,*

Traditional traffic assignment models often use historical travel demand, such as the costly origin-destination flow distribution and actual flow distribution, as inputs in determining the most efficient distribution of flow on a road network. In this paper, the authors examine the ideal flow network (IFN) model, a novel and alternative traffic assignment model. The IFN model is compared with a traditional traffic assignment model using a generic model comparison method. The application of the method is presented using a campus road network as a case study to examine the importance of understanding the road network structure—by making a comparison between the results of a traditional traffic assignment model and the IFN model to gain nuanced insights into the distribution of the traffic flow. The authors suggest that—while both models can yield almost the same result—the IFN model has the advantage of using a stochastic matrix, which is more readily available than demand data. The IFN model is likewise more geared toward evaluating the ideas of solving the traffic problem through simulation modeling, which—as a form of social engineering—is easier to stabilize into traffic management. (**Author's abstract**)

**Keywords:** *Ideal flow analysis, Traffic analysis, Traffic assignment model, Information and Communications Technology*

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NP

## **LIBRARY AND INFORMATION SCIENCE**

0445

### **Three-step approach to edge detection of texts**

*Mendoza, Renier G. , Recio, Kristine*

We proposed a three-step image segmentation approach to determine the edges of images containing old texts. In general, texts from old books and articles tend to be very noisy. Thus, we first employed a suitable denoising method to obtain a smooth approximation  $\tilde{I}$  of a given image  $I$ . Then, the fuzzy edge map  $E$  was obtained using the gradient of  $\tilde{I}$ . This gradient map gave an estimate of the edges of the texts. For the second step, the method of  $k$ -means++ with two clusters was employed to separate the edges from rest of the image. Because a smooth approximation of the image was used, the edges obtained are "thick." And so, in the last step of the our method, the binary image generated from the previous step was post-processed using a thinning algorithm. We implemented our method to images containing *Baybayin* texts from the National Museum of the Philippines. (**Author's abstract**)

**Keywords:** *Edge detection, Image denoising, method of  $k$  - means++, Thinning algorithm, Library and information science*

## LIVELIHOOD

0446

### **Effective storage method for shallot onion, *Allium cepa* L. var. *ascalonicum*** *Imbat, Resurreccion Bernadette C. , Dumaoal, Aleta E. , Atis, Marissa I. , Gabriel, Maura Lu*

Shallot (*Allium cepa* L. var. *ascalonicum*) is a multiplier type of onion commonly grown in Ilocos. Farmers prefer to use the bulb, rather than the true seeds, as planting material. Thus, shallot farmers have to store their planting materials through hanging and piling for the next cropping season. This has become a problem to farmers because their practice is not effective in keeping the bulbs from deteriorating. The Mariano Marcos State University evaluated different storage methods in shallot and assessed the quality of shallot stored for 2-5 months. Results showed that hanging and piling were effective for two months, but using paper box with rice straw was effective for five months. Using paper box with rice straw was effective in prolonging the shelf life of shallot onion. After five months of storage, the bulbs had 55.17% bulb weight recovery, 9.49% rotting, minimal sprouting (3.94%), and VQR of 7 (minimal deterioration). The technology of storing shallot using paper boxes with rice straw is recommended for small-scale storage. This technology is useful to shallot onion farmers, who keep their bulbs for planting materials. Through this technology, the problem of shallot farmers in keeping their seed materials can be addressed. (**Author's abstract**)

**Keywords:** Shallot onion, Storage method, Rice straw, Storage practice, Bulb recovery, Livelihood

## MARINE SCIENCE

0447

### **Growth, biomass yield, and proximate composition of sea vegetable, *Caulerpa macrodisca* (Bryopsidales, Chlorophyta) cultured in tank** *Zuldin, Wahidatul Husna, Shaleh, Sitti Raehanah Muhamad , Shapawi, Rossit*

*Caulerpa macrodisca* Decaisne, 1842 is a siphonous green macroalgae that has been reported to be distributed around southwest Asia (Sri Lanka); South China Sea; southeast Asia (Indonesia, Philippines, Singapore, and Vietnam); and Pacific islands (Samoan archipelago). However, the cultivation and consumption of *C. macrodisca* in the reported region were very uncommon due to the limited research on this green seaweed species. Thus, this study reported the growth rate, biomass yield, and proximate composition of *C. macrodisca* cultured in the tank. The *C. macrodisca* was successfully grown in the tank within 40d under the following conditions: salinity (30.29–32.18ppt), temperature (28.03–31.42°C), dissolved oxygen level (DO; 4.75–5.21mg L<sup>-1</sup>), pH (7.62–8.06), and light intensity (50.77–87.55μmol photons m<sup>-2</sup> s<sup>-1</sup>). The average specific growth rate of *C. macrodisca* in the tank was as high as 5.13±0.06% g day<sup>-1</sup> – as indicated by average mass increments in terms of fresh weight (from 16.56±0.17g to 129.30 ±2.83g), disc portion (from 30–60 discs to >100 discs in each tank), disc diameter (from 0.24±0.33cm to 2.42±0.18cm), and frond length (from 0.82±0.14cm to 14.51±0.27cm). The average biomass yield of *C. macrodisca* in the tank was 114.58±0.67 g m<sup>-2</sup> day<sup>-1</sup>. A proximate analysis was performed on the harvested *C. macrodisca* – with values (%) of 20.84±0.41, 19.74±0.24, 1.34±0.05, 21.79±0.08, and 93.35±0.13 for crude



protein, crude fibre, crude lipid, crude ash, and moisture content, respectively – comparable to the proximate content of wild *C. macrodisca* except for the slightly lower crude fiber content and higher ash content. This study suggested that *C. macrodisca* would perform equally well in tank with good proximate composition. In conclusion, this study is significant to provide a baseline data of an alternative *Caulerpa* species (*C. macrodisca*) for cultivation. (**Author's abstract**)

**Keywords:** *Caulerpa macrodisca*, Growth rate, Proximate composition, Seaweed culture, Marine science

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## MATHEMATICS

0448

### **Aboveground biomass density of capisaan landscape estimated using landsat 8 data** *Vallesteros, Shierel F. , Castañeto, Elmer T. , Castañeto, Yolina T. , Rodriguez, Ramil S. , Vallesteros, Arvin P. , Saballa, Almin*

The study employed remote sensing data and field measurement in estimating the aboveground biomass (AGB) of the Capisaan landscape in Kasibu, Nueva Vizcaya, which features many different land uses and land cover types. Its land cover is predominantly dipterocarp forest and karst forest interspersed with citrus orchards and patches of vegetable gardens. AGB densities were estimated using regression models whose independent variables consist of Landsat 8 bands, vegetation indices, and band ratios. Two sets of Landsat 8 data were used because of cloud contamination; hence, two sets of models were derived. The best two models, based on RMSE, have either Band 1 and Band 6 or Band 1 and Band 3 as predictors. The landscape contains around 285,140 tons of aboveground biomass translating to 200 tons ha<sup>-1</sup>. The bulk of this total AGB is found in dipterocarp forest, as expected. The large proportion of low-biomass land uses and land cover types such as citrus orchard, cultivated area, betel pepper gardens, and grassland, pulled down the average AGB density of the entire landscape relative to that of the dipterocarp and limestone or karst forests. Tree crown closure is significantly correlated to most of the Landsat 8 bands, vegetation indices, and band ratios, implying that Landsat 8 can be used to estimate the tree crown closure of varying land cover types. On the other hand, percent ground cover is significantly correlated to a smaller number of spectral variables. (**Author's abstract**)

**Keywords:** Above ground biomass, AGB density, Landsat 8, Mathematics

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NP

0449

### **Data mining using clustering technique as a basis in developing a gamified learning system**

*Pagudpud, Peter Paul P. , Pagudpud, Melidio*

Gamification, or the integration of game rudiments into a nongaming environment, is becoming popular in education as a way to promote engagement and motivation in the learning environment. However, if gamified learning systems are to be used in schools, developers should have a good understanding of target users. This study applied data mining using clustering technique for knowledge extraction from the results of the National Career Assessment Examination (NCAE) in the Division of Quirino. The NCAE is an examination given to all Grade 9 students in the Philippines to assess their aptitudes in the different domains. Clustering the students is helpful in conceptualizing and developing a gamified learning system. With the use of the RapidMiner tool,

clustering algorithms such as density-based spatial clustering of applications with noise (DBSCAN), kmeans, k-medoid, expectation maximization clustering, and support vector clustering algorithms were analyzed. The silhouette indexes of the said clustering algorithms were compared and the result showed that the k-means algorithm with  $k=3$  and silhouette index equal to 0.196 is the most appropriate clustering algorithm to group the students. Three groups were formed with 477 students in the determined group (cluster 0), 310 proficient students (cluster 1), and 396 developing students (cluster 2). The data mining technique used in this study is essential in extracting useful information. **(Author's abstract)**

**Keywords:** Data mining, Clustering technique, Gamified learning system, Mathematics

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 2018 July,  
 (Filipiniana Analytics)  
 NP

0450

### **Development of a patrolling scheme for Brgy. Tatalon, Quezon City using vertex weighted graph, graph nomination and graph partition**

*Giron, Michael James D. , Decio, Kenneth Q. , Cuevas, Leonardo S. , Brazil, John Mico P. , Rosal, Au*

Brgy. Tatalon is located in District 4 of Quezon City. Tatalon is a highly populated area and has both commercial and residential areas. Just like any barangay in the Philippines, the leadership has patrolling personnel known as barangay tanod. As of March 2016, there were only 18 tanods who should patrol the barangay's 21 streets at different times of the day. In this study, a patrolling scheme for the barangay was developed using graph domination, graph partition, and simple statistics. The map of the area was represented by a graph, with streets being the vertices; edges were determined if two streets had an intersection. Instead of giving weights to the edges, weights were assigned to vertices. The weights correspond to the average crime rate per day, which were provided by the local police station covering Brgy. Tatalon. Graph domination is then used to find a dominating set. A procedure was then developed to determine the number of tanods to be assigned to each shift. It was decided that three shifts be used and that an average of 22 barangay tanods must patrol the barangay during every shift. **(Author's abstract)**

**Keywords:** Graph, Weighted graphs, Graph domination, Patrolling scheme, Mathematics

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 2018 July,  
 (Filipiniana Analytics)  
 NP

0451

### **A family of congruent number elliptic curves with rank $>2$ derived from difference of biquadrates**

*Dimabayao, Jerome , Corpuz,*

It is widely known that a positive integer  $n$ , which can be written in the form  $a^4 - b^4$ , for integers  $a$  and  $b$ , is the area of some right triangle with rational side lengths. Equivalently, the congruent number elliptic curve  $E_n: y^2 = x^3 - n^2 x$  has rank of at least 1. This study attempts to increase the bound on the rank by considering positive integers  $n = a^4 - b^4 = d^4 - c^4$ , which are positive integers that can be written as a difference of two fourth-powers in two distinct ways. To do so, we utilize a result by Euler which provides a parametrization for positive integers of such form to show, via method of two-descent, that the infinite family of congruent number elliptic curves  $E_n$  has rank at least 2 over  $\mathbb{Q}$ . **(Author's abstract)**

**Keywords:** Elliptic curves, Congruent numbers, Euler, Biquadrates, Twodescent, Mathematics

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### **Instructional practices of secondary mathematics teachers and predictors of school achievement on mathematics: a basis for a teacher development program**

*Gragasín, Jr., Virgi*

This study examined the instructional practices of secondary public school teachers of mathematics in Nueva Vizcaya and the achievement of the schools where the respondents were teaching, and conceptualized a Teacher Development Program for the teachers. The study utilized the descriptive-correlation type of research and used several techniques in the gathering of data (i.e., questionnaire, interviews, and review of literature). Results of the study showed that there was a positive correlation ( $r=0.239$ , with  $\alpha$  level= $0.008$ ) between the teachers' level of professional development and school achievement; and a positive correlation ( $r=0.353$ , with  $\alpha$  level= $0.001$ ) between the level of awareness and practice of recent developments in math education and school achievement in the Division Achievement Test (DAT) and National Career Assessment Exam (NCAE). After finding out that there was a positive correlation between DAT and some of the instructional practices, and a positive correlation between NCAE and some instructional practices, a rundown of instructional practices that were "not much practiced" and "never practiced" was compiled, which served as basis for the Teacher Development Program. **(Author's abstract)**

**Keywords:** *Instructional practices, Teacher development program, Mathematics, Division Achievement Test, National Career Assessment Exam, Mathematics*

### **The spectra of the cartesian product of some special classes of asymmetric, circulant and $r$ -regular digraphs**

*Jos, Isag*

Two classes of asymmetric, circulant, and  $r$ -regular digraphs were dened in [4]. These digraphs are denoted by  $\sim Cr_n$  and  $d\sim Cn$ . The former is an orientation of the  $r$ th power of the cycle  $Cn$ . Another pair of asymmetric, circulant, and  $r$ -regular digraphs were introduced in [5]. One belongs to the class of tournaments, and the other is an orientation of a class of complete bipartite graphs. The former is denoted by  $\sim Tn$ , and the latter is denoted by  $\sim Km;m$ . In [4] and [5], the singularity and nonsingularity of these classes of digraphs were investigated. In [7], the spectra of the aforementioned special classes of digraphs and their complements were determined. A binary operation on digraphs is the cartesian product of digraphs. This paper gives the spectra and establishes some properties of the resulting digraph when the cartesian product of the digraphs given above are obtained. **(Author's abstract)**

**Keywords:** *Asymmetric, Circulant,  $r$ -Regular Digraphs, Mathematics*

## Success probability of an $n$ -step process with $n$ independent step probabilities

Nocon, Ederlina G. , Wee, Andrew Phi

A process is defined as a series of actions or steps taken in order to achieve a particular end. Currently, there are a wide range of studies involving different types of processes ranging from engineering, business, biology, to information theory. We are interested in a new type of process study, labelled as Process Based Strategy Model. The process specifically looks into the success probability of an  $n$ -step process with  $n$  independent step probabilities. In our model, there are exactly  $n$  steps that lead to the desired goal  $X_n$  a success in step  $i$  leads to step  $i + 1$  but a failure in it only leads to goal  $X_{i-1}$  and thereby, a failure in achieving the end goal  $X_n$ . We want to maximize the success probabilities of each step in order to assure the fulfillment of the end goal  $X_n$ . We accomplish this by developing theorems that adjust the success probabilities of each process' steps. Another method of achieving our objective is by replacing a certain step of the process with one or more steps which results to a higher overall success probability. We also used some functions which possibly model real-life variables to correspond to success probabilities. Lastly, we apply the process based strategy model on a scenario which shows how elements of a population are moved through the process with the concepts of saturation and cycles. (**Author's abstract**)

**Keywords:** *Process Based Strategy Model, Alternate Step(s) Approach, Success Functions, Target Saturation Number, Mathematics*

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2016,  
(Filipiniana Analytics)  
NP

## On the construction of some LCD codes over finite fields

Nocon, Ederlina G. , Lina, Eusebio

Linear codes with complementary duals (LCD codes) are linear codes that intersect with their duals trivially. In this paper, we construct some families of LCD codes using Massey's characterization of an LCD code. In particular, we obtain some classes of binary LCD codes using the permutation matrix and the all-one matrix. We also explicitly construct generator matrices of LCD codes using the generator matrices of self-dual codes and binary Hamming codes. For  $3 \leq r \leq 7$ , the binary LCD codes obtained using the Hamming matrix  $H_r$  are optimal. We also consider some known methods of combining two or more codes such as the direct product, direct sum, and Plotkin sum. We show that the direct product and the direct sum of two LCD codes are also LCD. We also prove that the permutation equivalence of codes preserves the LCD-ness of linear codes. (**Author's abstract**)

**Keywords:** *LCD codes, Complementary dual codes, construction of LCD codes, Binary LCD codes, LCD codes from known linear codes, Mathematics*

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Manila Journal of Science, Volume No. 9 Issue No. 1, 1-15  
2016,  
(Filipiniana Analytics)  
NP

## On the exponential diophantine equation $3x + by = (b + 1)z$

Bacani, Jerico B. , Mina, Renz Jim

The solutions of exponential Diophantine equations of type  $ax + by = cz$  (Equation 1) have been studied for many different variations of  $a$ ,  $b$ , and  $c$ . Particularly, Jesmanowicz investigated it when  $(a, b, c)$  are Pythagorean numbers, and he conjectured that if  $a$ ,  $b$ , and  $c$  satisfies  $a^2 + b^2 = c^2$ , then (Equation 1) has only the positive integer solution

$(X,Y,Z) = (2,2,2)$ . As an analogue of Jesmanowicz's conjecture, Terai proposed that if  $a,b,c,p,q,r > 2$  are fixed positive integers satisfying  $ap + bq = cr$ , with  $\gcd(a,b) = 1$ , then (Equation 1) has only the positive integer solution  $(X,Y,Z) = (p,q,r)$  except for a handful of triples  $(a, b, c)$ . Many special cases have been proven but the problem is still unsolved. The main goal of this paper is to study the exponential Diophantine equation (Equation 1) when  $a = 3$  and  $c = b + 1$ . We completely determined its solution in the set of positive integers when  $b$  is odd. We also present results when  $b$  is even. As a result, we confirm some special cases of Terai's conjecture and of the Jesmanowicz conjecture. **(Author's abstract)**

**Keywords:** Exponential Diophantine equation, Complete solutions, Terai's conjecture, Jesmanowicz's conjecture, Mathematics

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 2018 July,  
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 NP

0457

### Weak algebra bundles and associator varieties *Canlubo, Clarisson*

Algebra bundles, in the strict sense, appear in many areas of geometry and physics. However, the structure of an algebra is flexible enough to vary non-trivially over a connected base—giving rise to a structure of a weak algebra bundle. We will show that the notion of a weak algebra bundle is more natural than that of a strict algebra bundle by illustrating that the classifying object of algebra bundles and, consequently, of weak algebra bundles is a weak algebra bundle. We will give necessary and sufficient conditions for weak algebra bundles to be locally trivial. The collection of non-trivial associative algebras of a fixed dimension forms a projective variety called associator varieties. We will show that these varieties play the role the Grassmannians play for principal  $\mathfrak{gl}(n, \mathbb{C})$ -bundles. **(Author's abstract)**

**Keywords:** Algebra bundles, Associator varieties, Differential connections, Mathematics

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 2019/06,  
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 NP

## MEDICINE

0458

### Acute ischemic stroke in a Filipino with Parkinsonian Fahr's disease: a case report *Evangelista, Jojo R., Rosales, Raymond L*

Fahr's Disease (FD) is a rare neurodegenerative disorder of uncertain etiology characterized by abnormal intracranial calcium deposition in the basal ganglia. It initially presents in the 4th to 6th decade of life with diverse neuropsychiatric manifestations. The correlation between vascular calcification and coronary artery disease had been studied extensively, but its correlation with cerebrovascular disease remains elusive. Vascular calcification is thus an important risk factor for coronary artery disease. It was also postulated that a similar risk for cerebrovascular disease may be attributable to intracranial vascular calcification. We present the case of a 46-year-old male with progressive affective and cognitive disturbances, parkinsonism and ataxia. Eight years after initial presentation, he developed an acute ischemic infarct in the background of diffuse intracranial calcification characteristic of FD, confirmed by neuroimaging (Figure 1). While a number of cases FD with associated stroke or stroke-like symptoms have been reported, we are unaware of such occurrence in a Filipino. A pathologic model linking intracranial vascular calcification in FD with cerebrovascular disease and ischemic stroke has been proposed, and warrants further investigation. **(Author's abstract)**

**Keywords:** *Fahrs disease, Fahrs syndrome, Intracranial calcification, Stroke, Cerebrovascular disease, Medicine*

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2018/04,  
(Filipiniana Analytics)  
NP

0459

**Advanced prostate cancer management: proceedings of a scientific session, 20-21 July 2018, Manila, Philippines**

*Benedicto, Erwin G. , Torres, Aneliese H. , Torres, Chelseah Denise H. , Antonio, Carl Abelar*

Prostate cancer, the second most common cancer worldwide in 2012, poses a high public burden prompting the need to develop effective treatment strategies. To determine the progress made through the years, this paper documented the timeline of treatment strategies for advanced prostate cancer as presented in a scientific session held in July 2018. Two treatment strategies for metastatic prostate cancer were emphasized: the addition of docetaxel (chemotherapy) and abiraterone acetate plus prednisone to androgen-deprivation therapy (i.e. standard of care). Related clinical trials including but not limited to the CHAARTED trial, STAMPEDE trial, and LATITUDE trial showed that addition of either DOC or ABI led to a general increase in the overall survival of the patient. Furthermore, treatment strategies for non-metastatic castration resistant prostate cancer were also discussed. Evidence from clinical trials showed that addition of enzalutamide or apalutamide to ADT yielded better outcomes than ADT-placebo. These recent advancements have broadened the physician's options for treatment. (**Author's Abstract**)

**Keywords:** *proceedings, prostate cancer, treatment, prostate cancer management, chemotherapy, abiraterone acetate, prednisone, Medicine*

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Philippine Journal of Health Research and Development, Volume No. 22 Issue No. 4, 56-62  
2018/12,  
(Filipiniana Analytics)

0460

**Alkenylated phenolic natural products validate the claimed anti-cancer property of *Syzygium lineatum* ("Lubeg")**

*Castillo, Agnes , Macabeo, Allan Patrick , Ibana, Fr*

*Syzygium lineatum* or "*lubeg*" is a popular nutraceutical plant in the Apayao region known for its traditional antioxidant and cancer-healing properties. In this study, a bioassay-guided approach was undertaken to investigate anti-cancer principles from *lubeg*. Thus, crude extraction of the air-dried leaves followed by fractionation afforded three sub-extracts. Cytotoxicity screening by MTT assay revealed a substantial improvement of antiproliferative and cytotoxic activities from the crude extract to the petroleum ether and DCM sub-extracts. Purification of the most active fractions resulted in the isolation, and spectroscopy-aided identification (ESI-MS and NMR) of mono- and dihydroxylated alkenylbenzenoid derivatives. The alkenylated resorcinol conferred a highly selective antiproliferative activity against human chronic myeloid leukemia cells compared to the phenolic congener. Thus, an increase in hydroxyl functionalization is important for better and safer anti-cancer alkenylated phenolic natural products. In conclusion, our results validate the purported traditional use and add to the nutraceutical value and impacts of our very own *lubeg* as a sustainable source of Philippine medicinal plant products with cancer healing properties. (**Author's abstract**)

**Keywords:** *Syzygium lineatum, Anti-cancer, Antiproliferative, Cytotoxic, Medicine*

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2018 July,

### **$\alpha$ -Glucosidase inhibitors from endophytic fungi derived from *Pandanus simplex* leaves**

*Nonato, Maribel G. , Chang, Fang-Rong , dela Cruz, Thomas Edison E. , Rondilla, Roberth Ri*

Endophytic fungi, organisms that live inside plant tissues, are relatively underexplored sources of natural products. For example, diverse endophytes previously isolated from the leaves of *Pandanus amaryllifolius* Roxb. led to the discovery of new compounds such as the two new benzopyranone, diaportheone A and B, from *Diaporthe* sp.; the new isocoumarin, guignardiol from *Guignardia* sp.; and the new macrolide, colletotriolide from *Colletotrichum* sp., all with interesting bioactivities. In this study, the anti-diabetic potentials through  $\alpha$ -glucosidase inhibition activity of leaf inhabiting endophytic fungi isolated from *Pandanus simplex* were studied and explored. *Annulohypoxylon stygium*, one of the 21 isolated fungal endophytes from the host plant, had high  $\alpha$ -glucosidase inhibition and was selected for bioassay-guided isolation. A naphthalene derivative, 8-methoxynaphthol, and mixture of unsaturated fatty acid glycerides were obtained and identified with  $68.50 \pm 0.50\%$  and  $69.31 \pm 6.85\%$   $\alpha$ -glucosidase inhibition, respectively. This study is the first on the isolation of the above metabolites from *A. stygium*. The results demonstrated that endophytic fungi from *P. simplex* is a sustainable source of secondary metabolites that can be further explored as alternative chemical entities to alleviate diabetes.

(Author's abstract)

**Keywords:** *Endophytic fungi, Annulohypoxylon stygium,  $\alpha$ -glucosidase inhibitors, 8-methoxynaphthol, Unsaturated fatty acids, Pandanus amaryllifolius, Diaporthe sp., Guignardia sp., Colletotrichum sp., Pandanus simplex, Medicine*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 220  
2018 July,  
(Filipiniana Analytics)  
NP

### **Alternate day statin and fibrate given alone or in combination for postprandial dyslipidemia in patients with type 2 diabetes mellitus: a preliminary report**

*Mercado-Asis, Leilani B. , Mangelen, Sheila Farisha K., Mendoza, Erick S*

Postprandial lipemia represent an important risk factor for lifetime development of cardiovascular disease in patients with type 2 diabetes mellitus. Daily administration alone or combined statin and fibrate therapy has been shown to be an effective therapeutic approach but brings about serious logistics problem in our local setting. To address this concern, we report this observation where alternate day statin and fibrate treatment given alone or in combination in type 2 diabetes mellitus and similar effectiveness in lowering postprandial dyslipidemia has been obtained.

This is a retrospective case study in an endocrine clinic involving 53 patients seen from April 2014 to October 2015. The patients were on statin and fibrate combination (atorvastatin 20-40mg and gemfi brozil 300-600 mg or fenofi brate 145-160mg), statin alone (atorvastatin 20-40mg) and fibrate alone (gemfi brozil 300-600mg/fenofibrate 145-160mg) given on alternate days. Percent reductions of cholesterol, triglycerides, LDL for combined statin and fibrate; cholesterol and LDL for atorvastatin alone; and triglyceride for fi brate alone were determined.

In this preliminary report, 26 patients have available data. Follow-up period range was 4 to 48 weeks (mean  $22.76 \pm 11.8$  weeks). Alternate statin and fibrate (gemfi brozil) treatment yielded percent reductions from baseline as follows: cholesterol 7%, triglycerides 15%, and LDL 37% (P values=0.02, 0.10 and 0.019, respectively). On the other hand, alternate statin and fibrate (fenofi brate) yielded percent reduction from baseline as follows: cholesterol 41% and LDL 20.4% (P=0.15 and 0.13, respectively). The population is small, the decrease did not yield significant difference from baseline, however there is a tendency for triglyceride to decrease (P=0.09) with the combined statin and fenofibrate. With statin alone the percent reduction from baseline were as follows:

cholesterol 39% and LDL 62% ( $P=0.29$  and  $0.11$ , respectively). No percent reduction of triglyceride is seen with fibrate given on alternate day with  $P=0.19$ . The monthly cost reduction with combined alternate statin and fibrate treatment is at 34-48% while alternate day administration of the statin reduced cost by 60%.

This study showed lowering of postprandial total cholesterol, triglyceride and LDL with alternate statin and fibrate treatment, and total cholesterol and LDL with alternate day statin. The cost of treatment was also significantly lowered with the alternate regimen. However, a follow through study with adequate sample size is recommended to support these observations. (**Author's abstract**)

**Keywords:** *Statin, Fibrate, Postprandial dyslipidemia, Medicine*

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2018/04,  
(Filipiniana Analytics)  
NP

0463

### **Answering the health needs of the Filipino community**

*Suarez, Co*

This article discusses the dire need of having health research in helping the Filipino community in gaining awareness to communicable and non-communicable diseases. It highlights the National Unified Health Research Agenda 2017-2022 (NUHRA), a six-year plan of the DOST-Philippine Council for Health Research and Development, which focuses on addressing the needs of the Filipinos through collaboration among the academe, government agencies, the private sector, industry, and non-governmental organizations. (**Author's abstract**)

**Keywords:** *health research, NUHRA, communicable and non-communicable diseases, rehabilitation, Filipino community, Medicine*

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Philippine Journal of Allied Health Sciences, Volume No. 3 Issue No. 1,  
2019,  
(Filipiniana Analytics)

0464

### **Anthropometric measurements and performance profile of the 70th UAAP season athletes of the University of Santo Tomas**

*Reyes, Josephi*

The study determined the anthropometric measurements and performance profile of the collegiate and junior athletes of the University of Santo Tomas who participated in the 70th UAAP season. Two hundred fifty one eligible players (95 males, 84 females, 45 boys and 27 girls) of 13 sporting events of the UAAP performed the sports-specific physiological testing. The following general fitness and physiological tests were measured: anthropometric measurements, low back and hamstring flexibility, local muscular strength and endurance, maximal oxygen uptake ( $VO_{2max}$ ), motor ability and sports specific tests. Descriptive anthropometric and performance profile of athletes were calculated using means and standard deviations by gender and sport. Mean age of participants were  $15.0 \pm 0.75$  y/o for boys,  $13.42 \pm 1.2$  y/o for girls,  $20.05 \pm 1.74$  y/o for senior male athletes, and  $19.69 \pm 1.9$  y/o for senior female athletes. Anthropometric measurements revealed a morphology in athletes across different sports. Findings in the general physiological data to performance showed the following results: predicted  $VO_{2max}$  values from the 20-meter progressive shuttle run test (MSFT) was high in football males ( $54.0 \pm 4.6$  ml  $O_2$ /kg/min) and females ( $43.5 \pm 3.4$  ml  $O_2$ /kg/min); flexibility test was high among taekwondo boys ( $33.8 \pm 8.1$  cm), taekwondo males ( $33.2 \pm 7.8$  cm), and football females ( $35.1 \pm 4.4$  cm); Football males and females dominated the 2-min sit-up test with  $88.2 \pm 23.7$  repetitions and  $78.5 \pm 26$  repetitions, respectively. In the vertical jump test, basketball players generated a jump height of  $73.5 \pm 5.6$  cm in males and  $52.1 \pm 3.5$  cm in females. Results of the agility and speed tests cannot be compared across all sports because sports-specific testing protocols were used. Results of this study provide baseline and reference data that can be used to make guided



decisions in training athletes so that appropriate identification and training programs be designed to improve individual performances. (**Author's abstract**)

**Keywords:** *anthropometry, physical fitness, multi-stage fitness test (non-MeSH), performance evaluation, Medicine*

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Philippine Journal of Allied Health Sciences, Volume No. 2 Issue No. 2, 1-8  
2008,  
(Filipiniana Analytics)

0465

### **Anthropometric profile of elite Filipino fencers**

*Reyes-Otadoy*

This study established baseline kinanthropometric data for Filipino elite fencers. Since there are few anthropometric data on elite fencers, the data will fill the paucity of information in our database. The profile may be utilized to monitor, evaluate and modify training programs for competitive advantage in international games. Anthropometric measurements were taken from 24 elite Filipino fencers who were members of the national team and training pool of the different weapons in fencing. Height, weight, six skinfold sites (SUM6), somatotype and segment length were measured and descriptive analysis was used. The results show that male Filipino sabre players and female epee fencers were taller than other teams. Male and female sabre players were also heavier while epee players had wider arm span and higher leg length. Our female elite fencers had more body fat although their individual somatotypes were variable. The male Filipino elite players were mesomorphic similar to their international counterparts. However, the ratio of height to segment length, important as a factor in maintaining balance, agility and speed, appears to be the same for all players. This work establishes baseline kinanthropometric profile that adds to database for elite fencers. However, while absolute terms on height, weight, segment lengths, etc. may be important, the data should be reevaluated. In addition, there are perhaps other factors that give competitive advantage to fencers when they play in national and international games. Additional research is therefore recommended since kinanthropometric characteristics, although important, may just be one of the factors that play important roles in winning medals in this sport. This is the first study in the Philippines that examined in detail kinanthropometric measurements of elite Filipino fencers. The study shows that male and female elite players as well as players in different events show some differences in their profiles. Additional studies should be done to give a more complete kinanthropometric profile of our fencing teams. (**Author's abstract**)

**Keywords:** *kinanthropometry, fencing, anthropometry, sports, Medicine*

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Philippine Journal of Allied Health Sciences, Volume No. 2 Issue No. 2, 1-10  
2008,  
(Filipiniana Analytics)

0466

### **Antihyperglycemic activity of anahaw (*Livistona rotundifolia*) shoot extract in alloxan induced hyperglycemic rats**

*Alejo, Anabelle B. , Pagala, Czarmayne B. , Manzanillo, Vincent Luke J. , Bucao, Xenia Erika N., Arzaga, Jallene*

The Philippines is one of the emerging diabetes hotspots in the world today. This study was conducted to determine the antihyperglycemic activity of *Livistona rotundifolia* shoot extract in alloxan-induced hyperglycemic Sprague-Dawley rats. Phytochemical screening and acute oral toxicity test were done to determine the contents and safety dose of *L. rotundifolia* shoot extract on the test animals. The antihyperglycemic bioassay was done using 15 male Sprague-Dawley rats divided into five groups with three rats per group. Blood glucose level (BGL) was measured using a glucometer at 2, 4, and 6 hrs after treatment administration. Data obtained were analyzed using analysis of variance for complete randomized design and mean values were subject to least significant difference test ( $p=.05$ ). *L. rotundifolia* shoot extract contains flavonoids, saponins, fixed oil, alkaloids, proteins, and condensed tannins. The oral administration of the extract is safe and non-toxic within the dose of 300–2,000 mg kg<sup>-1</sup>. Results of the antihyperglycemic assay indicate that 6 hrs after treatment, the BGL of rats treated with

the 2,000 mg kg<sup>-1</sup> dose lowered to 320.33 mg dL<sup>-1</sup>, which is significantly lower than other treatments, and after 4 hrs continued to lower to 311 mg dL<sup>-1</sup>. At 6 hrs however, the BGL of rats treated with 2,000 mg kg<sup>-1</sup> dose with 232.33 mg/dL was now comparable to the normal rats and the Glibenclamide-treated rats with 94.67 mg dL<sup>-1</sup> and 338.33 mg dL<sup>-1</sup>, respectively. Thus, 2,000 mg kg<sup>-1</sup> dose of *L. rotundifolia* shoot extract has potential in lowering the BGL of hyperglycemic rats. (Author's abstract)

**Keywords:** Antihyperglycemic, Diabetes mellitus, Alloxan, Toxicity, *Livistona rotundifolia*, Medicine

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NP

0467

**Anti-inflammatory activity of methanol extract from *Broussonetia luzonica* (Moraceae) Blanco stem bark on carrageena-induced edema in sprague-dawley rat paw and its cyclooxygenase inhibition**

*Magbanua, Louise Jan J. , Cerrero, Christine Joy D. , Cabauatan, Yya Kyle A. , Caramoan, Denise C. , Cabanting, Rafael James G. , Casuga, Franelyne P., Racelis, Renz Mark M. , Torralba, Amiel King*

Pieces of evidence from scientific studies strongly recognize the correlation between inflammation and chronic diseases. Suppressing inflammation prevents the emergence of these diseases. In search for cost effective treatment, this study determined the potential anti-inflammatory activity of the methanol extract from *Broussonetia luzonica* stem bark in vitro and in vivo. Acute toxicity test was done to determine the approximate lethal dose of the extract. An in vitro cyclooxygenase inhibition of the extract was the preliminary test for anti-inflammatory potential. To confirm this pharmacologic activity, the methanol extract of stem bark at concentrations 400 mg kg<sup>-1</sup>, 1,000 mg kg<sup>-1</sup>, and 2,000 mg kg<sup>-1</sup> was given orally to Sprague-Dawley rats with carrageenan-induced edema on their right hind paw. Results revealed that the approximate lethal dose of the extract is greater than 2,000 mg kg<sup>-1</sup>. Results also show a higher percent inhibition of cyclooxygenase 1 and cyclooxygenase 2 than that of the positive control, indomethacin ( $p < .005$ ). The highest inhibitory effect was exhibited by the extract at 2,000 mg/kg dose because there was no significant increase in paw size. The optimum anti-inflammatory effect was observed 4 hours after the initial induction of rat paw edema. Mean paw measurements taken after 4 hours were significantly different ( $p < .005$ ). The methanol extract of the *B. luzonica* stem bark showed significant antiinflammatory activity. (Author's abstract)

**Keywords:** Anti-inflammatory, Cyclooxygenase, Carrageenan, Medicine

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0468

**Aptamer based piezoelectric quartz crystal dengue virus biosensor**

*Albano, Dharmatov Rahula B. , Sianghio, Gemine*

A new approach for aptamer selection was developed by employing a PQC (piezoelectric quartz crystal) biosensor to offer an early detection of the dengue virus. The aptamer was selected by binding it with a NS1 (nonstructural protein 1)-PQC biosensor. From a DNA library of random sequences, the aptamer was selected through a PQC-based systematic evolution of ligands by exponential enrichment (PQC-SELEX) and the candidate oligonucleotides were amplified. PQC-SELEX, which is a highly efficient affinity method, was used for partitioning. PQC-SELEX also facilitated the monitoring of bulk affinity of enriched libraries at every step of partitioning and screening of individual clones for their affinity to the target. This method allowed all clones to be screened prior to sequencing to ensure that only clones with suitable binding parameters were sequenced. The aptamer was immobilized on a quartz crystal for detecting NS12. The aptamer-PQC sensor showed a working

range between 20 ng mL<sup>-1</sup> to 20,000 ng mL<sup>-1</sup> and the developed piezoelectric aptamer sensor was shown to have sufficient sensitivity to detect nanogram quantities of NS1 in serum. **(Author's abstract)**

**Keywords:** *Piezoelectric quartz crystal, Aptasensor, Aptamer, Dengue, NS1, Medicine*

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2018 July,  
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NP

0469

### **Association of lateral epicondylalgia and shoulder rotatory motion: a cross-sectional case control study**

*Dones, Valentin , Tanguangco, Lyle P*

Lateral epicondylalgia (LE) is a cumulative strain injury affecting the common extensor origin of the elbow, manifesting as lateral elbow pain. Tightness of the fascia connecting the lateral elbow area with the shoulder area was assumed as potential source of LE. Limitation in shoulder rotatory motions may be associated with painful LE elbows. To determine the difference on shoulder rotatory motions between sides of symptomatic and asymptomatic elbows. Eligible participants had at least one elbow that tested positive for Cozen, Mill, or Maudsley's test. Using a universal goniometer, a blinded assessor measured the participants' active and followed by passive shoulder internal and external rotation. The primary investigator tested the external rotation followed by internal rotation of the right upper extremity, then subsequently the left upper extremity of healthy participants both passively and actively. The assessor showed excellent intra-tester reliability in measuring active and passive shoulder rotatory motions of 20 asymptomatic right upper extremities (ICC=0.98). Twenty-seven (27) participants (3 males, 24 females) with a mean (95%CI) age of 54 (49-58) years old were enrolled in the study. The mean visual analogue scale of the patients was 6.53 (5.91-7.13), with mean (95%CI) duration of 96 (50-142) weeks. Based on hand dominance and side of LE, significant difference was found in active and passive shoulder internal rotation ( $p>0.05$ ). Shoulder active and passive internal rotations were significantly associated with hand dominance in patients with LE. Tightness of the fascia and muscle in the shoulder and painful LE elbow may underpin the decreased shoulder rotatory motions. **(Author's abstract)**

**Keywords:** *lateral epicondylalgia, tennis elbow, shoulder, fascia, Medicine*

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2019,  
(Filipiniana Analytics)

0470

### **Autopsy findings in a patient with post-obstructive pulmonary edema**

*Chang, Jimmy , Chang, Ann Margaret , Santos, Marissa Kr*

Post-obstructive pulmonary edema (POPE), a form of non-cardiogenic pulmonary edema, is a significant entity in anesthesiology and head/neck surgery. This rapidly developing and life-threatening condition occurs following the relief of the obstruction in the upper airways. This condition has two main categories with distinct etiology. We report the case of a 62-year-old Filipino female who developed POPE after the removal of the endotracheal tube following a routine biopsy of her maxillary mass. Immediately after the removal of the endotracheal tube, she presented with episodes of hypotension and desaturation. Chest x-ray postre-intubation revealed bilateral lung opacities. The autopsy findings of the respiratory and cardiovascular system are presented. **(Author's abstract)**

**Keywords:** *Sleep apnea, Obstructive, Pulmonary edema, Autopsy, Medicine*

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Philippine Journal of Pathology, Volume No. 4 Issue No. 1, 1-6  
2019/06,

### **Bacterial determination of crude hydroalcoholic extracts of selected Philippine plants**

*Jacinto, Anna Muriel Ta*

This study determined the bacterial property of selected Philippine plants as potential source of antibacterial drugs. Microbial assay was done using paper disc diffusion method and the method of extraction used was maceration, wherein 80% alcohol was used as solvent. Hydroalcoholic extracts were subjected to a confirmatory test using color test method and revealed the presence of tannins, alkaloids, carbohydrates, flavonoids, and the absence of saponins. *Staphylococcus aureus* and *Bacillus subtilis* were used as test microorganisms. Results revealed that leaves of *Bixa orellana* had the greatest zone of inhibition (40 mm) against *S. aureus*, followed by *Mangifera indica* leaves (35 mm), *Punica granatum* leaves (30 mm), *Tamarindus indica* leaves (30 mm), *Carica papaya* leaves (27 mm) and *Cymbopogon citratus* leaves (27 mm). *B. subtilis* also showed sensitivity to *P. granatum* leaves (35 mm), *B. orellana* (30 mm), *T. indica* (25 mm), *M. indica* (25 mm), and *C. papaya* (23 mm). Penicillin was used as positive control (60 mm) and NSS as negative control (0 mm). Results showed that hydroalcoholic extracts of the said plants were sensitive to *S. aureus* and *B. subtilis*. **(Author's abstract)**

**Keywords:** *Bacterial determination, Crude hydroalcoholic extracts, Staphylococcus aureus, Bacillus subtilis, Bixa orellana, Mangifera indica, Punica granatum, Tamarindus indica, Carica papaya, Cymbopogon citratus, Medicine*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 199  
2018 July,  
(Filipiniana Analytics)  
NP

### **The birth of a national network for interprofessional education and collaboration: results from an inter-university partnership**

*Escuadra, Catherine Joy , Sy, Michael, Sumulong, Reeve*

The Philippine Interprofessional Education and Collaboration (PhiPEC) Conference is the first-ever national program held in the Philippines on interprofessional education and collaboration (IPEC). This project, initiated through an inter-university partnership between University of Santo Tomas and Angeles University Foundation, aimed to facilitate uniform understanding of IPEC across higher education institutions and health facilities as well as to instigate IPEC related researches in the country. The two-day conference was able to gather over 80 participants from more than 10 health and social care professions and 15 speakers who shared their expertise in health education and practice. Aside from these, the initiative has also gathered more than 500 followings in Facebook Page and 161 members in the mailing list. With the turn-out of this initiative, there was a move to rename the group into PhiPEC Network. The network has been agreed upon to serve as an informal entity that represents a collective of Filipino health and social care professionals towards advocating collaborative learning and health care services. Future directions were also determined focused on considering IPEC initiatives in education, practice, research, and policies. **(Author's abstract)**

**Keywords:** *interprofessional education and collaboration, IPE, IPC, Medicine*

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Philippine Journal of Allied Health Sciences, Volume No. 3 Issue No. 1, 1-5  
2019,  
(Filipiniana Analytics)

## Blockade of group V phospholipase A2 causes reduction of TGF- $\beta$ 1-induced fibrosis among diabetic rats

*Reyes, Jerica Isabel L., Muñoz, Nilda*

Hyperglycemia caused by diabetes upregulates TGF- $\beta$ 1 further activating fibrosis. This study investigated the pancreatic and cardiac changes in vivo to determine the effects of metformin (MET) and MCL- 3G1, a neutralizing antibody against group V phospholipase A2 (gVPLA2). Sprague Dawley rats were injected intraperitoneally with either 0.5 M citrate buffer (vehicle) or 45 mg kg<sup>-1</sup> streptozotocin (STZ). Intraperitoneal injection of 250 mg kg<sup>-1</sup> MET or 10  $\mu$ g total protein of the antibody were administered to diabetic rats and monitored for two weeks. STZ-treated animals showed marked hyperglycemia ( $326.8 \pm 67.08$  mg dL<sup>-1</sup>), decreased insulin levels ( $22.72 \pm 1.594$   $\mu$ IU mL<sup>-1</sup>) with upregulation of TGF- $\beta$ 1 at  $771.3 \pm 152.1$  pg mL<sup>-1</sup>, which were significantly different from baseline ( $p < .05$ ). Histopathological examination showed severe islet damage and cardiac fibrosis. With MET treatment, blood glucose level was  $79.57 \pm 1.403$  mg dL<sup>-1</sup> comparable to baseline ( $77.97 \pm 1.712$  mg dL<sup>-1</sup>). The amount of TGF- $\beta$ 1 also decreased to  $52.28 \pm 2.015$  pg mL<sup>-1</sup> with both pancreatic and cardiac tissues having less damage and fibrosis. However, MET did not improve insulin level ( $19.94 \pm 0.5207$   $\mu$ IU mL<sup>-1</sup>). MCL-3G1 mAb treatment resulted in normal blood glucose ( $100.2 \pm 10.27$  mg dL<sup>-1</sup>), higher insulin ( $111.5 \pm 9.186$   $\mu$ IU mL<sup>-1</sup>), and downregulation of TGF- $\beta$ 1 levels ( $53.36 \pm 2.990$  pg mL<sup>-1</sup>). Islet damage and cardiac fibrosis were not noted. It was observed that MET and MCL-3G1 mAb regulated blood glucose and TGF- $\beta$ 1 levels, however, only MCL-3G1 mAb blocked the process of islet damage and cardiac fibrosis. The data obtained from this study were the first demonstration showing that blockade of gVPLA2 by MCL-3G1 mAb attenuates TGF $\beta$ 1-induced fibrosis in diabetic rats. (**Author's abstract**)

**Keywords:** *Diabetes, Fibrosis, TGF- $\beta$ 1, Metformin, gVPLA2, Medicine*

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2018 July,  
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NP

## Botulinum toxin injection for pain in muscle spasm and visceromotor disorders: a meta-analysis

*Rosales, Raymond L. , Rosales, Mary Camille E. , Siongco, Paula R*

Apart from the popular use of botulinum neurotoxin type A (BoNT/A) for neuro-rehabilitation and cosmetic purposes, its analgesic potential has been highlighted in various studies. Although BoNT/A is effective, there is a paucity of literature explicating its effectiveness on muscle-based and visceromotor pain. This meta-analysis determined the effectiveness of botulinum type A (BoNT-A) in treating muscle-based (nociceptive) and visceromotor pain. Studies were searched at PubMed, ScienceDirect, EBSCO Host, and Google Scholar. Unpublished literature was also searched through ProQuest Dissertations & Theses Database and ClinicalTrials.gov. Randomized controlled trials (RCTs) and experimental studies on the effect of botulinum toxin on muscle-based pain were included. An abstraction form was independently accomplished by two reviewers. The standardized mean difference was used as the effect measure using the random-effects model and computed with RevMan 5.3. A total of 17 RCTs were included and analyzed. The standardized mean difference was  $-0.40$  (95%CI:  $-0.67, -0.13$ ), statistically favoring the BoNT-A group ( $z=2.94, p=0.003$ ). Findings also showed a significantly ( $X^2=66.56, p<0.00001$ ) large heterogeneity ( $I^2=74\%; \tau^2=0.21$ ). Subgroup analyses according to dose concentration and length of follow-up visits showed lower pain scores in the BoNT-A group with a dose less than 300 units ( $z=2.49, p=0.01$ ) and a follow-up period greater than 12 weeks ( $z=2.31, p=0.02$ ). BoNT-A injections are effective in treating muscle-based (nociceptive) and visceromotor pain disorders. (**Author's abstract**)

**Keywords:** *Botulinum neurotoxin, BoNT-A, Pain, Muscle-based pain, Visceromotor pain, Medicine*

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Journal of Medicine University of Santo Tomas (JMUST), Volume No. 1 Issue No. 1, 1-10  
2017/08,

### **Buccal cell micronuclei among betel quid chewers and non-betel quid chewers from selected barangays in Zamboanga City**

*Abubakar, Al-Zamzam, Halili, Servando Jr. , Abdurajak, Ben*

Betel quid chewing has been reported to have carcinogenic properties due to the presence of harmful compounds present in its ingredients. The oral mucosa is directly exposed to these carcinogenic compounds which could cause pathological changes and lead to malignancies. Micronucleus is a biomarker that indicates genetic alteration could form due to exposure from carcinogenic substances that can be attributed from betel quid chewing. Thus, a person's oral health status can be gauged through the detection of micronucleus in buccal cells.

A cross-sectional study was done to compare the presence of micronuclei in buccal epithelial cells between betel quid chewers and non-betel quid chewers in Zamboanga City.

Purposive sampling was used to enroll the 104 participants (52 betel quid chewers and 52 non-betel quid chewers). The demographic profiles and betel quid chewing habits of the participants were obtained using a questionnaire. Buccal cells samples were collected using clean and dry tongue depressors and were smeared directly onto pre-cleaned glass slides. Slides were processed for Papanicolaou staining by a medical technologist. For each slide, 1000 buccal cells were examined using a light microscope with an attached camera. Photomicrographs of buccal cells with micronuclei were taken. Two pathologists separately validated the results through the photomicrographs. Intraclass correlation coefficient for interrater reliability gave a value of 1 which indicates high reliability among observers.

The median of the frequency of micronuclei among betel quid chewers and non-betel quid chewers were 56.5 and 36, respectively. Mann-Whitney U test revealed a significant difference ( $p=0.031$ ) at  $\alpha=0.05$  in the micronuclei frequency between the 2 groups. There were 36.5% of betel quid chewers who have micronuclei frequency above the cut-off value and on the other hand, 15.4% among the non-betel quid chewers. Pearson's correlation coefficient revealed that there was a very weak negative relationship ( $r=-0.072$ ) between total micronuclei frequency and length of time of betel quid exposure among the exposed group.

Betel-quid chewers have significantly higher frequency of micronuclei compared to non-betel quid chewers which puts them at higher risk for developing oral malignancies. (**Author's abstract**)

**Keywords:** *Micronucleus, Betel, Quid, Areca, Papanicolaou, Medicine*

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Philippine Journal of Pathology, Volume No. 40 Issue No. 1, 1-7  
2019/06,  
(Filipiniana Analytics)  
NP

### **Cardiovascular endurance levels of Asian Games 2006 bound Filipino elite athletes**

*Lopez, Mary Jane , Sygui, Albrecht , Espino, Reil Vinard S. , Alfelor, Remelou G. , Dizon, Janine Margar*

The study assessed the endurance levels of Filipino Asian bound athletes (road cyclists, boxers, Olympic rowers and long distance runners) in terms of maximal oxygen uptake, heart rate max and blood lactate response. All elite Asian bound athletes of the Philippine National Team, participating in endurance events such as boxing, canoe and kayak, cycling, long distance running (athletics) and Olympic rowing are eligible to participate in this study. Anthropometric measurements such as height and weight were taken on the testing day. A series of sports specific battery of endurance test were conducted to measure maximal oxygen uptake, blood lactate and heart rate max. Endurance testing of the subjects yielded the following results: in terms of peak VO<sub>2</sub> Olympic rowers have the mean peak value of 64.14 ml/kg/min, long distance runners: 63 ml/kg/min canoe and kayak: 59.23 ml/kg/min,

boxing:57.13ml/kg/min,cyclists:52.07,l/kg/min. As for blood lactate cyclists mean peak blood lactate at 8 mmol/L, boxers: 10.5 mmol/ L, long distance runners: 11.2 mmol/ L. Canoe and kayak: 14.4 mmol/L, Olympic rowing: 15.9 mmol/L. In terms of heart rate max, Olympic rowers have a mean peak value of heart at 189.4 bpm, canoe and kayak: 185.5 bpm, boxing: 178.3 bpm, long distance running: 174 bpm, cycling: 165.5 bpm. The researchers were able to assess the endurance levels of Filipino Asian Games bound elite athlete (boxers, road cyclists, canoe and kayak athletes, Olympic rowers and long distance runners) in terms of heart rate (average heart rate responses, maximum heart rate and percent predicted heart rate max achieved), oxygen consumption, blood lactate response and peak VO2. This study also was able to provide endurance level values and establish a set of data in terms of aerobic capacity of elite Filipino endurance athletes. (**Author's abstract**)

**Keywords:** *aerobic capacity (non-mesh), asian games (non-mesh), elite athletes (non-mesh), endurance events (non-mesh), Medicine*

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Philippine Journal of Allied Health Sciences, Volume No. 2 Issue No. 2, 1-8  
2008,  
(Filipiniana Analytics)

0477

### **Challenges and opportunities in environmental and occupational health: highlights of the first national environmental and occupational health forum**

*Nique, Jem Erika A. , Tambiloc, Ruby D. , Molina, Victorio B. , Fadrilan-Camacho, Vivien Fe F. , Enoveso, Rose Abigail D. , Decena, Katherine Mae M. , Quizon, Romeo R. , Marian Fe Theresa C. Lomboy,, Ramos, Cheste*

Environmental and occupational health are interconnected disciplines of public health that are concerned in maintaining a symbiotic relationship between the ecosystem and humans. This relationship is under threat by the continuous and alarming increase of the Earth's temperature causing climate change that impacts not just health but also the economy and the safety of the population. The First National Environmental and Occupational Health Forum was organized by the Department of Environmental and Occupational Health, College of Public Health, University of the Philippines Manila to address and discuss the complex issues that the Philippines is currently experiencing when it comes to environmental and occupational health by providing a space where stakeholders from different sectors can actively participate in mapping out challenges and opportunities. The organizer's long-term vision is to catalyze and build a network of collaboration that is geared towards the improvement of health and safety in the workplace that involves mitigating the effects of climate change. The discussions in the forum gave a comprehensive insight into the different challenges we face for being one of the most vulnerable countries to natural disasters: how this affects health, workplace, and environment. These challenges created new opportunities for the country to build resilience and formulate adaptive strategies to decrease the vulnerability of the population especially the workforce who are constantly exposed to different hazards that are exacerbated by changes in the environment. (**Author's Abstract**)

**Keywords:** *climate change, workplace hazard, one health, agriculture, displacement, emergency response, Medicine*

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Philippine Journal of Health Research and Development, Volume No. 23 Issue No. 2, 47-53  
2019/06,  
(Filipiniana Analytics)

0478

### **Challenges of research ethics committees**

*Enriquez, An*

This article discusses the importance of having a research ethics committee in providing an additional oversight for the protection of human participants in carrying out scientific studies. It also tackles how research ethics committee intervenes in ensuring safety among participants and quality scientific technical soundness throughout the years. (**Author's Abstract**)

**Keywords:** *ethics committee, human participants, health research, Medicine*

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Philippine Journal of Allied Health Sciences, Volume No. 3 Issue No. 1, 1-2  
2019,  
(Filipiniana Analytics)

0479

### **Changes in attitudes towards professionalism among medical students during clinical clerkship**

*Atienza, Melflor A., Abu, Che*

Professionalism is a core competency of physicians, identified as one of the learning outcomes for the Doctor of Medicine program. In all the efforts geared towards supporting students develop high standards of professionalism through the 4-year course of medical education, perhaps the greatest gap is in assessment.

The study aimed to determine how attitudes towards professionalism among medical students change during clinical clerkship, which attitudes change, and if these changes are associated with certain demographic factors and specific clinical rotations.

This is a cohort study with a baseline and three consecutive measurements of attitudes towards professionalism among students in a medical school as they rotated in the different clinical departments for the first semester of AY 2018-2019. A 36-item questionnaire based on a validated instrument was used. Frequency counts, means, percentages, paired t-tests, analysis of variance, and chi-square were used to analyze the data.

Overall, the attitudes towards professionalism among medical students were positive at baseline and did not significantly change through three consecutive clinical rotations. The scores were highest and most stable for altruism, accountability, and excellence. No association was found between any change in attitudes and certain demographic factors including age, gender, and pre-medical course, and specific clinical rotation.

No significant change in attitudes towards professionalism was found among fourth year medical students as they rotated through three consecutive clinical rotations. While many factors should be considered, this finding should prompt a comprehensive look at how clinical clerkship experiences actually educate for professionalism.  
**(Author's Abstract)**

**Keywords:** *attitudes, professionalism, clerkship, clinical rotation, Medicine*

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Philippine Journal of Health Research and Development, Volume No. 24 Issue No. 2, 39-47  
2020/06,  
(Filipiniana Analytics)

0480

### **Clinical experience of Filipino clinicians on the use of bedaquiline for treating multi-drug resistant tuberculosis**

*Lao, Stephanie M. , Torres, Aneliese H. , Lofranco, Vivian S. , Torres, Chelseah Denise H. , Antonio, Carl Abelardo T. , Bermudez, Amiel Nazer C. , Benedicto, Erw*

The Philippines is among countries globally with high multidrug-resistant tuberculosis (MDR-TB) burden. An operations research on Bedaquiline (BDQ), a new drug for MDR-TB, was launched by the Department of Health (DOH) in 2016. This paper aimed to gather the opinions and first-hand experiences of clinicians in the Philippines regarding BDQ. A facilitated roundtable discussion among nine clinicians included in the operations research on BDQ in the Philippines was conducted in June 2018. Topics covered included: (a) considerations in the use of BDQ, (b) outcomes of patients given BDQ, and (c) perceptions on effectiveness and safety of BDQ. Recordings and field notes from the discussion were subjected to framework analysis. Participants gave BDQ an overall positive feedback due to the effectiveness, less toxicity, and ease of administration compared to other anti-TB drugs. Issues on BDQ included the novelty of the drug that caused doubts at first use and the limited application of the drug as dictated by the inclusion criteria within the context of the operations research, among others. The



significant number of patients lost to follow up and ways to address this challenge were also discussed. (Author's Abstract)

**Keywords:** *bedaquiline, multidrug-resistant tuberculosis, clinical experience, physicians, Philippines, Medicine*

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Philippine Journal of Health Research and Development, Volume No. 23 Issue No. 2, 20-25  
2019/06,  
(Filipiniana Analytics)

0481

### **Clinical practice in gout management among Filipino general care practitioners**

*Edar, Mary Flor Joy Y., Li-Yu, Juli*

Evidence-based practice guidelines for gout management is widely available. However, management by general care practitioners is still far from ideal. This study aims to determine the current trends in the management of gout among general care practitioners. Survey questionnaires were randomly distributed to the general membership of the Philippine College of Physicians (PCP) and the Philippine Academy of Family Physicians (PAFP). A total of 390 respondents participated, the majority being females (237, 60.8%) with a mean age of 37.32±10.22 (20-75) years, half of them holding practice within Metro Manila. The duration of practice was divided into four categories: 72 (18.5%) had <1 year of practice, 138 (35.4%) had 1-5 years of practice, 64 (16.4%) 5-10 years, and 116 (29.7%) had >10 years of practice. Two hundred and twelve (54%) respondents did not attend gout continuing medical education (CME) activities. More than half agreed with synovial fluid examination to confirm gout diagnosis in patients with acute monoarthritis. During a gout flare, 60.5% preferred colchicine while 15.8% prescribed urate lowering therapies. Colchicine dosing 3x daily was preferred in 30.3% while 17.4% advocated hourly dose until GI toxicity. Urate-lowering therapies (ULT) 1-2 weeks after the gout flare was preferred by 43.3% while 37.4% opted to give it until serum uric acid level (SUA) normalized before discontinuation. Most respondents (60%) chose prophylactic colchicine when starting ULTs. Half of the respondents (49.7%) aimed for SUA level of 6 mg/dL. In chronic tophaceous gout, 46.9% targeted a higher value of 5 mg/dL. Though gout management has improved among general care practitioners, there were still observed inconsistencies and heterogeneous patterns of practice in the community. (Author's abstract)

**Keywords:** *Gout survey, Adherence to gout guidelines, Filipino, Medicine*

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2017/08,  
(Filipiniana Analytics)  
NP

0482

### **Comparative toxicological analysis of metformin (biguanide) and glibenclamide (sulfonylureas), using zebrafish embryotoxicity test (ZFET)**

*Navarrete, Ian , Flores, Erika Louise, Lapuz, Bianca Louise , Hallare, Arn*

Type 2 (T2DM) and gestational diabetes mellitus (GDM) among pregnant Filipinos have been increasing over the years because of lifestyle westernization. While insulin has been the safe mainstay when dietary measures fail to maintain normoglycemia during pregnancy, recent studies have suggested oral hypoglycemic agents (OHAs) such as metformin and glibenclamide, may offer cheaper and efficacious alternatives. The problem however, is the passage of these drugs through the placenta which may pose possible danger towards the development of the growing embryo. The proposed study aims to evaluate and compare the embryotoxic and teratogenic potentials of the varying concentrations of the two PhilHealth covered oral hypoglycemic agents in the Philippines, namely metformin (biguanide) and glibenclamide (sulfonylureas).

In this study, a comparison on embryotoxic potentials of metformin and glibenclamide was conducted using zebrafish embryotoxicity test (ZFET) across concentrations found in fetal (10, 20, 100, 500, 1000, 2000µg/L) and maternal serum (10, 20, 100, 500, 1000, 2000mg/L).

Results revealed that metformin showed no significant ( $p>0.05$ ) lethal effects, but revealed significant risk for teratogenicity, specifically decreased head and tail lengths and advanced hatching. Conversely, glibenclamide revealed significant potential for lethal (e.g., coagulation) and teratogenic effects including pericardial and yolk sac edema, spinal deformity and increased tail length. Comparative evaluation between the two OHAs reveal that glibenclamide has significantly ( $p<0.05$ ) higher lethal and teratogenic effects. Together, our results suggest that the use of metformin over glibenclamide is favorable for safety testing in pregnant women suffering T2DM and GDM for the benefit of expanding treatment options for these diseases. (**Author's Abstract**)

**Keywords:** *embryotoxicity, glibenclamide, metformin, teratogenesis, zebrafish, oral hypoglycemic agents, Medicine*

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2020/03,  
(Filipiniana Analytics)

0483

### **Comparison of individual and group learning in different laboratory settings among third year medical technology students**

*Laude, Antonio F. Jr., Atienza, Melflo*

To learn technical skills in Medical Technology schools, laboratory experiments are made individually or in groups. The nature of student participation and effect of group work in laboratory skills and attitudes of students have not been well studied. The study compared individual work, working in groups of three, and working in groups of six in terms of skills and attitudes toward learning, motivation to learn, responsibility, helpfulness, and teamwork.

Experimental study was used that employed a counter-balance design among thirty-six thirdyear medical technology students who were instructed to learn laboratory skills in three settings and were rotated in six experiments. Performance examination and questionnaires were formulated by the researcher and used for gathering data. One-way ANOVA was used to determine the significant differences among practical exam scores of the three laboratory settings while Kruskal-Wallis H and Mann-Whitney U test were used to determine differences in rating scores of the attitude questionnaire.

There were no significant differences in students' skills  $F(2, 213)=1.97$ , ( $p=.142$ ) and in their attitude toward learning, helpfulness and teamwork among the laboratory settings. Students have higher motivation when working in groups ( $H(2)=14.413$ ,  $p=.001$ ) and assumed more responsibility when working alone than when working groups. When students worked individually or in groups of three, they perceived ending up doing most of the work. (**Author's Abstract**)

**Keywords:** *working in groups, individual work, medical technology, learning outcomes, skills, attitude, Medicine*

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Philippine Journal of Health Research and Development, Volume No. 24 Issue No. 2, 58-66  
2020/06,  
(Filipiniana Analytics)

0484

### **Comparison of sassone scoring and adnex model in differentiating benign and malignant ovarian neoplasm in a university hospital**

*Coloma, Maria Lourdes B. , Mallari, Romina Grize*

Ovarian cancer is the second most common gynecologic cancer worldwide and are usually diagnosed in advanced stages where prognosis is very poor. Ultrasound has been widely used to screen and differentiate benign and malignant ovarian neoplasm. There are several ultrasound scoring system designed to aid in the diagnosis, however, there is still no standard method accepted for screening of ovarian cancer.

The study compared the accuracy of SASSONE Scoring and ADNEX Model in differentiating benign and malignant ovarian neoplasm in the University of Santo Tomas Hospital.

Sixty-eight women who presented with an ovarian neoplasm by history and physical examination were recruited from January to October 2017. Ultrasound was requested to further characterize the mass. Sassone scoring and ADNEX Model were applied and computed based on the sonologic findings to differentiate whether the ovarian neoplasm was benign or malignant. The gold standard was the histopathologic examination of the mass after surgery.

There was no significant difference in the accuracy of Sassone Scoring and ADNEX model in pre-operatively differentiating benign and malignant ovarian neoplasm with 88% and 89% accuracy rate, respectively. Sassone scoring has a sensitivity of 62.5% and specificity of 91.67% while ADNEX has a sensitivity and specificity of 37.5% and 96.67%, respectively.

There is no significant difference in using SASSONE and ADNEX model in differentiating benign and malignant ovarian neoplasm prior to surgery. Both may be used as an ultrasound scoring system for predicting ovarian malignancy. However, in cases of suspicious tumors, ADNEX model is more useful in discriminating the type and stage of malignancy. (**Author's abstract**)

**Keywords:** Ovarian cancer, Adnexa, Screening, Ultrasound, Medicine

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2018/04,  
(Filipiniana Analytics)  
NP

0485

## **Correlation of glycosylated hemoglobin and oral glucose tolerance test results in hyperinsulinemic pre-impaired glucose tolerance state versus normoinsulinemic-normal OGTT**

**Torres-Salvador, Pilar D., Malaza, Gelinemae G., Mercado-Asis, Leilani B**

Prediabetes is an intermediate stage prior to development of diabetes mellitus. Preimpaired glucose tolerance state represents an early stage in the pathogenesis of diabetes wherein the normal glucose is attained by compensated hyperinsulinemia. Glycosylated hemoglobin is used in diagnosis and monitoring of diabetes but has not been explored in pre-IGT state. The objective of this study is to compare the 2-hour blood glucose, 2-hour insulin level, and HbA1c between normoinsulinemic-normal OGTT and pre-IGT groups.

Conducted at University of Santo Tomas Hospital, this was a retrospective analytical study of high-risk individuals for evaluation of type 2 diabetes from 2000-2011 and underwent 75-gm OGTT with 2-hour blood sugar and insulin determinations. The 2-hour glucose, insulin level and HbA1c in normoinsulinemic-normal OGTT were compared with the pre-IGT group using t-test. Correlation between the 2-hour blood glucose and insulin level with the HbA1c was done using Pearson correlation analysis. Statistical significance was considered for p-value of <0.05.

Second-hour blood glucose and insulin levels were significantly higher in the pre-IGT group as compared to the normoinsulinemic-normal OGTT group ( $128.60 \pm 18$  and  $89.29 \pm 68.82$  vs.  $90.68 \pm 26$  and  $17.40 \pm 8.15$ ). The HbA1c of the pre-IGT group was significantly higher than the normoinsulinemic-normal OGTT group ( $6.09 \pm 0.55$  vs.  $5.15 \pm 0.25$ , p-value <0.001). There was weak positive correlation between the HbA1c and 2-hour blood glucose levels between the two groups but not with the insulin levels.

The pre-IGT groups have significantly higher 2nd hour blood sugar, insulin and HbA1c levels. This suggests that indeed the metabolic abnormality must be addressed as early as the pre-IGT stage. (**Author's abstract**)

**Keywords:** Prediabetes, HbA1C, Hyperinsulinemia, Normoinsulinemic, Medicine

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### **Determining significant predictors of blood iron concentration and status in pregnant Filipino women using linear models**

*Capanzana, Mario V. , Agarrado, Rod Erick L. , Marcos, Juanita M. , Nacis, Jacus S. , Dalmacio, Leslie Michelle M. , Timoteo, Vanessa*

The decrease in blood iron levels during pregnancy is a concern that needs to be addressed, especially among Filipinos where anemia prevalence is relatively high. This study assessed maternal age, gestational age, height, body weight during pregnancy, daily consumption of iron supplements or multivitamins, gravidity, parity, and estimated monthly household income as potential predictors of levels of hemoglobin (Hb), hematocrit (Hct), serum ferritin (SF), serum iron (SI), total iron binding capacity (TIBC), unsaturated iron binding capacity (UIBC), and transferrin saturation (TSAT) among 109 pregnant women residing in Quezon, Palawan using simple linear regression (SLR). Significant predictors were then incorporated into full models using multiple linear regression (MLR) following the hierarchical method. Results show that gestational age significantly contributed to predicting levels of blood iron ( $p<0.05$ ). Gestational age was negatively associated with Hb, Hct, SF, log10 SF, log10 SI, and TSAT but positively associated with TIBC and UIBC. Gestational age accounted for variations ranging from as low as 4% in log10 SI up to 35% in UIBC. Additionally, weight was positively associated with Hb ( $p=0.016$ ) and Hct ( $p=0.027$ ), parity was negatively associated with log10 SF ( $p=0.031$ ), and daily consumption of iron or multivitamin supplements was negatively associated with TIBC ( $p<0.001$ ) and UIBC ( $p<0.001$ ). These identified predictors can be used in the clinical settings to target high-risk women for treatment or intervention. (Author's abstract)

**Keywords:** *Anemia, Blood iron levels, Gestational age, Iron deficiency, Linear models, Pregnant Filipino women, Medicine*

### **Development of a Cayenne (*Capsicum annuum*) dental balm**

*Zarsaga, Uriel , Imperio, Kevin Brendt , Mergal, Vicky , Taclan, Lorcelie , Pak, Lila B. , Ndaa, Andy William , Monde, Patience , Kinoti, Moses Murithi , Kayonga, Sam Pr*

This study was conducted to develop a dental balm using *Capsicum annuum*. Specifically, it verified the secondary compounds of cayenne through phytochemical analysis and determined the susceptibility of cayenne extract against *Candida albicans* and *Streptococcus mutans*. The cayenne was collected in its pure form and dried using a multicommodity heat pump dryer at an ideal drying condition of 50°C and 10% relative humidity. The dried cayenne was submitted to the Standards and Testing Division of the Department of Science and Technology for phytochemical analysis. The extract was tested for antimicrobial susceptibility using the Kirby Bauer test. Results revealed that the cayenne extract has the following secondary compounds: sterols, tannins, glycosides, alkaloids, flavonoids, and saponins. The Kirby Bauer test on *C. albicans* showed a zone of inhibition (ZOI) of 10 mm, 19.38 mm for the positive control, and 0 mm for the negative control (sample-free disc). Both the cayenne extract and the control had complete inhibitory activities. When tested against *S. mutans*, the cayenne extract presented a total ZOI of 10.67 mm, compared to chlorhexidine (Orahex) at 11.67 mm. However, both have the same complete inhibitory activities. It is possible to use cayenne extract as a natural inhibitor to control oral infections caused by *C. albicans* and progression of carriers against *S. mutans*. Thus, a dental balm with bees' wax, essential oil, vitamin E, and cayenne extract mixed at low constant heat was developed. (Author's abstract)

**Keywords:** *Capsicum annuum*, Dental balm, Zones of inhibition, *Candida albicans*, *Streptococcus mutans*, Medicine

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NP

0488

### **The effect of sodium bicarbonate abrasives in toothpaste on dental plaque removal: a pilot study**

*Garcia, Ma. Celina U. , Santiago, Maria Carmela S. , Velasco, Narec*

The role of dental plaque as the etiology of caries and periodontal diseases has long been established. Therefore, plaque control is central to the prevention and management of these oral diseases. Among the different means of self-performed plaque control, brushing is the most essential. Moreover, toothpaste is a common adjunct during tooth brushing, as its abrasive contents are believed to enhance plaque removal. This study aimed to compare the effectiveness of plaque removal when brushing with a sodium bicarbonate abrasive-containing toothpaste, compared to brushing using an abrasive-free toothpaste.

Twelve students from the University of the Philippines College of Dentistry participated in the study. The subjects discontinued all oral hygiene measures for a minimum of 48 hours. Using the Modified Bass technique, they performed tooth brushing for two minutes, using either an abrasive-free or abrasive-containing toothpaste. Toothpaste allocation was randomized via fishbowl method. Pre-brushing and post-brushing plaque scores were recorded using the Turesky modification of Quigley-Hein plaque index. A washout period of 11 days was implemented before crossover to the second round, wherein employed toothpastes were switched. The difference in plaque reduction between the two kinds of toothpaste was analyzed using Wilcoxon signed rank test.

Overall plaque reductions were 75% for the abrasive-free toothpaste and 73% for the abrasive-containing toothpaste. The difference between the toothpaste was statistically insignificant ( $p=0.48$ ). Therefore, based on the study, brushing with a sodium bicarbonate abrasive-containing toothpaste resulted in similar levels of plaque removal, compared to brushing with an abrasive-free toothpaste. There is insufficient evidence that abrasives in toothpaste result in more effective dental plaque removal. (**Author's Abstract**)

**Keywords:** *tooth brushing, toothpaste, abrasives, dental plaque, Medicine*

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0489

### **Effects of 2,3,5,6-tetramethylpyrazine on alcohol-induced injury in liver cells and on the early life stages of zebrafish (*Danio rerio* Hamilton 1822)**

*De Guzman, Margaret LC. , Hallare, Arnold V. , Trinos, Ma. Khrizelle Joyce D.S. , Espallardo, Richard Mar*

Alcohol liver disease (ALD), which is the collection of liver damage caused by excessive alcohol intake, is a major health problem. This study assessed the hepatoprotective effects of 2,3,5,6-Tetramethylpyrazine (TMP) against ALD using histopathological analysis of adult zebrafish livers. TMP is a compound, which has been mainly used for the treatment of cardio- and cerebrovascular diseases. Three concentrations (40, 60, and 80 mg L<sup>-1</sup> TMP) were used. Results showed that TMP was able to dose-dependently decrease mean scores for the four parameters diagnostic of ALD—steatosis, inflammation, cell death, and ballooning degeneration. These scores were comparable to those of the untreated group (no ethanol+no treatment) and positive control (ethanol+Hepasil DXTM), with all groups' scores being statistically different from those of the negative control group (ethanol+no treatment) ( $p<.05$ ). Other anomalies, namely, cholestasis, vessel congestion, and hemorrhage were noted only in the ethanol group, but not for other groups. These imply the high efficacy of TMP in terms of hepato-protection.

Its toxicity to the early development of embryos was evaluated using the zebrafish embryotoxicity test (ZFET), which suggested that TMP is also non-toxic or non-teratogenic at concentrations used for liver treatment. Percent mortalities in the TMP groups (20–100 mg L<sup>-1</sup>), as assessed by lethal endpoints (i.e., coagulation, non-detachment of tail, non-formation of somites, and nondetection of heartbeat), were minimal and not statistically different from that of the negative control (reconstituted water) but were statistically different from the positive control (3.5% ethanol). The occurrences of sublethal endpoints (i.e., yolk sac edema, pericardial edema, spinal curvature, abnormal heart rate, and body length) were generally comparable to those in the negative control and statistically different from the positive control. These results show that TMP is non embryotoxic and is reasonable as a hepatoprotective compound against ALD. (**Author's abstract**)

**Keywords:** *Alcohol liver disease (ALD), Zebrafish embryotoxicity test (ZFET), Tetramethylpyrazine (TMP), Danio rerio, Life stages of zebrafish, Medicine*

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0490

### **The effects of spirulina (*Arthrospira platensis*) dietary supplement as an adjunct therapy for children aged 7-14 years old with asthma: a randomized, double-blind placebo-controlled clinical trial**

*Gonzalez-Andaya, Agnes M. , Manzon-Reyes, Lou Ver Le*

The anti-inflammatory effect of Spirulina has been demonstrated to inhibit histamine release from mast cell-mediated allergic reactions. Studies have documented the anti-inflammatory and immunomodulatory properties of supplementation as an adjunct therapy for asthma.

The study determined the effects of Spirulina supplementation on asthma control and lung function among children aged 7-14 years old.

This is a randomized, double-blind, placebo-controlled study wherein children 7 to 14 years old diagnosed with mild-to-moderate persistent asthma were randomly assigned to receive either Spirulina (1000 mg to 2000 mg daily) or placebo for three months. Asthma Control Test (ACT) and Composite Asthma Severity Index (CASI) were used for patient report-based measures. Forced expiratory volume in 1 second (FEV1), forced vital capacity (FVC), FEV1/FVC, and peak expiratory flow rate (PEFR) were determined through spirometry. Post-supplementation assessment for 3 months was done.

A total of 39 patients (Spirulina=20, placebo=19) were enrolled in this trial. During the supplementation phase, both the Spirulina and placebo groups showed significant improvement in ACT scores (Spirulina,  $p<0.0001$ ; placebo,  $p=0.19$ ) compared to baseline. There was no significant change in CASI scores in both groups. However, during the post-supplementation phase, the Spirulina group showed significantly sustained improvement on both the ACT ( $p<0.0001$ ) and CASI scores ( $p<0.0001$ ) compared to placebo. The FEV1 ( $p=0.014$ ), FVC ( $p=0.008$ ), and PEFR ( $p=0.0001$ ) of the Spirulina group significantly improved by the end of supplementation. Overall, significant intergroup differences revealed only in FEV1 ( $p=0.0002$ ) and PEFR ( $p<0.0001$ ).

Daily supplementation with Spirulina significantly improved asthma control, FEV1, and PEFR compared to placebo. (**Author's abstract**)

**Keywords:** *Spirulina, Asthma, Spirometry, Alternative medicine, Medicine*

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NP

## **Efficacy of cinnarizine/dimenhydrinate compared to betahistine in the management of adults with peripheral vestibular disorder: a systematic review of randomized controlled trials (RCTs)**

*Martinez, Norberto V. , Roasa, Francis V. , Gloria, Cristopher*

The study compared the effectiveness of cinnarizine/dimenhydrinate with betahistine in the management of adult patients with peripheral vestibular disorder.

A systematic review of English articles by searching electronic databases at the University of Santo Tomas (Cochrane, Medline, CINAHL, PubMed, ScienceDirect, DOAJ, Biomed Central), Libraries in Metro Manila, and hard copies of journals and professional societies were identified. The search was done from May 2012 to July 2012 using the following search terms: Betahistine\*; Cinnarizine\*; and vertigo\* or dizziness\*.

Only double-blind RCTs studying the administration of cinnarizine/dimenhydrinate or betahistine in patients with peripheral vestibular disorder were included. The quality of data was assessed using CASP: an RCT appraisal tool.

One review author extracted data from included studies using predefined data fields and the other author checked the extracted data.

All pooled analysis was based on fixed effect models. Two RCTs (n=127) met our inclusion criteria. Heterogeneity was observed in both studies after one week of treatment, which was reduced when compared after four weeks of treatment. A fixed combination of cinnarizine 20 mg/dimenhydrinate 40 mg 3x a day significantly reduced the weighted mean difference (WMD) (p-value 0.00001, 95% confidence interval) of the mean vertigo score and the WMD (p-value 0.002, 95% confidence interval) of the concomitant symptom score after four weeks of treatment. No statistically significant difference was seen in the vestibulospinal and vestibulo-ocular tests.

This systematic review of RCTs confirms that the fixed combination of cinnarizine/dimenhydrinate could decrease the intensity of vertigo and improve the concomitant symptoms better than betahistine after four weeks of treatment (Grade C Recommendation, NHMRC guidelines 2009). (**Author's abstract**)

**Keywords:** *Cinnarizine, Dimenhydrinate, Betahistine, Vertigo, Vestibular disorder, Medicine*

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NP

## **The efficacy of *Lavandula angustifolia* Mill. essential oil as a nanoemulsion in pilocarpine drug-induced seizures swiss mice model**

*Policarpio, Anna Francheska G. , Mendoza, Ma. Laura Isabel D. , Capinig, John Reden T. , Lomboy, Lawrence Alfred Q. , Andal, Johannes C. , Ali, Athina Rosmina M., Castillo, Agnes*

Lavender (*Lavandula angustifolia* Mill.) has been widely known for its use in aromatherapy and for its therapeutic and medicinal activity. One of the recent studies in lavender oil is its medicinal effect in neurological disorders, mainly in epilepsy. However, there are no studies regarding lavender oil formulations. In this study, the pure essential lavender oil was formulated into a nanoemulsion in order to investigate the preventive antiepileptogenic property in pilocarpine drug-induced seizures in mice model. The seizure activity was analyzed through a seizure scoring scale. Results showed that the seizure score of the negative control was significantly the least ( $p<.001$ ). The seizure score of the mice induced but not treated (Group 2) was significantly higher than the negative control ( $p<.001$ ) but significantly less ( $p=0.031$ ) than those in the positive control. Those induced and treated with lavender nanoemulsion (Group 3) did not differ from the valproic acid, positive control ( $p=0.144$ ). Based on experimental seizure model and histopathological studies, the formulated lavender nanoemulsion is effective and comparable with valproic acid as a preventive antiepileptogenic agent. (**Author's abstract**)

**Keywords:** *Lavender, Lavandula angustifolia, Pilocarpine, Nanoemulsion, Epilepsy, Seizure, Valproic acid, Medicine*

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0493

## **Epidemiology of severe cutaneous adverse drug reactions in a university hospital: a five-year review**

*Paliza, Arnelfa C. , Guzman, Angel*

Severe cutaneous adverse drug reactions (SCAR) is seen in  $\leq 5\%$  of all hospitalized patients. It includes Stevens-Johnson syndrome/toxic epidermal necrolysis spectrum (SJS/TEN), drug-induced hypersensitivity syndrome/drug reaction with eosinophilia and systemic symptoms (DIHS/DRESS) and acute generalized exanthematous pustulosis (AGEP).

The main objective was to determine the epidemiological characteristics of SCAR patients at a tertiary hospital from 2011-2015. Specifically, it aimed to determine the prevalence, demographic characteristics and clinical profile of SCAR patients.

All SCAR patients from 2011-2015 were studied through a single-center, retrospective, descriptive, cross-sectional study.

Sixty-eight SCAR cases were diagnosed from 2011-2015 with a prevalence rate of 6.25 per 10,000 people. Majority were 46-55 years old with slight female predominance. The most common SCAR was DIHS/DRESS (50%), followed by SJS/TEN (30%) and AGEP (20%). Eight percent had previous drug reactions, 69% had comorbidities and 90% were diagnosed clinically without biopsy. The antibiotics was the most common culprit drug category followed by allopurinol and anticonvulsants. Prompt withdrawal of culprit drug/s, supportive therapy, systemic steroids and antihistamine, topical emollients and saline compress were mainstay of treatment. Mortality rate was 4% for all SCAR categories

The epidemiology of SCAR in this study is similar to those reported in other literature. The adults were commonly involved; DIHS/DRESS was the most common SCAR with antibiotics being the most common culprit. Prompt withdrawal and supportive therapy were essential. Systemic steroid, antihistamine; topical emollients and saline compress resulted in improvement of patients. In contrast, there was lower prevalence rate with slight female predominance; and lower mortality rate even with the use of systemic steroids. (**Author's abstract**)

**Keywords:** *Severe cutaneous adverse drug reactions, SCAR, Drug reaction, Epidemiology, Medicine*

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0494

## **Evolving clinical presentation and assessment of pheochromocytoma: a review**

*Amba, Neil Francis A. , Mercado-Asis, Leilani B., Siao, Ria Mari S*

Pheochromocytoma (PHEO) is a neuroendocrine lesion in the adrenal medulla composed of chromaffin cells producing excess amount of catecholamines. These tumoral cells have the property to synthesize, metabolize, store, and secrete catecholamines and their metabolites. The clinical symptomatology is derived from the peripheral tissue effect of norepinephrine, epinephrine, and their by-products. Morbidity and mortality is increased



due to the delay in the diagnosis and treatment. A high index of suspicion leads to testing for PHEO through biochemical, imaging, and genetic studies. Dilemma in its assessment comes about when the clinical picture is beset by too much catecholamine secretory periodicity, too little catecholamine secretion, in lesions less than 1 cm, in exclusively dopamine-secreting tumors, and in the unavailability of biochemical tests and imaging.

The aim of this review is to focus on the progress in the approach of early diagnosis of pheochromocytoma through improved clinical, biochemical, and imaging modalities. Emphasis is made on the early recognition of evolving clinical presentations, with the introduction of cardiovascular imaging, 2D echocardiogram, and cardiac MRI in the early diagnosis of patients with no risk factors and with equivocal biochemical and imaging results yet present with cardiovascular events. From the data reviewed and presented, several algorithms are proposed by the authors as an easy guide for clinicians in the diagnostic approach of pheochromocytoma. (**Author's abstract**)

**Keywords:** *Pheochromocytoma, Catecholamines, Metanephrines, Methoxytyramine, Medicine*

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0495

### **Facilitating factors and barriers to newborn screening uptake in the Cordillera Administrative Region and Region V**

*Tetangco, Joselito H. , Tetangco, Maria Elenita L. , Lelis, Myrah Joan H. , Silvestre, Catherine J. , Beltran, Frederick David E. , Padilla, Carmencita D. , Cordero, Cynthia P. , Mary Ann J. Ladia,, Torralba, Ermie*

Republic Act 9288 or the Newborn Screening Act of 2004 was enacted. A multi-sector effort towards systematic screening of newborn disorders and built-in systems for subsequent confirmatory tests for positively screened as well as treatment for confirmed cases was likewise implemented. Despite multi-sector efforts and continuous quality improvement mechanisms, national newborn screening coverage remained low for several years.

The study determined factors that influence Newborn Screening (NBS) uptake from various perspectives: mothers, health providers, and program administrators.

Framework analysis of NBS program documents, 25 focus group discussions and 37 key informant interviews of mothers, health providers and program administrators were done in purposively selected communities in the Cordillera Administrative Region and Region V.

Findings showed the need to disseminate correct NBS procedures, especially upon obtaining positive results. Financing issues were addressed innovatively, but system administrators and health providers required a common understanding of program implementation. Monitoring geographically hard-to-reach areas remained a challenge. Barriers outside the system adversely affected filter cards availability, specimen transport, and release of results. Improved online and paper-based educational campaign, greater local government unit support, streamlined PhilHealth processes, a workload-based manpower complement for monitoring, and continuity clinics to handle positive findings can increase NBS uptake. (**Author's Abstract**)

**Keywords:** *newborn screening, perceived merits, attitude and intent, facilitating factors and barriers to uptake, Medicine*

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### **The Filipino dietary habits and nutrition knowledge questionnaire (DHNKQ-FIL): a psychometric study**

*Se, Johnmer Paul , Quilala, Rayesha Azzedine Ma. , Pagarigan, Stephanie Claire , Cardenas, Alessandro , Esteban, Ronell Angelo , Pineda, Karen Leslie, Servañez, N*

The Dietary Habits and Nutrition Knowledge Questionnaire (DHNKQ) is a validated assessment tool that provides information about the nutritional practices of collegiate athletes as an integral support to sports performance. This psychometric study aims to translate and validate the DHNKQ for the Filipino collegiate population to come up with the DHNKQ-FIL using various psychometric protocols consolidated into two phases. The first phase involved the translation of the tool into Filipino and testing for face and content validity through a focus group discussion by an expert committee and was finalized with the administration of a pre-test to 30 collegiate athletes for final modification purposes. The second phase tested the validated DHNKQ-FIL on a new set of 30 collegiate athletes for internal consistency and reliability testing, statistically analyzed using Cronbach's  $\alpha$  and intraclass correlation coefficient, respectively. The DHNKQ-FIL used modern Filipino terminologies, more appropriate for the modern Filipino collegiate athlete. Item Content Validity Index (I-CVI) had scores of 90% and above in semantic, idiomatic, experiential, and conceptual equivalence for both sections. Food guides and choices, along with the usage of medical jargon, were identified areas for modification in the validity testing. Pre-test subjects considered the questionnaire appropriate and applicable for Filipino athletes after cognitive interview. The pilot test showed scale reliability scores of 0.68 or "Questionable" for dietary habits section and 0.81 or "Good" for nutritional knowledge. Test-retest reliability had a score of 0.79 or "Acceptable" for dietary habits and 0.60 or "Questionable" for nutrition knowledge. The acceptable scores for the translation, validation, and reliability of the DHNKQ-FIL makes it a valid tool for assessing dietary habit and nutritional knowledge among Filipino collegiate athletes. (**Author's abstract**)

**Keywords:** *nutrition knowledge, dietary habits, translation, validation, Medicine*

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Philippine Journal of Allied Health Sciences, Volume No. 3 Issue No. 1, 1-17  
2019,  
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### **Filipino version of Penn facial pain scale: phase 1 validation study**

*Rosales, Raymond L. , Yu, Genevieve Ly*

Trigeminal neuralgia (TN) affects 4-5 people per 100,000 population. Because of its key feature—sudden intense facial pain—immediate and long-term treatment is warranted. The newly validated Penn Facial Pain Scale (PFPS) is of great value for assessment of how trigeminal pain and its treatment affect our patients' lives. This study translated the PFPS to a Filipino version which can be used with ease in our setting. The study used validation study. Forward translation was carried out by an expert. The initial output was sent to 10 Neurologists for content and face validity. The experts rated each item's relevance and through item level content validity index, items which scored  $>0.80$  were accepted and those that scored lower were subjected to discussion by the investigators. The revised questionnaire was then administered to 8 TN patients for face validity. The final output was back translated and compared to the original PFPS. Content and face validity as assessed by 10 neurologists showed that all questions were relevant. Some words were edited according to their suggestions. Eight TN patients voluntarily answered the edited version of the questionnaire for face validity and cognitive debriefing. No further changes were made to the edited questionnaire which was then back translated. The back translation was found to be similar to the original PFPS. The Filipino version is similar to the original PFPS and can be used in evaluation of TN. A Phase 2 reliability study should be ideally done prior to utilization in clinical setting. (**Author's abstract**)

**Keywords:** *Trigeminal neuralgia, Facial pain, Pain scale, Pain assessment, Medicine*

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## The functional outcome of arthroscopic anterior cruciate ligament reconstruction in patients using different graft tension during tibial fixation

*Molano, Alberto Ma. V. , Javier, Gabriel Alfo*

Anterior Cruciate Ligament (ACL) reconstruction is commonly performed to restore knee kinematics and halt the progression of osteoarthritis. A primary variable that could influence the outcome of ACL reconstruction is the tension applied to the graft at the time of fixation. If the tension is too great, an abnormal compressive force could potentially develop across the tibiofemoral joint, hindering knee motion, and subjecting the articular surfaces to increased stress. If the tension in the graft is too low, the graft will not be effective in restoring normal kinematics. The Tegner Lysholm Knee Scale is a functional scoring for patients with ligamentous injuries. It is a patient-reported measure of knee function and is important for comprehensive assessment conditions in both the clinical and research context. Our objective was to compare which tension technique graft tension using a Mitek Tensioner™ vs maximal sustained two-hand technique) would yield better functional outcome at 6 months and 12 months postoperatively using the Tegner Lysholm Knee Scale.

Twenty-nine patients who underwent arthroscopic ACL reconstruction at the University of Santo Tomas Hospital Private Division were randomly divided equally into two groups (group A or group B). During tibial fixation, group A would receive 15lbs graft tension using a Mitek Tensioner and group B would receive graft tension using the maximal sustained two-handed pull technique. The patients underwent a standard rehabilitation protocol at an institution of their choice and a Lysholm Scoring Scale and Tegner activity scale were self-administered at 6 months and 12 months after the surgery in order to assess their functional outcome.

The results showed that the functional outcome scores of group A were higher than group B. The yielded p-value was 0.10 (6 months), 0.07 (12 months) for group A and 0.27 (6 months), 0.46 (12 months) for group B. The results showed no sufficient evidence of a significant difference between the effects of arthroscopic ACL reconstruction with 15 lbs weight using a Mitek Tensioner (group A) and graft tension using the maximal sustained two-handed pull (15 lbs technique (group B) in the knee functional outcome of patients at 6 months and 12 months postoperatively.

The functional outcome scores of patients who underwent ACL reconstruction using different graft tension did not show significant results. Further re-evaluation of patients' functional outcome score is necessary after 12 months postoperatively. The desired tensioning technique of the ACL surgeon would be at his/her convenience knowing beforehand the pros and cons of each technique. (**Author's abstract**)

**Keywords:** *Arthroscopic ACL reconstruction, Lysholm Scoring Scale, Tegner activity scale, Graft tension, Tibial fixation, Medicine*

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NP

## HLA-B27 and HLADRB1 genotyping of spondyloarthropathies among Filipino patients

*Silao, Catherine Lyn T. , Ngo, Joenavin D. , Li-Yu,*

The study investigated the role of human leukocyte antigen (HLA) genes among Filipino patients of varying ages with spondyloarthropathies compared to healthy controls in a tertiary center.

This is a case-control study where the index patient is matched by a related and unrelated control. HLA-B27 and HLA-DRB1 genotyping were performed via polymerase chain reactions using sequence-specific primers.

There were 47 indexed patients with a mean age of 39.38 years, including 22 females and 25 males. Of these, 25 had psoriatic arthritis (PsA), 19 ankylosing spondylitis (AS), 2 undifferentiated arthritis (UA), and 1 inflammatory bowel disease (IBD). More females (64%) had PsA while more males (84%) had AS. HLAB-27 was identified

in 22 patients. Among these, 17 were AS patients, 3 PsA, 2 UA, and none with IBD. HLA-B27 was significantly associated with axial involvement (OR=14, 95%CI 3.38, 58.07) and bilateral sacroiliitis (OR=16.61, 95%CI 3.11, 88.8), but not with peripheral involvement (OR=0.125, 95%CI 0.32, 0.485) ( $p<0.05$ ). Of the HLA-B27 + AS patients, 16 had axial symptoms, 14 had bilateral, while 3 had unilateral sacroiliitis, and 3 had uveitis. Of the HLA-B27+ PsA patients, 2 had prominent axial involvement, while 3 patients with axial involvement were HLA-B27-. No pattern of DRB1 alleles was found to be significantly associated with any of the spondyloarthropathies.

This first genetic study on genetic polymorphism among Filipino patients strengthened the association of HLA-B27 with AS. However, there was no pattern of association with HLA-DRB1 alleles in this cohort of patients.

This is the first study that confirms a significant HLA-B27 susceptibility of Filipino spondyloarthropathy patients. However, exploratory findings did not find a HLA-DRB1 genotype to extend a similar susceptibility pattern.  
(Author's abstract)

**Keywords:** HLA-B27, HLA-DRB1, Spondyloarthropathy, Genotyping, Filipinos, Medicine

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NP

0500

## **Immunohistochemical expression of WT1 in nasopharyngeal carcinoma among Filipino patients in a tertiary hospital**

*Manasan, Criston Van, Carnate, Jose Jr., Atun, Jenny Maureen*

Nasopharyngeal carcinoma (NPC) is endemic in Southeast Asia and the Philippines. Novel treatments are desirable due to the high disease burden and adverse effects of existing modalities. Detection of WT1 expression via immunohistochemistry has been reported in many tumors. Moreover, immunotherapy via WT1 peptide vaccination has shown promising results in a wide range of malignancies. No studies on WT1 expression in NPC have been published in any population. Documenting WT1 expression in NPC via immunohistochemistry may provide insight into the possibility of using WT1 vaccination for this disease. This was a retrospective descriptive study. All newly-diagnosed cases of NPC from 2016 to 2017 with samples stored in the Department of Laboratories of the Philippine General Hospital were considered. Cases were included based on specific criteria. The tumor classification of each case was reviewed and WT1 immunohistochemistry staining was performed. Assessment of the strength of WT1 immunostaining was conducted. The results were analyzed using Chi-square test for association with fisher exact correction. A total of 57 cases were included, all of which were non-keratinizing squamous cell carcinomas (NK-SCCs). Forty-nine were undifferentiated type while eight were differentiated type. The mean age was 48 years. Two thirds were male, one third were female. Seventeen of the 57 cases (29.8%) were positive for WT1 immunostaining, and all were undifferentiated type. The majority (82.32%) of the positive cases showed cytoplasmic expression. There was a significant association between tumor classification and WT1 staining. Similar to studies conducted in other carcinomas, a considerable subset of NPCs express WT1. This finding opens other avenues for exploration, including the feasibility of WT1 peptide vaccination as a treatment option. Further studies on the associations between WT1 and NPC are recommended.  
(Author's abstract)

**Keywords:** Nasopharyngeal cancer, Wilms tumor, wt1, Immunohistochemistry, Immunotherapy, Medicine

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NP

### **Immunohistochemical profile, disease-free survival, and pattern of recurrence among non-metastatic breast cancer patients of the Philippine General Hospital during the first 5 years of implementation of the Department of Health-Breast Cancer Medicine Access Program**

*Cario, Clarito, Rosario, Rachel, Ngelangel, Corazon, Cacanindin, Jezraline Marie, Amante, Ma*

This study determined the 5-year disease-free survival and patterns of recurrence of patients enrolled in the Breast Cancer Medicine Access Program (BCMAP) of the Philippine General Hospital. This is a retrospective cohort study of patients enrolled in BCMAP from January 2012 to December 2016. Kaplan-Meier survival analysis was used to determine the disease-free survival. Cox-Mantel Log Rank Test and Cox Proportional Hazards were used to determine factors that influenced survival. Of the 1,680 patients enrolled in the study period, 231 did not finish their treatment. The most common molecular subtype was Luminal A, and majority had High Risk St. Gallen Category. The most common site of recurrence was the bone. Only 612 patients were included in the analysis of survival due to incomplete data. Median disease-free survival had not yet been reached, but those who did have recurrence, did so in a median time of 17 months. Survival was found to be significantly influenced by comorbidities, lymphovascular invasion, ER and PR statuses, and molecular subtypes. Even though a lot of patients benefitted from the BCMAP, lacking data and a significant number of patients lost to follow-up limited the analysis of outcomes. Complete data collection and stronger follow-up is recommended. **(Author's Abstract)**

**Keywords:** breast neoplasms, disease-free survival, immunohistochemical profile, pattern of recurrence, PGH, DOH, BCMAP, Medicine

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### **Incidence of contrast induced nephropathy in patients undergoing coronary angiography: an annual review in a university hospital**

*Tan de Guzman, Wilson L., Ramirez, Marcellus Francis L., Ona, John Patrick F., Tan, Katherine*

The rapidly growing number of percutaneous coronary interventions has led to a considerable improvement in the outcome of patients with acute coronary syndromes, yet concurrently exposing patients to enormous volumes of contrast media with the inherent risk of renal function impairment.

The study determined the incidence of contrast induced nephropathy of patients admitted at University of Santo Tomas Hospital (USTH) who underwent coronary angiography with or without Percutaneous Transluminal Coronary Angioplasty (PTCA).

This is a retrospective, descriptive study including patients aged 18 years and above, of any gender, admitted at the USTH from January 1, 2016 to December 31, 2016, who underwent coronary angiography with or without PTCA with baseline and follow up creatinine levels 48-72 hours after the procedure. Data were retrieved by review of medical records of these patients.

Three out of 78 patients (3.8%) had elevated creatinine but all three patients also underwent major surgery within 48 hours after coronary angiography which could explain the renal impairment.

Although contrast induced nephropathy was described as the third most common cause of new Acute Kidney Injury in hospitalized patients, it was accordingly nil among those who underwent coronary angiography at USTH from January to December 2016. Benefits and risks of undergoing coronary angiography should always be weighed individually. Risk stratification scores should only serve as a guide in managing patients and proper preventive measures should be applied. **(Author's abstract)**

**Keywords:** Contrast Induced Nephropathy, Coronary Angiography, Epidermal Growth Factor Receptor, Transluminal Coronary Angioplasty, Medicine

**Induction of apoptosis by extracted *Hylocereus polyrhizus* is dependent on downregulation of Akt phosphorylation and subsequent activation of caspase 3 expression in human liver cancer cells (HepG2) *in vitro***

*Muñoz, Maria Nilda M. , Labrador, Ale*

The antioxidant-rich nature of *Hylocereus polyrhizus*, commonly known as dragon fruit, has beneficial effects on the human liver. This study determined the potential cancer-inhibiting activity of *H. polyrhizus* against cultured human liver cancer cell lines (HepG2). By Western Blot analysis, the mechanism of action(s) by which *H. polyrhizus* lessened the proliferation of HepG2 cells were examined and its effect on Akt phosphorylation and Caspase 3 activation were measured. The phytochemical profile of methanolic extract of *H. polyrhizus* was evaluated using ultraviolet spectrophotometry and liquid chromatography with mass spectrometry (LCMS). Extracted *H. polyrhizus* exhibited significant suppression of HepG2 liver cancer cell growth. The minimum inhibitory concentration 50 (IC<sub>50</sub>) of *H. polyrhizus* extracts against HepG2 liver cancer after 16 hours treatment was IC<sub>50</sub>=62.31±0.89 µg mL<sup>-1</sup> extract. *H. polyrhizus* extract caused downregulation of constitutively expressed phosphorylated Akt. By contrast, *H. polyrhizus* extract upregulated the expression of Caspase 3, a marker of DNA fragmentation and apoptosis. Phytochemical screening showed that each gram of extract contains 78.75±5.67 mg phytosterol, 20.86±1.04 mg phenolics, and 14.78±2.84 mg flavonoids. LC-MS analysis confirmed the presence of phytosterol (bofutaline, 2-monopalmitin), cyanogenic glycoside (lotaustralin), and mostly alkaloids (corypalline, trigonelline, NMethylisopelletierine and plakohypaphorine). Our study is the first demonstration that *H. polyrhizus* possesses potential anti-proliferative property against liver cancer cells, and that it can serve as functional food for chemoprevention of liver cancer disease. (**Author's abstract**)

**Keywords:** *Phosphorylated Akt, Caspase 3, DNA fragmentation, Western blot and liquid-chromatography with mass spectrometry, Hylocereus polyrhizus, Medicine*

**Infusion reaction to monoclonal antibodies in outpatient infusion units of a university hospital: a two-year retrospective study**

*Salvador, Joanna Luisa Z., Mesina, Flordeluna Z. , Garcia, Angelita T.*

Monoclonal antibodies have revolutionized the treatment of immune-mediated inflammatory diseases (e.g., rheumatoid arthritis [RA], Crohn's disease [CD], and psoriasis) as well as malignant diseases. Currently, there are about 100 monoclonal antibodies and even more are expected in the coming years. Knowledge of not only their mechanism of action but also their adverse event profile is tantamount. One of the distinctive side effects of these drugs is the potential for non-allergic and allergic infusion reactions caused by cytokine release. These adverse reactions should be monitored and managed immediately for patient welfare and safety.

The study was conducted to determine the prevalence of infusion reaction among patients given monoclonal antibodies at outpatient infusion units of a University Hospital, from July 2015 to July 2017.

This is a two-year retrospective study at the University of Santo Tomas Hospital (USTH), a tertiary teaching hospital. A chart review of patients seen at the USTH Benavides Cancer Institute (BCI) and Joint and Bone Center (JBC) were gathered. Patients who received monoclonal antibodies namely rituximab, infliximab, bevacizumab,

tocilizumab, belimumab, brentuximab, pembrolizumab, trastuzumab, pertuzumab, nimotuzumab and eculizumab from July 2015 to July 2017 were included in the study.

Majority of patients were in the 61 to 70 years age group (25.7%); the median age of the population was 53 years and the majority were females (64.9%). The most common indication for monoclonal antibody infusion is rheumatoid arthritis (28.4%). More than one-fourth of the patients did not receive pre-medications (28.4%) but a good number (25.7%) received at least two drugs: paracetamol plus diphenhydramine plus corticosteroids followed by 17.6% who received paracetamol plus diphenhydramine. The authors found a significant difference in the occurrence of infusion reaction between those that were given pre-medications compared to those who were not given pre-medications ( $p=0.032$ ). The most common monoclonal antibodies administered were rituximab (28.4%); tocilizumab (23%); and infliximab (14.9%). However, only rituximab (9.5%), infliximab (2.7%), and bevacizumab (1.4%) had infusion reactions. The overall incidence rate of infusion reaction to monoclonal antibodies was 14%. The onset was within 2 hours with most infusion reactions occurring in the first cycle. Ninety percent were classified as grade 2 infusion reactions. Management of these reactions included rescue medications and brief interruption of infusion. No hospitalization nor recurrence of infusion reaction on the resumption of infusion occurred.

The prevalence rate of infusion reaction to monoclonal antibodies was 14% in this present single-center two-year retrospective study. All adverse events were graded mild to moderate (grade 2) in severity, and were all accordingly managed successfully in the outpatient setting. (**Author's abstract**)

**Keywords:** *Infusion reaction, Monoclonal antibodies, Prevalence, Medicine*

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**0505**

### **Injuries of University of Santo Tomas college teams during the UAAP season 70** *Dones, Valentin*

Sport is an activity governed by sets of rules and customs usually played competitively. Winning or losing from this activity is determined by the physical capabilities of the athletes. In the Philippines, college students from eight different universities and schools in the country compete in the University Athletic Association of the Philippines (UAAP) Season 70. To identify the most common injuries of the University of Santo Tomas (UST) student-athletes in UAAP 70 and to identify the most common body areas injured. It also aimed to determine changes in the most prevalent injury and relative risk of injury of UST-College Teams in UAAP Season 69 compared to UAAP Season 70. A descriptive study of the injuries sustained by the UST college teams participating in the UAAP Season 70 was done. The Center for Research on Movement Science (CRMS) of the Tomas Aquinas Research Complex (TARC) of UST approved the study. All players of the different teams gave their consent to be monitored. A total of eleven (11) UAAP Sports was monitored by the UST-CRS licensed physical therapists. The Australian Sports Injury Data Dictionary was revised and reviewed by the monitoring team composed of licensed physical therapists. They recorded information on the following: type of injury, injured body region, nature and cause of injury, use of protective garment or equipment, contributing factors to injury and the initial treatment given. A total of 101 injuries were reported for all 11 monitored events of the UST teams in the 70th UAAP season. The most commonly injured body part was the lower leg (26.73%), followed by the thigh (20.79%) and the knee (13.21%). The most common injury was cramps (38%) followed by bruise/contusion/laceration (23.81%). The knee (17%) and lower leg (15%) were the most common sites of injury in UAAP 69. Cramps were still the most prevalent injury in UAAP 70 as it was in UAAP 69. There is a difference in the risk of injury depending on the sports being played. The relative risk of injury is considerably higher in junior basketball (0.92), women's volleyball (0.60), men's baseball (0.47), men's basketball (0.47) and men's soccer (0.44). Primary prevention through health promotion and education in injury prevention must be disseminated in all sports. Basketball still had the highest relative risk of injury in UAAP 69 and UAAP 70. (**Author's abstract**)

**Keywords:** *sport activity, sport injuries, UAAP, Medicine*

### **Insights on maternal health in the Philippines from National Health Surveys and Maternal Health Policies**

*Ang-Bon, Rita Mae , Ricarte, Juan Antonio , Cagayan, Ma. Stephanie Fay S. , Llamas-Clark, Er*

The Sustainable Development Goal 3 (SDG) took effect after many of the world's developing countries failed to meet the previously set Millennium Development Goals (MDG). Despite advances in crucial maternal health metrics, the maternal mortality ratio in the Philippines is still increasing. This study aims to document the progress in maternal health in the Philippines and analyze the patterns in maternal mortality reduction in relation to various maternal health metrics and contextual factors.

Data from 36,664 livebirths were analyzed from the five published Philippine Demographic and Health Surveys. Direct estimation was used to project the different maternal health metrics within the 20-year period. Data from the Philippine Health Statistics (PHS) reports were also used to plot the maternal mortality ratio in the Philippines throughout the years. Correlation with contextual factors such as government budget, maternal health policies and reports was also done.

Despite the improvements in facility-based delivery and coverage of skilled attendants, there was no direct progress observed in the maternal mortality ratio. Relative inequalities in maternal health indicators between urban and rural settings have also shown considerable improvement. There were also notable milestones in maternal health, including the adoption of MDGs, development of various guidelines and policies, and the passing of the reproductive health law.

Findings indicate that the programs to improve maternal healthcare in the Philippines have not succeeded in improving maternal mortality. For the Philippines to meet SDG3, these programs should be designed to incorporate socioeconomic and contextual factors. (**Author's Abstract**)

**Keywords:** *Philippines, maternal health, maternal mortality, MMR, Medicine*

### **Interstitial lung disease and pulmonary arterial hypertension in overlap syndrome: a case report**

*Navarra, Sandra V. , Frio, Mika*

The study presented the onset of severe pulmonary arterial hypertension (PAH) in a patient with interstitial lung disease (ILD) associated with overlap syndrome. A 42-year-old female was diagnosed with overlap syndrome consisting of systemic lupus erythematosus (SLE), systemic sclerosis (SSc) and rheumatoid arthritis (RA). The serologic profile included positive antinuclear antibody (ANA), anti-dsDNA, anti-RNP, anti-Ro, anti-Scl70, anti-Sm, rheumatoid factor and hypocomplementemia (C3, C4). She had chronic stable ILD for 17 years maintained on hydroxychloroquine (HCQ), prednisone 5 mg/day and indacaterol. The current admission was due to progressive dyspnea and right-sided heart failure over the past month. Chest radiograph showed pulmonary congestion, and 2-dimensional echocardiography (2DE) disclosed severe PAH with systolic pulmonary arterial pressure (SPAP) of 76mmHg by tricuspid regurgitation (TR) jet, dilated right ventricle (RV) with poor systolic function, moderate pericardial effusion with no signs of tamponade. She received furosemide, beraprost, sildenafil, and prednisone was increased to 20mg/day. Two weeks following discharge, there was complete resolution of symptoms and repeat 2DE showed non-dilated RV with good systolic function, normal SPAP of



21.4mmHg and minimal pericardial effusion. Prednisone was tapered to 5mg/day; beraprost, sildenafil and HCQ were continued.

Overlap syndrome was diagnosed by the combination of clinical features and serology distinctive of SLE, SSc and RA. Her illness, particularly ILD, was adequately controlled over several years, until the recent onset of PAH complicated by right-sided heart failure. The dramatic response to high-dose steroids is more consistent with inflammatory vasculitis of SLE activity rather than fibrosis typical of SSc. (**Author's abstract**)

**Keywords:** *Overlap syndrome, Pulmonary arterial hypertension, Interstitial lung disease, Systemic lupus erythematosus, Scleroderma, Medicine*

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0508

### ***In-vitro and in-vivo* assessment of Philippine *Pandanus* species (Pandanaceae) as potential anti-inflammatory agents**

*Tan, Mario A. , Castillo, Agnes L. , del Mundo, Cris*

*Pandanus amaryllifolius* Roxb. and *Pandanus tectorius* Parkinson ex Du Roi (Pandanaceae) have been ethnomedically used in the treatment of inflammatory diseases, however, this claim is yet to be scientifically established. This study aimed for in vitro and in vivo assessment of methanolic and aqueous leaf extracts from these species as potential antiinflammatory agents. Metabolite profiling was done on the extracts via liquid chromatography-mass spectroscopy (LC-MS). In vitro assessment on the extracts was conducted through cyclooxygenase (COX)-1 and COX-2 inhibitory screening assays. The result showed that only *P. tectorius* aqueous leaf extract showed a remarkable COX-1 (86.04%) and COX-2 inhibitory effects (79.07%) comparable to the positive control Indomethacin ( $p>.05$ ). Acute toxicity testing was also performed on *P. tectorius* aqueous leaf extract based on OECD Guideline 425 and showed that the extract is nontoxic in rats at 2,000 mg kg<sup>-1</sup>. These findings imply that aqueous extract of *P. tectorius* leaves possesses COX inhibitory property that could serve as the basis for its anti-inflammatory activity. Determination of anti-inflammatory activity in vivo is currently being done. (**Author's abstract**)

**Keywords:** *Anti-inflammatory, Pandanus amaryllifolius, Pandanus tectorius, Cyclooxygenase, Metabolite profiling, Medicine*

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0509

### **Life on a tightrope: an interpretive phenomenological analysis of narratives of coping with academic stress among Filipino medical students**

*Sevilla, Tiphany P. , Querubin, Genevieve Anne R. , Juan, Mart Blas Angelo P. , Garan-Giller, Elizabeth Aileen, Dator, Dominico Carlo S. , Calimag, Maria Minerva P.*

Life in a medical school is stressful for just about every medical student. Academic stress in small doses heightens the energy and awareness, giving one that mood most refer to as “pumped up” or “wired”.

When the incremental progression of stress brought about by health and emotional factors compounded by social and financial problems, overwhelmingly surpasses one’s ability to cope, it leads to feelings of being “burnt out” or “stressed out”. It can have a negative impact on a medical student’s cognitive and psychological functioning

resulting in poor academic performance. Each person has his or her own unique way of dealing with it; some may outwit pressure without a bad outcome, while others just simply succumb to it.

A vast majority of research on academic stress is centered on its contributing factors and how they affect other aspects of students' lives. Coping mechanisms and effective ways in dealing with stress have also been delved into, but none have dwelt on a study of the medical students' lived experience of academic stress. There was no study found in literature which examined and collectively characterized the different phases that medical students go through in coping with academic stress, hence the impetus to undertake this study. Anchored on the Transactional Model of coping with stress, this study was undertaken to answer the central question: How do Filipino medical students collectively characterize the phases they undergo in coping with the stresses in medical school?

The methodological underpinnings of this study are based on phenomenology. The objective of Interpretive Phenomenological Analysis (IPA) is to understand how a particular phenomenon is constituted from the participant's perspective. It offers researchers the opportunity to learn from the insights of experts—the research participants themselves. The respondents' insights were gathered through narratives culled through a guided semi-structured questionnaire patterned after social networking sites, allowing the respondents to liberally exploit their voices and thoughts. Narrative accounts gathered focused on the medical student's daily activities, matters that precipitate anxiety, their views on stress, and methods of coping. Through cool and warm analyses, the narratives were ultimately subjected to phenomenological reduction.

Fascinatingly, after subjecting the narratives to a thorough and comprehensive phenomenological analysis, six emergent themes surfaced which collectively characterized the phases the respondent medical students underwent in coping with academic stress: Self-effacement Phase (Sensing inner trepidation), Self-awareness Phase (Settling in new surroundings), Self-weariness Phase (Struggling through stress) Self-attentiveness Phase (Staying focused to survive), Self-equilibrium Phase (Sustaining a state of symmetry), and Self-mastery Phase (Striving towards sovereignty and satisfaction). The “Tightrope” is a representation that lucidly embodies these six themes

The respondents have experienced substantial challenges in medicine: they surmounted their inner trepidation; settled and acclimatized to their new surroundings; gained the courage to outwit stress and struggles; fought to strive, survive and stay focused; learned to maintain a state of balance and symmetry; and finally lived up to a sense of sovereignty and self-satisfaction. It is just a matter of perspective and attitude that demarcates a victor from a slacker. (**Authors' abstract**)

**Keywords:** *Medical students, Stress, Coping, Filipino, Medicine*

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0510

### **Metabolite profiling and cox inhibitory and cytotoxic properties of *Lasianthus trichophlebus* Hemsl. (Rubiaceae)**

***Tan, Mario , Lagamayo, Mark, Alejandro, Grecebio Jonat***

The Rubiaceae family of plants has been known to display different pharmacological activities. This study determined the cyclooxygenase (COX) inhibitory and cytotoxicity of the methanolic, hexane, chloroform, and aqueous extracts of the dried leaves of *Lasianthus trichophlebus* Hemsl. Metabolite profiling using liquid chromatography-mass spectroscopy (LCMS) was also done to determine the secondary metabolites which could be responsible for their activity. The in vitro COX-1 and COX-2 inhibitory assessment on the extracts showed that *L. trichophlebus* MeOH extract exhibited COX-1 (52.64%) and COX-2 (57.12%), while the CHCl<sub>3</sub> extract exhibited COX-1 (60.49%) and COX-2 (54%) inhibition. Acute toxicity testing of the MeOH extract using the OECD Guideline 425 showed nontoxicity up to 2,000 mg kg<sup>-1</sup> BW. MTT assay is currently being done to determine the cytotoxicity of the extracts. (**Author's abstract**)

**Keywords:** *Lasianthus trichophlebus, LC-MS, Cyclooxygenase, Rubiaceae, Medicine*

### **Molecular descriptors for drugs: a discriminant analysis**

*Billones, Junie B. , Gonzaga, Alex C. , Billones, L*

The biological activity of a compound is assumed to be encoded in its chemical composition and geometric structure, from which physico-chemical, electrotopological, and graph theory-derived properties can be determined. This study aimed to identify molecular descriptors derived from Dragon® 6 software that can discriminate compounds as drug or non-drug. In this study, over 4000 molecular properties were obtained for approximately 2000 known drugs and 2000 non-drugs on which Linear Discriminant Analysis was performed. Compounds can be discriminated between drug and non-drug with 81% accuracy using only two molecular descriptors, the information index HVcpx and the topological index MDDD. A “Rule of Three” ( $HVcpx \leq 3$  and  $MDDD \geq 30$ ) seems to confer druglikeness in compounds. This rule can be used as additional filter in high throughput screening of compounds in any drug discovery research. (**Author's Abstract**)

**Keywords:** *Dragon@descriptors, discriminant analysis, druglikeness, topological, information index, drug discovery, Medicine*

### **The national external quality assessment scheme for diagnostic medical parasitology in the Philippines, 2009–2015**

*Lupisan, Socorro , Sombrero, Lydia , Mondoy, Melisa , Luchavez, Jennifer , Roxas, Celine Bernice , Navarro, Rafael , Bugayong, Mark Philip , Bautista, Prince Ninja , Dominquez, Kim Joshua , BaÃ±aga, Jahra , Rapanut, Julius Matt , Sadiasa, Alexander , Tangcalagan, Dave , Galit, S*

The Research Institute for Tropical Medicine (RITM)–National Reference Laboratory (NRL) for Malaria and Other Parasites, mandated by the Department of Health–Philippines (DOH), administers an annual Proficiency Test (PT) in diagnostic medical parasitology to clinical laboratories throughout the Philippines through the National External Quality Assessment Scheme (NEQAS). The PT in Parasitology aims to monitor and evaluate the capability of Philippine laboratories in the identification of blood and intestinal parasites, and the estimation of malaria parasite density in malaria-infected blood films. As of 2018, participation in the NEQAS is an annual requirement by the Department of Health–Health Facilities and Services Regulatory Bureau (DOH-HFSRB) for each clinical laboratory to obtain a license to operate.

This report aims to summarize the results of the PT for Parasitology and assess the performance of participating laboratories in malaria and fecal parasite microscopy from 2009 to 2015.

RITM–NRL oriented clinical laboratories in the NEQAS in 2008. Laboratories submitted their accomplished enrolment forms to RITM–NRL and paid fees to enroll in the PT in 2009 to 2015. Participating laboratories identified the species of malaria in blood films and the parasite/s in formalin-preserved fecal specimens. Estimation of parasite density in malaria blood films was performed as well.

One thousand five hundred forty (1,540) laboratories participated from 2009 to 2015. Mean and median scores in all seven years were below the cut-off score of 80. *Schistosoma japonicum* was the most difficult to identify with only 7.7% of laboratories having correct identification result. Majority of participants from 2010 to 2014 gave malaria parasite density estimates outside the acceptable range.

Most participating laboratories performed poorly in the proficiency tests over the last seven years. Training and refresher courses for laboratorians are recommended in order to address the poor performance in the laboratory diagnosis of parasitic infections, especially the endemic and uncommon ones, in the country. (**Author's abstract**)

**Keywords:** *Laboratory proficiency testing, External quality assessment, Medical parasitology, Malaria, Schistosomiasis, Helminthiasis, Protozoan infections, Medicine*

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0513

**Nephroprotective effect of the ethanolic extract of *Caulerpa racemosa* (Forsskal) J. Agardh against gentamicin-induced nephrotoxicity in sprague-dawley rats**  
*Macadangang, Santi , Buted, Stephanie , Buenavista, Charize , Baccay, Nadine , Alea, Paolo , Casuga, Franelyne P., Mallari, T*

The nephroprotective property of the ethanolic extract of *Caulerpa racemosa* (Forsskal) J. Agardh, a green algae abundant in Philippine shorelines, was investigated. *C. racemosa* was desalted in distilled water, cleansed, then dried. The dried plant was subjected to percolation to obtain the ethanolic extract. Total phenolic content (TPC) and total flavonoid content (TFC) were determined. In vivo nephroprotective activity of the extract was performed for eight days on Sprague-Dawley rats through Gentamicin-induced nephritis. Nephroprotective activity of the extract at different concentrations (250 mg kg<sup>-1</sup>, 500 mg kg<sup>-1</sup>, and 1,000 mg kg<sup>-1</sup>) were assessed through blood assays (blood urea nitrogen and creatinine), which were performed at the onset and at the end of the experiment. One kidney was incised for histopathological testing. Silymarin (50 mg kg<sup>-1</sup>) served as the positive control, and Gentamicin (80 mg kg<sup>-1</sup>, in sulfate form) was used to induce nephritis. Total flavonoid and phenol content determination showed that the extract contains 1.00±0.003 mg QE (quercetin equivalent) g<sup>-1</sup> sample and 0.800 ± 0.04 mg GAE (gallic acid equivalent) g<sup>-1</sup> sample, respectively. Nephroprotective evaluation based on hematologic and pathophysiologic parameters showed that the extract protected rat kidneys against gentamicin-induced renal tubular alterations and rises in blood urea nitrogen and serum creatinine. Extracts at different concentrations showed significant difference compared with the negative control, however, it was not dose-dependent. The 500 mg kg<sup>-1</sup> extract ameliorated Gentamicin-induced nephrotoxicity. (**Author's abstract**)

**Keywords:** *Nephroprotective, Caulerpa racemosa, Gentamicin-induced nephritis, Green algae, Medicine*

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0514

**Oral carcinoma cuniculatum: a case report**  
*Tabije, Jay Hansel , del Castillo, Cynthia , Salera, Leila , Carnate, Jo*

We report a case of oral carcinoma cuniculatum, an exophytic variant of oral squamous cell carcinoma that has bland cytomorphologic features, and a peculiar and characteristic growth pattern. Despite the lack of cytologic atypia, the tumor exhibited locally aggressive and infiltrative behavior with bone and cutaneous involvement. Pertinent benign and malignant mimics, and helpful differentiating features are also discussed. (**Author's abstract**)

**Keywords:** *Oral squamous cell carcinoma, Oral squamous cell carcinoma variant, Oral carcinoma, Mouth neoplasms, Medicine*

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### **Outputs and outcome of the pharmacy directly-observed treatment short-course (DOTS) initiative in the Philippines**

*Antonio, Carl Abelardo T. , Fabella, Ronald Allan M. , Mendoza, Eden C. , Manalo, Jorel A. , Agbon, Azar G. , Avelino, Michelle D. , Guevarra, Jonathan P. , Orolfo, Diana Dalisay A. , Bermudez, Amiel Nazer C. , Cochon,*

This is an evaluation of the effectiveness of the technical assistance package for the Pharmacy DOTS Initiative (PDI) in the Philippines. Five pre-identified implementation sites were included in the evaluation. A survey was conducted to ascertain pharmacies currently implementing PDI and the number of TB presumptive cases referred by these pharmacies. Data abstraction was performed to determine the change in the number of TB cases seen by local TB programs after its implementation. Findings revealed that the proportion of pharmacies actively referring presumptive TB patients is not significantly lower than 60% ( $p=0.1892$ ). Furthermore, results showed that the average monthly referrals were not statistically lower than 20 clients per month ( $p=0.9159$ ). Nevertheless, interrupted time series analysis found no statistically significant immediate effects ( $p=0.516$ ) and long-term effects ( $p=0.3673$ ) on the total number of new TB cases identified after the PDI was implemented in the year 2014. The PDI was able to achieve outputs related to pharmacy engagement and referral of TB presumptive clients. However, the PDI was unsuccessful in increasing the actual number of TB presumptive cases seen by local TB programs in its implementation sites. (**Author's Abstract**)

**Keywords:** *tuberculosis, Directly Observed Treatment Short Course (DOTS), Innovations and Multi-Sectoral Partnerships to Achieve Control of TB (IMPACT), evaluation, Philippines, Medicine*

### **Patient perception of medical student engagement in community-based outreach activities during community health clerkship: a q-methodology study**

*Calimag, Maria Minerva P. , Calimag, Angela Paul*

The essence of the medical profession is providing service not only to individual patients but to the community at large. The patient-physician interaction is essential in the Community Service learning component of the Doctor of Medicine curriculum of the University of Santo Tomas, Faculty of Medicine and Surgery (UST-FMS) students for more than five decades. As the modern view of the patient veers away from paternalism, however, he assumes the roles of "member of the health team," an "evaluator of care," and a potential "agent of change." Evidence-based guidelines on health promotion in adult patients recommend giving them "voice" and involving them in projects. A blank spot exists regarding attitudes and expectations of adult patients about the role of medical students in community-based projects, as these remain unreported. Anchored on the Community-based Program Theory, this paper explores the central question: How do patients perceive the role of medical students in a community-based setting?

The Q-methodology is the primary design used in this study. It combines the objectivity of quantitative approach with the essence of human experiences as explored in qualitative studies. The participants (P-sample) were 25 subjects gathered by convenience sampling in a community outreach site of the Department of Preventive, Family, and Community Medicine of the UST-FMS, in a comprehensive Philippine University. They were asked to arrange 25 statements (Q-sample), derived from the initial interview, in the Q-sort table based on their degree of agreement, which was then further explicated in the post-sort interviews. The results were then subjected to by-person factor analysis with varimax rotation using the PQ Method version 2.11.

Four profiles emerged from the by-person factor analysis, i.e., the respondents value the medical students in their various roles in the community as: (1) 'community engager' in a curative role; (2) "capacity enhancer" in a promotive role; (3) "community enabler" in a preventive role; and (4) "community energizer" in a rehabilitative role. The discussion focused on similarities and differences among profiles regarding the three principal themes (attention, appreciation, and action) derived from the statements used as the Q-sample. This paper contributes to primary care research, as it 1) applied a mixed-method approach in the study of patient and physician relationship in the Philippine community setting; 2) knowledge and perceptions of Filipino patients were codified and made explicit through this study; and 3) it adds to the worldview of the culture-laden concept of patient-physician relationship, particularly regarding the Filipino patients' perceptions of the medical student as a primary care physician and the role they play in his/her healthcare. (**Author's abstract**)

**Keywords:** *Community-based, Primary care, Roles, Medical students, Philippines, Medicine*

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0517

### **Pharmacy DOTS Initiative (PDI): a case study on integrating pharmacies in the tuberculosis directly observed treatment-short course (TB DOTS) network in the Philippines**

*Manalo, Jorel A. , Orolfo, Diana Dalisay A. , Cochon, Kim L. , Guevarra, Jonathan P. , Antonio, Carl Abelardo T. , Bermudez, Amiel Nazer C. , Avelino, Michelle D. , Agbon, Azar D. , Mendoza, Eden C. , Fabella, Ronald All*

Tuberculosis (TB) is a disease that has continuously burdened Filipinos. Various programs have been launched by public and private sectors to decrease the incidence of TB and to scale up TB prevention and control in the country. In line with this, pharmacists have been contributing in the campaign against TB since 2004 through the implementation of the Pharmacy DOTS Initiative (PDI). Through the project Innovations and Multi-Sectorial Partnerships to Achieve Control of TB (IMPACT), PDI was relaunched in the country in 2014. This case study aims to evaluate the impact of PDI on TB prevention and control by assessing the effectiveness of the technical assistance package rolled out during program implementation. A review of documents was done to evaluate the achievement of the specific targets of PDI. Among the targets, the percentage of actively referring pharmacies and the number of referrals made throughout the program failed to meet the target. The remaining program targets such as the establishment of a referral system, training of pharmacy personnel, adoption of a TB DOTS curriculum in pharmacy schools, and presence of national legislation, policies, and guidelines relevant to PDI were satisfactorily met. PDI had a good response at the start of its implementation, but several issues resulted in the inability to sustain the interventions and achieve set targets. (**Author's Abstract**)

**Keywords:** *tuberculosis, program evaluation, case study, Philippines, Medicine*

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2020/03,  
(Filipiniana Analytics)

0518

### **Physical activity level using pedometry of Filipino pre-adolescents**

*Lipardo, Donald S. , Lagman, Rachel*

An active lifestyle among children and adolescents plays an important role in the normal growth and development. However, studies from different countries have shown a decreasing participation of children in physical activity. In the Philippines, very little is known of preadolescents involvement in physical activity. This study aims to 1) determine the physical activity level of pre-adolescents using pedometers, and 2) examine the factors that could affect the physical activity level of children, i.e., sex, age, body mass index, number of hours watching

television/using computers and kinds of transportation used in going to school. Descriptive cross sectional study. 90 students ( 41 boys with mean age of  $11.4 \pm 0.8$  with mean BMI of  $20.8 \pm 5.0$  kg/m<sup>2</sup> and 49 girls with a mean age of  $11.5 \pm 0.7$  with a mean BMI of  $20.1 \pm 4.1$  kg/m<sup>2</sup>) from a private school in Manila, Philippines participated in the study from July to August 2006. Physical activity was measured using pedometers which counted the steps taken per day. The overall pedometer reading was  $8085.5 \pm 2839.3$  steps per day for the total population with a statistically higher mean steps/day of  $8785.0 \pm 3000.5$  for boys and  $7499.7 \pm 2535.2$  for girls (p value = 0.03). Only 5 of 41 boys and 5 of 49 girls were able to meet the recommended pedometers steps of 13,000 steps/day and 11,000 steps per day respectively. Sex, body mass index and mode of transportation were factors that affected the mean pedometer steps. large majority of the study population was not able to meet the recommended steps per day to maintain a healthy lifestyle. Males, lower body mass index and walking to school had a positive association with higher mean pedometer count. A decreasing physical activity pattern could increase the likelihood of having lifestyle diseases in these children in the coming years. Children should be encouraged to have a more active lifestyle, not only in school, but also with the family. **(Author's abstract)**

**Keywords:** pre-adolescent, pedometer, physical activity, Medicine

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2008,  
(Filipiniana Analytics)

0519

### **Phytochemical and FTIR analysis of the isolated polyphenolic compounds of *Morus alba* L. leaves and its effect on the blood ureacreatinine ratio of nephrotoxic rats**

*Que, Yoko Jane L. , Molina, Gernelyn Shaira C. , Navales, Edgardo Antonio R. , Gabbuat, Sheena Angela V., Castro, Renz Edward S. , Castillo, Ransell Joy B. , Calzo, Sarah May H., Castillo, Agnes*

*Morus alba* L., commonly known as white mulberry serves as a source of bioactive constituents and is usually used in phytopharmacy and in functional food formulation. The isolated polyphenolic compounds of *Morus alba* L. leaves were subjected to FTIR testing, phytochemical tests, and *in vivo* testing for nephroprotective potential. Thirty-six male Sprague-Dawley Rats were randomly selected and were assigned into six groups namely, the Normal control, Nephrotoxicuntreated, Cilostazol-treated, 100 mg/kg BW, 250 mg/kg BW and 500 mg/kg BW Mulberry treated groups. The study was carried out for 10 days, and the blood urea nitrogen/creatinine ratio (BCR) showed that Mulberry Treated groups (100 mg/kg, 250 mg/kg and 500 mg/kg) were considered to be lower than those of nephrotoxic-untreated and Cilostazol-treated. A blood urea nitrogen/creatinine ratio of 45.6 (100 mg/kg BW), 34.6 (250 mg/kg), and 48.2 (500 mg/kg BW) were said to signify a probable nephroprotective potential.

As a conclusion, it can be inferred that isolated polyphenolic compounds of *Morus alba* L. leaves with doses of 250 mg/kg BW (Urea: p= 0.516; Creatinine: p=0.999) and 500 mg/kg BW (Urea: p= 0.959; Creatinine: p=1.000) showed a significant difference on the blood ureacreatinine ratio of the nephrotoxic Sprague-Dawley rats as compared to the nephrotoxic- untreated, and cilostazol-treated group. **(Author's abstract)**

**Keywords:** *Morus alba*, Nephroprotective, Phenolic compound, Medicine

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2018 July,  
(Filipiniana Analytics)  
NP

0520

### **Phytochemical screening, antioxidant, and hepatoprotective activity of common Fig (*Ficus carica* L.) lef ethanolic extract in male wistar Albino rats (*Rattus norvegicus* B.)**

*Blanco, Ma.Tereza A. , Valdez, Pal*

Fig (*Ficus carica* L.) is an excellent source of minerals, vitamins, and dietary fiber because it is free from fat and cholesterol and contains a high amount of amino acids. Since there is no accounted research about the plant in the

Philippines, this study was conducted to determine the phytochemical constituents present in common fig leaf ethanolic extract (CFLEE); evaluate the antioxidant property using the 2,2-Diphenyl-1-Picrylhydrazyl (DPPH) assay; and compare the hepatoprotective property of CFLEE-treated albino rats with that of silymarin-treated and untreated albino rats through enzyme marker and histological liver examination. The CFLEE results showed that the extract contained alkaloids, carbohydrates, saponins, phytosterol (diterpenes), phenolic compounds, flavonoids, and proteins. The concentration of CFLEE that scavenges 50% of free radical DPPH is 24,600 µg mL<sup>-1</sup>. The initial serum glutamine pyruvic transaminase (SGPT) levels of the male rats assigned to the three treatments were not significant. After the induction of paracetamol hepatotoxicity, the final SGPT level obtained from the male rats treated with silymarin and CFLEE were not significantly different, however, the untreated rats had significantly higher SGPT level. **(Author's abstract)**

**Keywords:** *Ficus, Phytochemical, Antioxidant, Hepatoprotective, DPPH, Rattus norvegicus B., Albino rats, Medicine*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 211  
2018 July,  
(Filipiniana Analytics)  
NP

0521

### **Platelet rich plasma in arthroscopically repaired rotator cuff muscle: a meta-analysis of randomized controlled trials**

*Munji, Jeremy James C. , Lorenzo, Patrick*

Platelet-rich plasma (PRP) has been used as a biologic augmenter in arthroscopically repaired rotator cuff muscle. The objective of this meta-analysis is to compare the clinical and structural outcomes of patients with and without PRP supplementation in arthroscopic rotator cuff repair.

A systematic search in different online databases was done to evaluate studies involving PRP supplementation in arthroscopically repaired rotator cuff muscle, reviewing the re-tear rates, pain scale and functional shoulder scores in groups with and without PRP supplementation.

Six studies were eligible for the meta-analysis. Arthroscopically repaired rotator cuff with PRP supplementation showed statistically better clinical and structural outcomes compared to the group who did not receive supplementation.

PRP as a biologic augmenter can decrease the re-tear rates as well as pain scale and can improve the functional shoulder scores of patients with arthroscopically repaired rotator cuff muscle. **(Author's abstract)**

**Keywords:** *Platelet Rich Plasma, Rotator Cuff Muscle, Arthroscopic rotator, Medicine*

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Journal of Medicine University of Santo Tomas (JMUST), Volume No. 3 Issue No. 1, 1-8  
2019/04,  
(Filipiniana Analytics)  
NP

0522

### **Post-varicella acute inflammatory demyelinating polyradiculoneuropathy in a 51-year-old Filipino male: a case report**

*Dadgardoust, Pariessa D., Rosales, Raymond L*

Primary varicella zoster infection is commonly observed in school-aged children. There are increasing reports of adults also being affected. Varicella zoster infection has a myriad of clinical complications. The rarer of these complications is Guillain-Barre syndrome (GBS) or acute inflammatory demyelinating polyradiculoneuropathy with less than 50 cases in reported literature. We report the case of a 51-year-old Filipino male who presented with bilateral lower extremity weakness two weeks after a primary varicella infection. Cerebrospinal fluid (CSF)



analysis showed elevation of CSF protein at 69 mg/dL (NV 15 to 45mg/dL). CSF varicella virus Immunoglobulin G was 1.8mIU/ml (NV 1.3mIU/ml) and Immunoglobulin M was at 1mIU/ml (NV 0.9mIU/ml). Nerve conduction velocity studies mainly showed a demyelinating form of neuropathy involving motor (predominantly) and sensory nerves. The objective finding in this case, as well as the clinical history, is indicative of a demyelinating sensorimotor polyneuropathy after a varicella infection. According to our awareness and considering its rarity, this was the first Filipino case to be reported with varicella infection and GBS. (**Author's abstract**)

**Keywords:** *Varicella, Acute inflammatory demyelinating polyradiculoneuropathy, Guillain-Barre Syndrome, Medicine*

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Journal of Medicine University of Santo Tomas (JMUST), Volume No. 1 Issue No. 1, 1-5  
2017/08,  
(Filipiniana Analytics)  
NP

0523

### **Predictive value of histologic characteristics on hormone receptor and HER-2 status of patients with invasive breast carcinoma, no special type, in an academic medical center** *Cagampan, Ma. Carmen , Elomina,*

This study aims to assess the predictive value of histologic characteristics in determination of hormone receptor (ER/PR) and HER-2/Neu status in patients with invasive breast carcinoma of no special type (NST).

A 4-year review of histopathology and immunohistochemistry reports of women diagnosed with invasive carcinoma NST, was done. Multiple logistic regression was used to determine the association between histologic characteristics and ER and PR status, while multinomial multiple logistic regression was used to determine the association between histologic characteristics and HER-2 status, and that between ER and PR expression, and HER-2 immunoreactivity. All analyses included age, pathologic tumor size, lymph node stage, and lymphovascular space invasion as covariates.

A total of 137 cases were included in the study. Architectural grade is a significant positive predictor of equivocal HER-2 status ( $P=0.026$ ). Nuclear grade is a significant negative predictor of ER status ( $P=0.031$ ). Elston score and Nottingham histologic grade showed no significant association with hormone receptor and HER-2 status. ER status demonstrated no significant association with HER-2 expression, but PR status appears to be a significant negative predictor of a strongly positive HER-2 status ( $P=0.035$ ). Lymph node stage seems to be a significant positive predictor of an equivocal HER-2 status.

Histologic characteristics can predict ER, PR, and HER-2 status, and interactions between expression of these markers provide some insights regarding the complex genetic interactions in the pathogenesis of breast cancer, and its translation into different histologic phenotypes. (**Author's abstract**)

**Keywords:** *Breast carcinoma, Histology, Immunohistochemistry, Medicine*

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Philippine Journal of Pathology, Volume No. 4 Issue No. 1, 1-6  
2019/06,  
(Filipiniana Analytics)  
NP

0524

### **Preparation, characterization, and antibacterial activity of gentamicin-loaded chitin nanogel** *Binag, Christina , Castillo, Agnes , Obel,*

Antimicrobial resistance (AMR) is one of the most serious health problems experienced worldwide. One solution is to create a novel drug delivery that enhances the antibacterial activity of a drug through the use of "nanoantibiotics". In this research, gentamicin, a broad spectrum antibacterial drug, was encapsulated in a nanogel

prepared from chitin and tested for its activity against resistant and non-resistant strains of *Staphylococcus aureus* and *Pseudomonas aeruginosa*. Chitin nanogel (CNGs) were prepared through freeze-thawing method using KOH and then regenerated with methanol followed by ultrasonication. Gentamicin-loaded chitin nanogel (GCNGs) were prepared by incubating gentamicin with CNG. Particle size analysis revealed that CNG and GCNGs had an average particle size of 501.53 nm and 801.4 nm, respectively. Zeta potential analysis of CNGs and GCNGs indicated a charge of +24.6 mv and +21.76 mv, respectively. For the antibacterial testing, the prepared GCNG produced a lower minimum inhibitory concentration (MIC) of 0.125 mcg mL<sup>-1</sup> compared to that of gentamicin which produced an MIC of 0.25 mcg mL<sup>-1</sup> against *P. aeruginosa* based on broth microdilution assay. The prepared GCNG also produced an MIC of 16 mcg mL<sup>-1</sup>, which is better than the MIC of gentamicin alone at 32 mcg mL<sup>-1</sup> tested against methicillin-resistant *S. aureus*. These results indicate that CNG is a good candidate carrier for gentamicin since it can increase the activity of the gentamicin against *P. aeruginosa* and the methicillin-resistant *S. aureus*. **(Author's abstract)**

**Keywords:** *Gentamicin, Chitin, Nanogel, MRSA, Staphylococcus aureus, Pseudomonas aeruginosa, Medicine*

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 2018 July,  
 (Filipiniana Analytics)  
 NP

0525

### **Presumptive detection of antibiotic residues in raw meat of *Bos taurus* (Bovidae) and *Sus scrofa domesticus* (Suidae) obtained from the public market of Las Pinas City, Philippines**

*Mendoza, Ma. Victoria E. , Brijuega, Ermira D. , Martinez, Jaymie Lauren , Laurente, Maribeth R. , Raloso, Jessa D. , Jacinto, Anna Muriel T. , Dumagsa, Geraldine Rheigniere G., Montessa, Michael Thomas*

This study was carried out to detect antibiotic residues in raw meat of *Bos taurus* (Bovidae) and *Sus scrofa domesticus* (Suidae) obtained from the public market of Las Piñas City. Three batches were collected from the public market and examined for the occurrence of antibiotic residues. It was observed that pork had the greatest zone of inhibition in all the groups of antibiotics. Samples were positive for the presence of penicillin type (61 mm), tetracycline type (61 mm), sulfonamides (53 mm), aminoglycosides type (49 mm), and macrolides (17 mm). Beef also contained penicillin type (56 mm), tetracycline type (56 mm), sulfonamides (46 mm), aminoglycosides type (42 mm), but did not contain macrolides (0 mm). The presence of antibiotic residues in raw meat carcasses poses a health risks, such as antibiotic resistance, teratogenicity, carcinogenicity, and hepatic and renal failure, to consumers. This study showed that a considerable contamination of antibiotic residues in raw meat was found in both samples. **(Author's abstract)**

**Keywords:** *Antibiotic residues, Raw meat, Bos taurus, Sus scrofa domesticus, Medicine*

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 2018 July,  
 (Filipiniana Analytics)  
 NP

0526

### **Prevalence and predisposing factors of Parkinson disease: a community-based study in Barangay Mangilag Sur, Candelaria, Quezon: a research protocol**

*Salazar, Gerardo B. , Rosales, Mary Camille E. , Rosales, Joseph Mariuz B. , Romana, Nadia Beatrice S. , Robles, Danica Jane S. J., Rodriguez, Ron Christian Neil T. , Rosales, Raymond L.*

Parkinson disease (PD) is a neurodegenerative disorder affecting the central nervous system caused by the death of dopaminergic cells in the ventral region of the pars compacta of the substantia nigra. The subsequent lack of dopamine causes movement-related disorders including tremors, rigidity, hypokinesia, and postural instability. The clinical diagnosis of PD is hinged on the triad of asymmetric bradykinesia, rest tremors, and rigidity, with an

expert (usually a neurologist) eliminating those cases having mimics of the symptomatology. Development of the disease is through certain environmental, hereditary, and genetic factors. In the Philippines, PD is a rarely seen disorder and establishing a prevalence study has been difficult for neurologists. Prevalence of the disease in the country has been estimated to be less than 1% based on a 2007 study conducted by the Philippine Neurologic Association but without ascertainment of cases. The researchers aim to determine the disease's prevalence in a locale and explore the possible predisposing factors on the development of the disease.

The research will be conducted through a two phase descriptive design. Screening of the target population using a questionnaire will constitute the first phase, and the second phase will be through case ascertainment of positively screened participants by a neurologist. Point prevalence rate will be used for statistical treatment. The research protocol was approved by the UST Faculty of Medicine and Surgery–Department of Clinical Epidemiology, as it adheres to the Declaration of Helsinki in clinical studies or surveys. (**Author's abstract**)

**Keywords:** *Parkinson Disease, Prevalence, Community Survey, Rural, Medicine*

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2017/08,  
(Filipiniana Analytics)  
NP

0527

**A prospective, randomized, open label, single-center study for assessment of safety and effectiveness of recombinant human insulin 30/70 + insulin glulisine compared to recombinant human insulin NPH + regular in the management of type 2 diabetes**

*Jain, Rishi , Shah, Agam , Vasam, Anand , Mendoza, Erick S. , Tanche-Ngo, Mary Jane , Mane, Ashish , Puppalar, Gaurav , Mercado-Asis, Leil*

The high prevalence of type 2 diabetes mellitus (T2DM) in the Philippines has burdened the health care system. Therefore, we compared the standard of care Insulin 30/70 + Insulin Glulisine (Arm B) to a traditional insulin regimen NPH Insulin + Regular Insulin (Arm A) to test the concept that both insulin regimens provide comparable effectiveness and safety in real-world practice.

This is a ‘proof-of-concept,’ prospective, randomized, open label pragmatic study of 40 consecutive Filipino T2DM patients from October 2015 to June 2016. The primary endpoint was a reduction in HbA1c at 12 weeks. The secondary endpoints were changes in Fasting Plasma Glucose (FPG), Post Prandial Glucose (PPG), Capillary Blood Sugar (CBS), weight and insulin dose at 12 weeks. ANCOVA and Fisher’s exact tests were used.

Patients in treatment arm A showed comparable glycemic control to arm B as measured by reductions in HbA1c (2.89% vs. 2.67%; P=0.657), FPG (65.94 vs. 46.71 mg/dl; P=0.57), PPG (76.49 vs. 86.96 mg/dl; P=0.271) and CBS (115.15 vs. 145.95 mg/dl; P=0.420). Both treatment arms reported similar weight gain (1.92 vs. 1.22 kg), experienced similar incidence of hypoglycemia (7 vs. 6 patients) and adverse events (AE) (8 vs. 8 patients).

The traditional combination of NPH Insulin + Regular Insulin offers comparable glycemic control and tolerance as the standard of care without any new safety signals in the Filipino T2DM population. With a lower price, it can be one of the strategies to reduce the financial burden of antidiabetic treatment. (**Author's abstract**)

**Keywords:** *Insulin Glulisine, NPH Insulin, Regular Insulin, Type 2 Diabetes Mellitus, Filipino population, Medicine*

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2019/04,  
(Filipiniana Analytics)  
NP

### Qualitative determination of antibiotic residue using four plate test (FPT) in cooked and uncooked chicken meat

*Montessa, Michael Thomas T. , Mendoza, Ma. Victoria E. , Brijuega, Ermira D. , Martinez, Jaymie Lauren , Laurente, Maribeth R. , Jacinto, Anna Muriel T. , Gamido, Ma. Angelika B. , Addun, Desiree Jo*

This research focuses on the antibiotic residues present in uncooked and cooked chicken meat samples, particularly the breast and thigh parts. The antibiotic residue was determined quantitatively by four plate test (FPT). *Bacillus subtilis* and *Micrococcus luteus* were the bacterial species that the researchers utilized during the experimentation. Three samples were collected from Cavite and were tested for the presence of  $\beta$ -lactams, aminoglycoside, macrolides, and tetracyclines. The results showed that the cooked thigh part chicken sample had the largest zone of inhibition for macrolides type antibiotic residue (32 mm) while the cooked breast part of the chicken meat sample was positive for  $\beta$ -lactams group (33 mm). Tetracycline type and aminoglycoside group of antibiotics obtained both the smallest zone of inhibition in the cooked thigh part of the chicken (10 mm) and cooked breast part (10 mm). In the uncooked thigh part, tetracycline type of antibiotic had the least measurement of inhibition (17 mm). In the uncooked breast part, aminoglycoside type of antibiotic had the least zone of inhibition (22 mm). The greatest zone of inhibition in the uncooked thigh part was  $\beta$ -lactams group (30 mm). Lastly, breast part sample had the widest zone of inhibition (38 mm). Results confirmed that there is antibiotic residues in chicken meat samples that were collected in Cavite. **(Author's abstract)**

**Keywords:** *Antibiotic residues, Chicken meat, Breast and thigh part, Four plate test, Bacillus subtilis , Micrococcus luteus, Medicine*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 214  
2018 July,  
(Filipiniana Analytics)  
NP

### Recurrent bifacial neuropathy in a case of steroid responsive neurosarcoidosis: a case report

*Garcia, Lawrence George P., Rosales, Raymond L*

Neurosarcoidosis is a rare or misdiagnosed disease that can be masked in a case with fleeting neurologic deficits, especially craniopathy. We present a 26-year-old Chinese-Filipino male who presented with recurrent facial neuropathy that was heralded by fleeting blurring of vision bilaterally. He was apparently responsive to corticosteroids (intravenous and oral methylprednisolone) from initiation to date. During the course, he also noted selective weakness of the right finger flexors. Nodules in the face eventually appeared that led to a biopsy disclosing a noncaseating granuloma. Apart from electrodiagnostic tests, a supportive diagnostic test for sarcoidosis was the presence of lymphadenopathies on his chest noted on Computed Tomography (CT) scan. Cerebrospinal fluid (CSF) and brain Magnetic Resonance Imaging (MRI) tests were not yielding. To our knowledge, this was the first reported Chinese-Filipino case of neurosarcoidosis involving cranial and peripheral nerves. **(Author's abstract)**

**Keywords:** *Case report, Sarcoidosis, Neurosarcoidosis, Cranial nerve, Neuropathy, Noncaseating, Granulomatous, Steroid responsive, Medicine*

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Journal of Medicine University of Santo Tomas (JMUST), Volume No. 1 Issue No. 1, 1-6  
2017/08,  
(Filipiniana Analytics)  
NP

## Retention of basic and clinical concepts in anatomy and the effect of multiple testing

*Atienza, Melflor A. , Reyes, Julius Cea*

Clinical competency depends on student's knowledge of basic sciences including the learned concept in Anatomy. But what if students forget the learned knowledge of human anatomy?

This research investigated knowledge gain post instruction, knowledge retention (or loss) of basic and clinical concepts five months after. It also compared the effect of delayed-multiple testing and delayed single testing in the retention of acquired knowledge.

This is an experimental study conducted among first year medical students who underwent neuroanatomy module and later followed-up after five months using a 32-item test-retest. Items were categorized as basic knowledge and clinical correlation. Participants were randomly assigned into two groups; delayed-multiple and delayed-single testing. Mean difference in scores between the 2 testing periods (end of module and terminal delayed test) were analyzed using paired samples t-test while mean difference between basic and clinical correlation were analyzed using independent samples t-test. The degree of knowledge loss was determined using the computed Knowledge Loss Percentage (KLP).

Knowledge gain was noted at the end of instruction (p value<0.001). Knowledge loss is higher among basic knowledge (p value<0.001) and demonstrated a higher computed KLP. Repeated testing demonstrates a higher retention (KLP=4.34) compared to those administered with a single test only (KLP=26.73).

Knowledge loss occurs post instruction and more pronounced among basic concepts. Clinical correlation and frequent testing demonstrate a significant retention capability. To reduce the effect of knowledge loss among basic concepts, this study recommends the implementation of multiple testing. (**Author's Abstract**)

**Keywords:** *knowledge loss, clinical correlation, assessment, Medicine*

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Philippine Journal of Health Research and Development, Volume No. 24 Issue No. 2, 48-57  
2020/06,  
(Filipiniana Analytics)

## A retrospective cohort study in a university hospital evaluating the effect of maternal glucose-containing intravenous fluid in neonatal glycemia

*Cunanan, Elaine C. , Malaza, Geline*

Maternal hyperglycemia during the peripartum period is highly correlated with fetal hyperinsulinemia and consequent neonatal hypoglycemia. Liberal use of intravenous glucose therapy prior to delivery can potentially cause maternal hyperglycemia, therefore, it is prudent to implement all preventive measures. This study aims to determine the occurrence of neonatal hypoglycemia with intravenous glucose therapy prior to delivery in maternal diabetes mellitus. This was a retrospective cohort study of neonates born from diabetic mothers at the University of Santo Tomas Hospital Clinical and Private Divisions from January 1, 2013 to December 15, 2017. Clinical information gathered was divided into maternal and neonatal characteristics. Maternal intravenous fluid use, rate, and duration were noted; maternal and neonatal blood glucose results were obtained.

There were 109 infants of diabetic mothers, of which 105 were delivered as singleton and 4 from twin pregnancies. Neonatal hypoglycemia was present in 14.68%. Comparing the risk factors, there was a higher amount of glucose infused to the mothers whose offspring developed hypoglycemia compared to those without hypoglycemia. Statistically, this did not demonstrate a significant difference. The rate of glucose infusion and frequency of maternal insulin use were similar between the groups. Linear correlation was not evident when the total glucose infused and the rate of intravenous glucose infusion was compared to the neonatal glucose in the first hour of life.

Based on this study, routine administration of glucose- containing intravenous fluid did not influence the incidence of neonatal hypoglycemia. It is recommended that further prospective studies be conducted. (**Author's abstract**)

**Keywords:** *Gestational diabetes mellitus, Neonatal hypoglycemia, Intravenous fluid, Medicine*

**The state of the journal**  
*Gomez, Iva*

This article is an editorial about the Philippine Journal of Allied Health Sciences, its mission, and history. It also shares the status and renewed plans for the Journal as it re-opens its publication 2008.

**Keywords:** *journal, publication, Medicine*

**Status of vitamin D-25 hydroxy vitamin D-25 (OH) in patients with multiple myeloma**  
*Mesina, Flordeluna Z. , Pasamonte, Dona*

Multiple myeloma (MM) causes generalized bone loss leading to lytic bone lesions and pathologic fractures. The increased osteoclast activity and reduced osteoblast function favors bone resorption and decreased bone formation. Vitamin D is vital in regulating calcium homeostasis and osteoclast-mediated bone resorption. Deficiency of Vitamin D among MM patients may complicate bone mineralization problems and fractures.

The study was conducted to determine the status of Vitamin D in patients with multiple myeloma, specifically to determine the levels of Vitamin D, intact parathyroid hormone and ionized calcium among MM patient.

The study is a prospective, cross-sectional study which included patients who were 18 years old and above, male or female, diagnosed with MM at the University of Santo Tomas Hospital, with or without treatment. Excluded in the study were those with Vitamin D and calcium supplementation. Eligible subjects were extracted blood for Vitamin D assay, intact parathyroid hormone and ionized calcium.

A total of 22 patients with MM were included in the study. Sixteen patients (72.7%) had hypovitaminosis D. Among these sixteen patients, seven (31.8%) had Vitamin D deficiency (Vitamin D levels <20ng/mL [50nmol/L]) and nine (40.9%) had Vitamin D insufficiency (levels of 21-29ng/mL [52.5-72.5nmol/L]). Only 6 (27.3%) of them were found to have normal serum Vitamin D (levels of >29ng/mL [>72.5nmol/L]). The mean age ( $p=0.069$ ), intact PTH ( $p=0.062$ ) and ionized calcium ( $p=0.188$ ) of the three groups of patients did not differ.

This study found a high incidence of Vitamin D deficiency among MM patients seen at the University of Santo Tomas Hospital. Vitamin D deficiency was independent of age, intact PTH and ionized calcium. It was more common in male subjects. Patients with hypovitaminosis D are at risk of having secondary hyperparathyroidism.

Vitamin D status should be determined among patients with MM. Early recognition and treatment of hypovitaminosis D will prevent the risk of having secondary hyperparathyroidism that can complicate skeletal-related events. (**Author's abstract**)

**Keywords:** *Vitamin D-25, Hydroxy Vitamin D-25 (OH), Multiple Myeloma , Lytic bone lesions, Pathologic fractures, Medicine*

### **Structural stability analysis of models of dopamine synthesis and D1 receptor trafficking in RPT cells using CRNT**

*Pilar-Arceo, Carlene P.C. , Mendoza, Eduardo R. , Lubenia, Patrick Vincent N. , Villar, John Just*

Dopamine plays an important role in different physiological and metabolic functions, including the control of sodium excretion in the kidney. Studies have shown that there is a positive correlation between a defect in dopamine synthesis and/or dopamine receptor function, and a defect in renal sodium excretion—which may lead to the development of essential hypertension. Specific receptors for dopamine, such as the D1 receptor, have been identified in the various regions within the kidney. It is observed that errors regarding dopamine receptor-G protein coupling and changes in the signaling components may be responsible for the failure of dopamine to increase sodium excretion in hypertensive subjects. In this paper, two symbolic kinetic models of dopamine synthesis and one of dopamine D1 receptor trafficking are presented. The three models are chemical reaction networks constructed and analyzed using Chemical Reaction Network Theory (CRNT), a framework that provides different insights on the static properties of a chemical reaction network regarding the existence of steady states, their multiplicity, and structural stability. It is found that all three networks do not support multiple steady states. (Author's abstract)

**Keywords:** *Chemical reaction network theory, Concentration robustness, D1 receptor trafficking, Renal dopaminergic system, Structural stability analysis, Symbolic kinetic modeling, Medicine*

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2019/09,  
(Filipiniana Analytics)  
NP

### **Synthesis, antitubercular activity and molecular docking studies of benzyl-modified 8-hydroxyquinolines**

*Ali, Mohd Tajudin Mohd , Pueblos, Kirstin Rhys S. , Quimque, Mark Tristan J. , Mathias, Mark Lester M. , Macabeo, Allan Patrick G., Franzblau, Scot*

Infection with *Mycobacterium tuberculosis*, the causative agent of TB, is responsible for one of the global epidemics. Thus, new drugs are needed that do not confer cross-resistance with the currently administered front-line therapeutics. Quinoline-based natural products and synthetic derivatives have been extensively explored for antitubercular activity.

The main goal of this study is to prepare a collection of benzylated 8-hydroxyquinoline derivatives through synthesis, and assess their antitubercular activity along with a molecular docking study to clarify their biological mechanism of action.

The benzylated 8-hydroxyquinoline derivatives were synthesized using Williamson synthesis methods. Antitubercular activity was assessed against fast replicating *M. tuberculosis* H37Rv using Microplate Alamar Blue Assay (MABA) and non-replicating cultures using Low-Oxygen Recovery Assay (LORA). Molecular docking studies were carried out against enoyl-acyl carrier protein reductase (InhA).

Five benzylated 8-hydroxyquinoline derivatives were synthesized in moderate yields and characterized using NMR spectroscopy. MABA and LORA assays indicate compounds 3–5 as the most inhibitory derivatives with MIC 's ranging from 6.38 to 54.28µM. Molecular docking against InhA showed modest 90 binding energies for compounds 4 (-8.5kcal/mol) and 5 (-8.6kcal/mol).

Our findings suggest a rationale for the further evolution of this promising series of antitubercular quinoline small molecules. Structure-activity analysis show that an 8-benzyl moiety with chlorine atom/s is/are important for improved activity against replicating and non-replicating *M. tb.* H<sub>37</sub>R<sub>v</sub>, which is also supported by our *in silico* studies. (**Author's Abstract**)

**Keywords:** antitubercular, *Mycobacterium tuberculosis*, quinolines, molecular docking, enoyl-acyl carrier protein reductase, Medicine

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2019/09,  
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0536

### **Synthesis of *N*-acylated lactam derivatives with selective cytotoxic and antitubercular activities**

*Macabeo, Allan Patrick G. , Franzblau, Scott G. , Dahse, Hans-Martin , Mandigma, Mark John P. , Quimque, Mark Tris*

The exploration of pharmacophore-inspired drug targets allow the simplification of preparing template scaffolds, making the discovery of future hit compounds accessible and sustainable. In this study, 13 new *N*-acylated lactam derivatives inspired from cytotoxic *Piper* alkaloids were prepared synthetically using standard acylating conditions. According to the results of the MTT assay, the crotonylated and fluorinated cinnamoyl valerolactam and the crotonylated and nitro-containing cinnamoyl derivatives were the most antiproliferative against human myeloid leukemia cancer cells. On the other hand, anti-TB susceptibility testing using MABA showed the dimethacrylated, crotonylated, and nitrocinnamylated butyrolactam derivatives with strong inhibition against *Mycobacterium tuberculosis* H37R<sub>v</sub> (MIC 1–3 µg mL<sup>-1</sup>). When assessing the overall chemotherapeutic profile of a compound, selectivity to cancer cells or pathogen (over normal cells) must be taken into high consideration. The fluorocinnamylated butyrolactam and nitrocinnamylated valerolactam derivatives displayed high selectivity on chronic myeloid leukemia cancer cell-lines, and the dimethacrylated and crotonylated butyrolactams against *M. tuberculosis* H37R<sub>v</sub> over HUVEC and VERO cells (with SIs greater than 10). Our results show the high pre-clinical potential of *N*-alkenoylated derivatives to treat leukemia and tuberculosis. (**Author's abstract**)

**Keywords:** *N*-acylated butyrolactam, Antiproliferative, Cytotoxic, Antitubercular, *Mycobacterium tuberculosis*, *Piper*, Medicine

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 216  
2018 July,  
(Filipiniana Analytics)  
NP

0537

### **Synthesis-driven discovery of novel, highly selective antitubercular, and anti-proliferative *nor*-securinine derivatives with pre-clinical potentials**

*Franzblau, Scott G. , Mandigma, Mark John P. , Dahse, Hans-Martin , Macabeo, Allan Patr*

The sustainable use of natural products and their derivatives in developing future hit compounds to treat tuberculosis and cancer are among the priorities in present day drug discovery. In this study, nine novel derivatives of the *Securinega* alkaloid, *nor*-securinine decorated with acyl and chlorine atoms, were prepared by an easy-to-carry-out strain-release promoted nucleophilic addition reactions in a single step. All derivatives were unambiguously characterized using HR-ESIMS, NMR, and singlecrystal X-ray diffraction experiments. Among the nine derivatives, the *N*-chlorocinnamylated derivative conferred the highest antitubercular activity with a minimum inhibitory concentration of 0.6 µg mL<sup>-1</sup> and good selectivity over VERO cells with selectivity index greater than 100. On the other hand, the *N*-lauryl derivative showed approximately two-fold selectivity to chronic myeloid leukemia and HeLa cancer cells over HUVEC cell. Compared to *nor*-securinine, the latter compound had



better enhanced anti-proliferative and cytotoxic activities. Our results show the promise of decorating natural products with electrophilic moieties to discover future pre-clinical chemotherapeutic candidates against tuberculosis and cancer. (**Author's abstract**)

**Keywords:** *nor-securinine, Antiproliferative, Cytotoxic, Antitubercular, Medicine*

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2018 July,  
(Filipiniana Analytics)  
NP

0538

### **Systemic hormonal unloading in unilateral adrenalectomy in a patient with bilateral adrenal hyperplasia: a case report**

*Mercado-Asis, Leilani B. , Mendoza, Erick , Gan, Florence Rochelle , Gomez, Ma. Felisse*

Unilateral adrenalectomy has not been recommended in the guidelines as a treatment for primary hyperaldosteronism secondary to bilateral adrenal hyperplasia (BAH). Interestingly, recent studies have shown that increased circulation of aldosterone increased oxidative stress, cardiovascular (CV) complications such as atrial fibrillation, myocardial infarction and heart failure; and that unilateral adrenalectomy led to improved CV function. Therefore, recognizing the role of unilateral adrenalectomy in BAH, specifically for improved quality of life is important.

A 47-year-old hypertensive (highest blood pressure [BP] 150/90mmHg) woman had a severe headache, muscle weakness, polyuria, and polydipsia. Her serum potassium (K) was low at 3.1 mmol/L (3.5–5mmol/L). Initial tests showed elevated plasma aldosterone, suppressed plasma renin activity and elevated aldosterone-renin ratio (6.61ng/ dL, <0.1ng/mL and 66, respectively). Plasma aldosterone after saline suppression test (12.70ng/dL) confirmed the diagnosis of primary aldosteronism (PA). MRI showed a well-defined, oval-shaped solid nodule in the medial limb of the left adrenal gland (1.8cm x 1.2cm). Bilateral adrenal vein sampling with adrenocorticotrophic hormone (ACTH) stimulation test was compatible with BAH (cortisol-corrected aldosterone ratio pre-ACTH stimulation 1.29 and post-ACTH 1.66), with dominant aldosterone secreting left adrenal gland (7200 vs 3760ng/dL). She was started on spironolactone 200 mg/day and amlodipine 10mg/day and eventually shifted to eplerenone. Despite the optimal dose of eplerenone and amlodipine, she still experienced severe headaches, palpitations and breakthrough elevations of BP that led to her recurrent admissions. Eplerenone was shifted back to spironolactone (150-200mg/day) with amlodipine dose (10mg/day) normalizing her blood pressure and potassium level, yet with persistent headache and muscle weakness. Repeat imaging using CT scan with contrast showed consistent results. Postoperatively, with all medications discontinued the patient was asymptomatic, normotensive (110/70mmHg) and normokalemic (4.0mmol/L). One month later, her BP started to increase again at 140/80mmHg and her K decreased to 3.4mmol/L. Normalization of said parameters (BP:120/70mmHg K: 4.1mmol/L), with stabilization following lower doses of amlodipine (5mg/day) and spironolactone (25mg/day). Also, all the symptomatology of the patient resolved completely.

This present case exemplifies a unilateral adrenalectomy approach in BAH, which led to improvement in BP and K levels, despite low medication doses. Furthermore, symptom relief and improved quality of life, as desired outcomes, were achieved. (**Author's abstract**)

**Keywords:** *Hormonal unloading, Primary aldosteronism, Hypertension, Bilateral adrenal hyperplasia, Hyperaldosteronism, Case report, Medicine*

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2019/04,  
(Filipiniana Analytics)  
NP

### **Test-retest reliability, internal consistency, and discriminant validity of the Filipino version of Knee injury and Osteoarthritis Outcome Score among community-dwellers with knee osteoarthritis**

*Mandario, Angelica Marie , Ladeza, Angela Mariz , Enriquez, Rachel Ann , Blancaflor, Andrea , Averia, John Kenneth Ceazar , Escuadra, Catherine Joy , Manlapaz, Donald, Mendoza, Jose Javier , Natividad, Thad*

This study aimed to determine the test-retest reliability, internal consistency, and discriminant validity of the Filipino Knee injury and Osteoarthritis Outcome Score (F-KOOS) among community-dwellers with knee osteoarthritis (OA). The study also examined the suitability of the F-KOOS in terms of relevance and ease of understanding. This psychometric study utilized a cross-sectional design. Participants (>50 years old) with knee pain and soreness were recruited from the community and were medically diagnosed with knee OA according to the American College of Rheumatology clinical criteria. Participants were instructed to report for two sessions approximately two weeks apart. Descriptive statistics were used to describe the characteristics of participants and suitability in answering F-KOOS. Test-retest reliability and internal consistency were determined through intraclass correlation coefficients (ICCs) and Cronbach alpha, respectively. Discriminant validity was examined by comparing those with and without knee OA using independent t-test ( $p < 0.05$ ) per F-KOOS subscale. A total of 53 participants (35 females, 18 males) with a mean age of  $69.67 \pm 5.83$  years old were included in the study. The domains of the KOOS in the pre-test and re-test range from 0.30 to 0.78 ( $p < 0.05$ ), indicating good test-retest reliability between two assessment points. All domains of the F-KOOS had high internal consistency (Cronbach alpha of  $> 0.7$ ) ranging from 0.87 to 0.96. Discriminant validity of all domains of F-KOOS between participants diagnosed with and without knee OA showed p-values  $< 0.01$  which indicate a significant difference between both groups. In terms of preference, out of 40 participants who answered the survey, 55-85% expressed ease and satisfaction in answering F-KOOS. The study demonstrated that the F-KOOS has an acceptable test-retest reliability, good internal consistency, and discriminant validity in individuals with knee OA. The study further determined that the use of the F-KOOS is appropriate, relevant, and easy to understand in the community setting.

**(Author's abstract)**

**Keywords:** KOOS, psychometric properties, knee osteoarthritis, outcome measures, Medicine

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Philippine Journal of Allied Health Sciences, Volume No. 3 Issue No. 1, 1-9  
2019,  
(Filipiniana Analytics)

### **A three-year review of the clinical and pathologic profile of patients with colonic polyps in a university hospital in Metro Manila (2014-2016)**

*Lopez, Rolando A. , Co, Gregory Al*

The data on the prevalence and distribution of polyps in Asians is limited with conflicting data about the most common type. The study was conducted to obtain recent data about the histologic types of endoscopically labeled as polyps by colonoscopy and correlate with the clinico-pathologic profile. Retrospective cross-sectional review of histopathologic and endoscopic reports of colonoscopy with biopsy of colonic polyps of patients in the University of Santo Tomas Hospital (January 2014-December 2016). 3910 colonoscopies were performed and a total of 302 patients were retrieved and 500 polyps were resected. The most common indication was hematochezia and hemorrhoids. The colonic polyps were solitary in 36% of the cases. Majority were seen in 50-69 years old, left sided region (78%), particularly the sigmoid (37%), and sessile (77.3%). The most common type is tubular adenoma (45%) and majority of the adenomatous polyps were seen in the sigmoid. There is significant association between age and presence of an adenomatous polyp where  $\geq 70$  years old are about 2.5 times more likely to have adenomatous polyp and pedunculated polyps are 2 times more likely to be adenomatous. There is no significant association between presence of an adenomatous polyp and polyp size and gender.

The type and distribution of colorectal polyps are similar with others and vigilant approach of the left side should be exercised. Absence of any significant difference between size and adenomatous nature necessitate the need for

early identification and removal of colorectal polyp in preventing morbidity and mortality from cancer. (**Author's abstract**)

**Keywords:** *Colorectal Polyp, Colonoscopy, University of Santo Tomas Hospital, Metro Manila, Medicine*

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2018/04,  
(Filipiniana Analytics)  
NP

0541

### **Total synthesis of Diaportheone A** *Roggo, Silvio , ZÃ¼ger, Peter Patrik , Tan, Ma*

Chromones are benzoannelated x-pyrone heterocyclic class of natural products which are widely distributed in nature. Secondary metabolites with the chromone structure showed diverse pharmacological properties. Their structural diversity and synthetic accessibility have made the compounds with chromone scaffold excellent targets in organic synthesis and play an important role in drug discovery and medicinal chemistry. Diaportheone A, a natural product chromone, was previously isolated from the endophytic fungi *Diaporthe* sp. P133. To determine the absolute configuration and for biological evaluation, total synthesis was done. The process utilized cyclization and in situ thermal syn-elimination of a  $\beta$ -ketosulfoxide as key steps. Diaportheone A was successfully synthesized in four steps with 46% overall yield. The absolute configuration was determined using X-ray crystallography. (**Author's abstract**)

**Keywords:** *Chromone, Diaportheone A, Total synthesis, X-ray crystallography, Endophytic fungi, Medicine*

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2018 July,  
(Filipiniana Analytics)  
NP

0542

### **Translation and cross-cultural adaptation of the Friedrich Short Form of the Questionnaire on Resources and Stress (QRS-F) to measure the stress level of Filipino parents and other caregivers of children with disability**

*Ibay, Cecilia Anne , Buencamino, Carlo Angelino , Arroz, Mark Timothy , Benzon, Rigel , Medallon, Kim Gerald , Morato-Espino, Paulin Grace, Ko, Marie Selene , Gomez, Ivan*

The Friedrich Short Form of the Questionnaire on Resources and Stress (QRS-F) is a tool that measures stress levels of parents of children with disabilities. The objectives of this study are 1) To translate and culturally adapt the QRS-F for use by Filipino parents and other caregivers of children with disability in the Philippines, and 2) To establish its psychometric properties. The tool underwent the process of translation & cross-cultural adaptation with the following steps: 1) face & content validation, 2) translation and equivalence and 3) pilot study of the pre-final QRS-F. Convenience sampling was performed to select sixty Filipino parents and other caregivers of children with disability enrolled in special education schools and thirty Filipino parents and other caregivers of typically developing children enrolled in regular schools, all located in Metro Manila. A translated, and culturally adapted QRS-F was developed and was found to have good reliability and construct (known group) validity. The QRS-F is a culturally valid tool that can be used to measure the stress levels of Filipino parents and other caregivers of children with disability. (**Author's abstract**)

**Keywords:** *questionnaire, stress, parents, children, disability, Medicine*

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Philippine Journal of Allied Health Sciences, Volume No. 3 Issue No. 1, 1-13  
2019,

**Translation and validation of the physical activity scale for the elderly in Filipino community-dwelling older adult fallers and non-fallers**

*Canares, Carmela Grace , Pagaduan, Marc , Enriquez, Gerard Joseph , Santiago, Sharmaine , Tubig, Mariel, Lopez, Eudinel Joshua , Lipardo, Donald, Devora, Kris*

Increased falls rate in older adults may be due to a declining level of physical activity. However, there is currently no local assessment tool to assess the physical activity of older adults in the Philippines. The objectives of the study were to: (1) translate the Physical Activity Scale for the Elderly (PASE) in Filipino (PASE-F); (2) establish the validity and equivalency of PASE-F version; and (3) determine the association between physical activity level and fall history in older adults living in the community. Standard translation procedure was followed. Qualitative analysis and appropriate revisions were done based on the comments of three health professionals in geriatric care. Equivalency was analyzed using two-sample t-test with equal variances, and Spearman Rho. The association of physical activity with fall history was established using simple logistic regression. 310 (62.3% females) community-dwelling older adults, with mean age  $68 \pm 6.5$ , from Manila, Philippines participated. The validated PASE-F and the original PASE were equivalent with a p-value of 0.84, and Spearman's Rho of  $>0.05$ . No significant association was found between PASE-F scores and fall history, p-value = 0.16, 95% CI [1, 1.004]. Fallers show non-significantly higher PASE-F scores compared to non-fallers. PASE-F is a valid and equivalent translation of the original PASE. However, obtained PASE-F scores did not show association with a history of falls. Prospective studies may be done to determine the predictive value of PASE-F scores in the incidence of falls. (**Author's abstract**)

**Keywords:** *physical activity, older adults, fall history, Medicine*

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Philippine Journal of Allied Health Sciences, Volume No. 3 Issue No. 1, 1-8  
2019,  
(Filipiniana Analytics)

**Videotape instruction vs brochure on the effectiveness of unsupervised home exercise program in patients with knee osteoarthritis**

*Oquinena, Maria Teresa I. , delos Reyes, Francisco , Yu, Mary Jane , Aguinaldo, Jhoanalyn B. , Gonzalez-Suarez, Consuelo B. , Mercado, Vivienne Francesca , Regino, Jo*

The optimum treatment for osteoarthritis is a combination of education, medication, weight reduction, and exercise. However, the adherence to exercise decreases with treatment duration. This study aims at determining the effectiveness of a home exercise program in patients with knee osteoarthritis delivered through a brochure or videotape to improve compliance, pain and function; and also in the reduction of paracetamol intake. This is a single-blind, randomized, controlled study in a home setting.

One hundred and two participants with knee osteoarthritis were included in the study. Intervention: The participants were randomly assigned into video and brochure groups and instructed to perform the exercises for six months. They were evaluated for one month during the program and immediately after the end of the intervention. Outcome measures were pain using the Visual Analog Scale, modified Knee Outcome Survey-Activities of Daily Living Scale, 6-minute walk test (6MWT), compliance, and paracetamol intake.

There were significant improvements in all outcome measures from baseline to one and six months in both groups. However, there was no significant difference between the mean change in all the outcome measures except for the mean change in the distance walked in the 6MWT at one and six months, which was significantly higher in the brochure group. Compliance to exercise and paracetamol intake decreased from one to six months in both treatment arms but was not statistically different for both groups.

The provision of a home exercise program using either video or brochure could be effective in the management of osteoarthritis. (**Author's abstract**)

**Keywords:** *Osteoarthritis, Video exercise, Brochure exercise, Home exercise program, Medicine*

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2017/08,  
(Filipiniana Analytics)  
NP

0545

### **Wire-free virtual breast localization using liquid carbon nanoparticles**

*San Agustin, Norman Val , Quimbo, Ricardo Victorio , Buenaflor, Ma. T*

The emergence of improved multi-modal diagnostics including functional imaging has enabled the diagnosis of more nonpalpable breast lesions. Lesions diagnosed as early unifocal breast cancers are amenable to breast-conserving surgery (BCS). The precise localization of these lesions is a caveat to its complete removal along with sufficient surgical margins and the preservation of normal breast tissues. Carbon marking is an alternative to needle wire localization that is easy to perform and simplifies the workflow of the multidisciplinary team involved in breast cancer care. (**Author's abstract**)

**Keywords:** *Liquid carbon nanoparticles, Non-wire breast localization, Carbon nanoparticles suspension injection (CNSI), Molecular breast imaging (MBI), Medicine*

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Philippine Journal of Pathology, Volume No. 4 Issue No. 1, 1-4  
2019/06,  
(Filipiniana Analytics)  
NP

0546

### **Work-related musculoskeletal disorders of physical therapists in UST-CSR affiliated centers**

*Musni, Merwen Mitchel Q. , Liabres, Victorino T. , Larracas, Joan Michelle U. , Basilla, Christopher Ginno L. , Lipardo, Donald S. , Lagman, Rachel*

To determine the 12-month prevalence of work-related musculoskeletal disorders (WMSD) among professional physical therapists (PTs) working in UST-CRS affiliated centers, their severity, associated factors and the PT's responses to injury. A 4-page self-administered questionnaire was used to gather demographic data, job-factor survey, body areas affected and their severity, injury prevention strategies and responses to injury. Among the respondents, 87.23% (n=41) experienced musculoskeletal symptoms in the past 12 months. The highest prevalence of WMSD among respondents was in the following anatomical areas: lower back (82.98%), upper back (57.45%), and neck (48.94%). Therapists with a severity score of > 3 for WMSD were in the low back (71.79%), hips/thighs (57.14%) and wrist/hands (54.55%). The only specialty area related to WMSD was orthopedics with concurrent increased neck, low back, wrist/hand, knee, upper back, ankle/foot, and thumb symptoms. 88.24% (n=15) of the identified job-related factors were associated with either upper back or lower back symptoms. Strategies used by therapists (89.36%; n=42) in response to WMSD included the use of selfprotective behaviors to reduce the work-related strain on their bodies. WMSD among PTs working in UST-CRS affiliated centers were highest in the low back, upper back and neck. High severity scores associated to the low back, hips/thighs, and wrist/hands greatly affected their work, ADLs, and leisure. Almost all identified job-related factors were associated with spinal symptoms. Self-protective behaviors were often used by PTs to decrease the risk of WMSD. (**Author's abstract**)

**Keywords:** *physical therapy, work-related musculoskeletal disorders (non-MESH), prevalence, Medicine*

## NUTRITION

0547

### **Development and evaluation of a culturally sensitive food frequency questionnaire for the assessment of prebiotic and probiotic intake of urban-living, low-to-medium-income women**

*Gabriel, Alonzo A. , Bongga, Demetria C. , Pico, Marietoni B. , Bayaga, Cecile Leah T., Barrios, Erniel B*

Modern food product development has introduced maternal consumers to functional foods. Prebiotics and probiotics are well-known functional food components. This study developed a culturally sensitive, qualitative food frequency questionnaire (FFQ) to assess the prebiotic and probiotic intakes of healthy, urban-living Filipino women. Food items in the developed FFQ were based on five datasets of information. Reproducibility was tested by comparing respondents' (n=73) responses on Day 30 (FFQ1) and Day 31 (FFQ2). Verification of the developed tool was conducted by comparing responses from the FFQs with multiple food recalls obtained from the same respondents and sampling time. Thirteen (13) food groups with 39 unique food items were included in the developed FFQ. Binomial results showed matched responses of food items (38/39) between FFQ1 and FFQ2. Comparison of the results of FFQ and multiple food recalls showed highly similar responses. The developed FFQ to assess prebiotic and probiotic intakes of women was reproducible and has been verified. (**Author's abstract**)

**Keywords:** *food frequency questionnaire, maternal nutritional status, prebiotic, probiotic, reproducibility, verification, Nutrition*

0548

### **Development of power vegan cupcake**

*Oasan, Ruchel , Balagtas, Maribel , Estrada, Miriam , Laborde, Gladys Mae , Dela Cerna, Patricia , Datoy, John Jayson , Llagas, J*

The objective of this study was to develop a nutrient-dense product, the Power Vegan Cupcake, using local plant-based ingredients. Brown rice flour, all-purpose flour, muscovado sugar, salt, and baking powder were sifted and mixed. Saluyot and pandan leaves were boiled for 15 minutes and then cooled, blended, and strained. The saluyot puree and pandan juice were then mixed with the dry ingredients, soy milk, and vanilla. The batter was mixed, and raisins and banana were added. The batter was baked in an oven for 25 minutes at 200°C. Each Power Vegan Cupcake (70 g) contains 41.7 g of carbohydrates, 4.7 g of protein, and 3.12 g of fat, for a total calorie content of 198.4 cal. It also contains 28.75 µg of Vitamin A, 2.4 mg of Vitamin C, 50.6 mg of calcium, 1.5 mg of iron, 0.17 mg of thiamin, 0.19 mg of riboflavin, 2.93 mg of niacin, and 98.7 g of phosphorus. The product was found to contain a higher amount of carbohydrates, protein, and micronutrients compared to regular cupcakes on the market. Its shelf-life was one day in room temperature and eight days in the refrigerator. The selling price is ₱10.50 per piece and ₱88.50 per box of eight pieces. Thirty respondents ages 18-29 evaluated the product. The results show a rating of *like very much* from 63%, 53%, and 50% of the evaluators in terms of appearance, texture, and taste, respectively. (**Author's abstract**)

**Keywords:** *Vegan, Cupcake, Product development, Nutrition*

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**Discovery of nutrigenetic markers correlated with vitamin D nutrition in different lifestyle genes among adult respondents of the 2013 national nutrition survey**

*Duante, Charmaine , Concepcion, Mae Anne , Perlas, Leah , Rodriguez, Marietta , Zumaraga, Mark P*

With vitamin D implicated in a wide range of multiple health outcomes, a fuller understanding of the determinants of vitamin D status is needed, and this must include consideration of its inherited characteristics. The study determined the relationship between genetic variations in lifestyle-related genes and serum vitamin D levels among adult respondents. The study followed a cross-sectional research design. A total of 187 adult respondents, aged 21 years old and above, of the 2013 National Nutrition Survey were analyzed. Anthropometric, biochemical, clinical, and dietary data were generated through validated questionnaires, physical examination, and laboratory analyses. Total serum 25-hydroxyvitamin D (25OHD3) was determined using electro-chemiluminescence binding assay method. Genomic DNA was used for massively parallel sequencing of lifestyle-related genes. Of the 187 subjects, 90 were classified as low serum 25OHD3 concentration (<50nmol mL<sup>-1</sup>) and 97 were high serum 25OHD3 (>50nmol mL<sup>-1</sup>). 25OHD3 was associated with triglyceride and systolic blood pressure. At least 10 genetic variations showed statistically significant difference in serum vitamin D concentration across genotypes. These genes were previously shown to have contributed to cardiovascular diseases, diabetes, osteoporosis, iodine deficiency, stress response, and drug metabolism. This study serves as a pilot study that provides additional evidence-based information on the putative contribution of genetic variants on optimizing vitamin D nutrition for overall health. Understanding how genetic variations interact with environmental factors, especially nutrition, may hold the key to better prevention and management of diseases, particularly nutrition-related diseases. (Author's abstract)

**Keywords:** *Next generation sequencing, Nutrition, Vitamin D, Nutrition*

**Effect of indigenous processing on the nutrient and antinutrient content of corn (*Zea mays* L.)**

*Lorilla, Aaron P. , Alpos, Marbie A. , Villame, Rovi Gem E. , Alviola, Pedro A. IV , Lumakin, Charles Luke U. , Malida, Pretty Lou S. , Fronteras, Jenni*

Antinutrients are metabolites that can decrease the bioavailability of nutrients in food, but they can be reduced by certain processing methods. The Obu Manuvu group in Marilog District, Davao City practices indigenous processing of corn. Analyses of the antinutrient content showed a significant decrease in cyanogenic glycoside and tannin. These changes profoundly affected the proximate composition and mineral content of corn. The total carbohydrate, zinc, manganese, and calcium content increased while moisture, crude fat, and crude fiber content decreased after processing. Hence, the indigenous processing of corn by the Obu Manuvu represents a good practice in improving the nutritional profile of corn in terms of greater availability of some nutrients. (Author's abstract)

**Keywords:** *Antinutrient, Corn, Indigenous processing, Nutrient, Roasting, Size reduction, Nutrition*

**Factors associated with overweight and obesity among adults 20.0 years and over:  
results from the 2013 national nutrition survey, Philippines**

*Acuin, Cecilia Cristina S. , Austria, Rovea Ernazelle G. , Canag, Jay Lord Q. , Patalen, Chona F. , Duante, Charma*

In 2016, the World Health Organization (WHO) estimated that at least 2.8 million people die each year as a result of overweight/ obesity associated with the occurrence of chronic diseases that has dire social and economic consequences. In the Philippines, the prevalence of overweight/ obesity among adults showed a gradually increasing trend. Local studies using national-scale data on the determinants of overweight/obesity among adults in the Philippines are found to be lacking as related studies available were done on selected population groups only. This study aimed to address this research gap and provide evidence for setting goals and targets to halt the increase of overweight/ obesity. Analysis of secondary data was done using the 2013 National Nutrition Survey results. Findings revealed that 30.0% of 9,076 adults 20.0 years and over with complete socio-demographic, socio-economic, anthropometric, clinical, and health and dietary data were overweight/ obese. Controlling for the effects of other variables, the factors significantly associated with overweight/ obesity among adults 20.0 years and over included adequacy of recommended energy intake, type of residence, age group, civil status, wealth quintile, highest educational attainment, and smoking status. The odds of being overweight/ obese was 29% higher among those who met the recommended energy intake compared to those who did not, and 28% higher among those living in urban areas than rural areas. As socio-economic status improved and as the population aged, the odds of overweight/ obesity increased. Adults with partners were more likely to be overweight/ obese than those who were single. In comparison to adults with no grade completed, the odds of being overweight/ obese were higher among those who were high school/vocational graduates and twice as high among college graduates. This study provides consistent evidence on the factors associated with overweight/ obesity, which may be addressed through multi-sectoral approach by crafting maximally effective programs and local policies. **(Author's abstract)**

**Keywords:** *NCDs, NNS, Obesity, Overweight, Philippines, Risk factors, Nutrition*

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2019/03,  
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NP

**Household food security is associated with stunting among preschool children in  
Occidental Mindoro**

*dela Luna, Kim Leonard G., Bullecer, Ernani*

Food security is achieved when the population at all times has access to safe, sufficient and nutritious food to sustain a healthy and active life. This study aimed to determine significant association between household food security and stunting among preschool children in Occidental Mindoro. Specifically, this study was conducted to determine the prevalence of stunting among preschool children and household food security in the study area.

This study utilized cross-sectional study design and a three level multi-stage, stratified random sampling to answer the study objectives. A total of 480 preschool children (n=240 urban; n=240 rural) were included in the study. Radimer-Cornell Tool was used to determine the food security status of the household. A validated-constructed questionnaire was used to determine other factors which were controlled in this study. Multiple Logistic Regression was used to determine significant association between the exposure and the outcome variable while controlling confounding variable simultaneously.

Result of this study revealed that the prevalence of food insecurity in the province was 51.04% (95% CI: 46.55, 55.53) while prevalence of stunting was 36.04% (95%CI: 31.73, 40.35). Meanwhile, after controlling the



confounding effect of household income and low dietary diversity score it was found that the odds of having a stunted child were 23 times higher among food insecure households (OR: 23.00, 95%CI: 12.05, 43.91).

Based from the result of this study, magnitude of household food insecurity and stunting were found to be very high in the study areas. There was a significant association between household food security and stunting among preschool children. (**Author's Abstract**)

**Keywords:** *stunting, preschool children, household food security, Nutrition*

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Philippine Journal of Health Research and Development, Volume No. 22 Issue No. 3, 67-76  
2018/09,  
(Filipiniana Analytics)

0553

### **Nutrition-related corporate social responsibility programs of selected corporations in the Philippines**

*Gordoncillo, Normahitta P. , Talavera, Ma. Theresa , Marges, Rosemarie L. , Mojica, Loi*

Malnutrition being a multi-faceted problem, with causes cutting across a number of sectors (WFP, 2014) requires a combination of effort and programs to effectively be addressed. Many corporations have embarked on programs that can contribute to the reduction of malnutrition. This study aimed to describe and analyze the nutrition-related Corporate Social Responsibility (CSR) Programs of six corporations and their contribution to effort to the reduction of malnutrition. This study used a pretested questionnaire in data collection by self-administered and interview processes of representatives from six corporations. Data was analyzed by profiling and characterizing the CSR programs according to five parameters and the programs' contribution to nutrition-improvement. Corporations in the food and beverage industry implements the most number of nutrition related CSR programs and are mostly focused on nutrition-specific interventions. The corporations were found to implement programs that are appropriate and effective. The CSR programs have the capacity to contribute on nutrition improvement by being able to address some of the immediate, underlying and basic causes of malnutrition. (**Author's Abstract**)

**Keywords:** *Corporate Social Responsibility, malnutrition, nutrition specific intervention, nutrition sensitive interventions, Nutrition*

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Philippine Journal of Health Research and Development, Volume No. 23 Issue No. 1, 1-15  
2019/03,  
(Filipiniana Analytics)

0554

### **Promoting sufficient fruit and vegetable intake among teachers: an intervention using the Solomon four group design**

*Simbulan, Nymia P. , Mira, Nona Rac*

Majority of recent deaths in the Philippines were attributed to noncommunicable diseases. Adequate consumption of fruits and vegetables can potentially decrease the burden of certain heart diseases and cancer. Health promotion and education interventions have been shown to increase fruit and vegetable intake.

The study was conducted to evaluate the impact of a self-management intervention on psychosocial variables and fruit and vegetable intake (FVI) of public school teachers.

The study utilized the Solomon four-group design. The psychosocial variables were derived from Bandura's social cognitive theory and Ajzen's theory of planned behaviour. FVI was measured using a food frequency questionnaire. An assessment of interaction between the intervention and pretest, group comparison tests, and nested ANOVA approach were performed.

Teachers from 44 schools, 112 in the intervention group and 116 in the control group, were included in the analysis. Results indicate no significant interaction between treatment and pre-test group ( $F[1,224]=0.15$ ,

p=0.703), no significant differences in the psychosocial variables scores and FVI of the intervention and control groups ( $p>0.05$ ). Significant findings in two of four psychosocial variables, particularly diet-related attitude ( $t=2.412$ ,  $p=0.009$ ) and knowledge regarding the recommended FVI (Fisher's exact test  $p=0.010$ ), and mean FVI ( $t=1.898$ ,  $p=0.031$ ) were only found using data of the posttest-only intervention group who were able to attend the lecture-workshop and control group.

The study found no evidence of pretest sensitization. There was insufficient evidence to conclude that there were differences in FVI and psychosocial variables of the intervention and control groups postintervention. (**Author's Abstract**)

**Keywords:** *fruit and vegetable intake, self-management intervention, teachers, Solomon four-group design, Bandura's social cognitive theory, Ajzen's theory of planned behaviour, Nutrition*

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Philippine Journal of Health Research and Development, Volume No. 23 Issue No. 2, 26-39  
2019/06,  
(Filipiniana Analytics)

0555

### **Rice-based complementary food: providing nutrition from 9-11 month of life**

*Morales, Amelia V. , Abilgos-Ramos, Riza G., Labargan, El Shaira A. , Rodriguez, Raffy*

In developing countries, most of the complementary foods consumed by growing infants are deficient in essential nutrients and inaccessible to vulnerable families, leading to undernutrition. The use of simple processing technology and nutrient-rich local crops are one of the effective approaches of improving its nutrient adequacy. The study was designed to develop an instant rice-based complementary food for 9-11 month old children. Ten combinations of complementary flours were prepared using D-optimal mixture design ranging from 50-55% for rice, 30-35% for soybean, and 15-20% for yellow sweet potato to optimize the nutrient and sensory acceptability ( $n=30$ ). These were further evaluated for hydration and water activity properties. Three optimum combinations of complementary flours were generated and subjected to consumer sensory evaluation ( $n=50$ ). Nutritional composition of the product was also assessed. Results showed that the optimal complementary food blending ratio with high nutrient and consumer acceptance was 50% rice, 35% soybean and 15% yellow sweet potato flours that contained 1.36% moisture, 17.72% protein, 6.75% fat, 1.38% minerals, 73.85 g carbohydrates and 423.04 kcal which met the daily intake recommendations of WHO/FAO (2004) except fat. The complementary flour blends exhibited high water absorption index (3.66-4.67 g/g), low water solubility (0.24-0.39%), and low swelling power (0.02-0.03 g/g). Water activity of 0.052-0.123 signified a shelf-stable product. A 100-g serving of the product can supply 409 calories, 4 mg iron, 3 mg zinc, 63 mg calcium, 62 mg magnesium, and 508 mg potassium. Hence, the nutritive complementary food can be a key contributor in improving the daily diet and alleviating the deleterious effect of malnutrition among 9-11 month old children in low-income community. (**Author's abstract**)

**Keywords:** *Rice-based, Complementary foods, d-optimal mixture design, Nutrition*

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Transactions of the National Academy of Science and Technology, Volume No. 41 Issue No. 1, 96  
2019 July7,  
(Filipiniana Analytics)  
NP

0556

### **Risk factors associated with zinc status of Filipino preschool and school-aged children**

*Gironella, Glen Melvin P. , Marcos, Juanita M., Perlas, Leah A.*

In the 2008 National Nutrition Survey, zinc deficiency among preschool and school-aged children was reported as a significant public health problem. This study aimed to identify the risk factors correlated to zinc deficiency in preschool (6 mo–5 yr old) and school-aged (6–12 yr old) Filipino children. Statistical analyses were done to measure the association of zinc status of children with demographic, anthropometric, biochemical, dietary, environmental, and socioeconomic data of the 2008 National Nutrition Survey using test on means, chi-square test and test on distributions and logistic regression analysis. Older preschool and school children were more at-

risk to zinc deficiency. Stunting, anemia, vitamin A deficiency, and iodine deficiency disorder were more prevalent in zinc-deficient children. Lower average intakes of most nutrients; consumption of lesser amounts of fish, meats, and poultry; and higher intake of corn and corn products and green leafy vegetables were also noted among zinc-deficient children. Children belonging to households with lower wealth quintile and with household head working as agricultural farmer or fisherman are also more at-risk. Being male, residence in rural areas and educational attainment of household head below high school also lower zinc status in school-aged children. Older age, high prevalence of stunting, anemia, and vitamin A deficiency, and inadequate and poor quality diets are significantly associated to zinc deficiency among preschool and school-aged children. Poor households and household head working as agricultural farmer or fisherman are likewise significant risk factors among these children. Being male, residence in rural areas and educational attainment of household head below high school also significantly correlates to low zinc status of school children. **(Author's abstract)**

**Keywords:** *Filipino preschool and school children, Micronutrient deficiencies, Nutrient and food intakes, Socio-economic status, Stunting, Zinc deficiency, Nutrition*

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Philippine Journal of Science, Volume No. 148 Issue No. 2, 225-236  
2019/06,  
(Filipiniana Analytics)  
NP

0557

### **Validity of household dietary diversity score as a measure of food insecurity among households in Lucena City, Quezon**

*Arias, Frances Po*

Food security is a multifaceted issue experienced by nations worldwide. A trend currently being explored in recent studies in measuring food security at the micro level is the Dietary Diversity Score (DDS). Household Dietary Diversity Score (HDDS), a type of DDS, obtains a snapshot of the economic ability of a household, making it an effective food insecurity indicator. The objective of this study was to assess the validity of the HDDS as a tool for measuring food insecurity. The study employed a cross-sectional analytic design with 368 study households in Lucena City, Quezon Philippines. Household Food Insecurity Access Scale (HFIAS) and Household Mean Adequacy Ratio (HHMAR), being two of the most frequently used methods in measuring household food insecurity, were used as reference standards to assess the validity of the HDDS in identifying food insecure households. Receiver Operating Curve (ROC) Analysis was done to determine the appropriate HDDS cut-off for identifying food insecure households. The areas under the curve (AUC) obtained (0.618, 0.70, 0.701, 0.743), classified HDDS as a fair indicator of food insecurity. HDDS of 6 was identified as the optimal score when evaluating food insecurity with consideration of sensitivity and specificity. In this study, HDDS was proven to be a valid measure of food insecurity. It shows the great potential of this quick assessment tool in identifying population-at-risk, which is crucial in the design of a timely and appropriate intervention to alleviate food insecurity and other nutrition and health-related problems which may arise. **(Author's Abstract)**

**Keywords:** *food security, dietary diversity score, nutrition, household dietary diversity, dietary assessment, Nutrition*

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Philippine Journal of Health Research and Development, Volume No. 22 Issue No. 4, 1-8  
2018/12,  
(Filipiniana Analytics)

## **PHYSICS**

0558

### **Absorbed dose rates in air along the roads in Quezon City, Philippines**

*Kanda, Reiko , Tokonami, Shinji , Feliciano, Chitho P. , Enriquez, Eliza B. , Aniago, Ryan Joseph , Cruz, Paolo Tristan F. , Hosoda, Masahiro , Mendoza, Christopher O. , Palad, Lorna Jean H. , Iwaoka,*

Nuclear power plant facilities are either in the planning stage or under construction in neighboring countries around the Philippines. It is important to obtain background dose rates data in advance before the occurrence of any radiological or nuclear accidents in the future in order to estimate the increase in dose rates due to the radiological and nuclear accidents. In the Philippines, many people are living in Metro Manila. Quezon City is the largest area in Metro Manila and has many educational facilities and government agencies. In this study, the dose rates were continuously measured along major roads in Quezon City by the car-borne survey. The measured dose rates on the road ranged from 7.7 to 41 nGy h<sup>-1</sup> – with a calculated mean value of 13 nGy h<sup>-1</sup>. These dose rates were less than that of the background level for terrestrial gamma rays in the world (59 nGy h<sup>-1</sup>). These results will be useful as reference data for background levels in case of any future radiological or nuclear accidents. (Author's abstract)

**Keywords:** Car-borne survey, Dose rate, Natural radiation, Physics

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Philippine Journal of Science, Volume No. 148 Issue No. 2, 389-393  
2019/06,  
(Filipiniana Analytics)  
NP

0559

### **Assessment of groundwater system in Angeles and Clark, Pampanga using isotope and chemical techniques**

*Dawal, Karlen C. , Castro, Joey C. , Menguito, Charito M. , Abaño, Susan P. , Castañeda, Soledad S. , Racadio, Charles Darwin T. , Mendoza, Norman DS., Sucgang, Raymond J*

The cities of Angeles and Clark in the Pampanga River Basin (PRB) are among of the groundwater critical areas in the country identified by the National Water Resources Board (NWRB). A quantitative hydrological assessment is therefore needed to serve as basis for better water resource management. The use of isotope techniques in hydrological studies has been known to be an efficient approach in performing hydrological assessments. In May 2017, 26 groundwater samples—one from shallow well (12 mbgl) and 25 from deep boreholes (50 to 250 mbgl) —were collected in Angeles City and Clarkfield. The surface geology was characterized by recent volcanic deposits from the 1991 Mt. Pinatubo eruption. The geological cross-sections were simple with two aquifers separated by a clay layer. Hydrogeochemistry showed a mixed cation-bicarbonate type of water while the water stable isotopes plot ( $\delta^{18}\text{O}$  vs  $\delta^2\text{H}$ ) revealed little to no pronounced evaporative enrichment, which suggests a relatively rapid recharge rate. The  $\delta^{18}\text{O}$  values of groundwater samples ranged from -7.4‰ to -8.7‰, which were typical isotope signatures of rainfall in these areas during the onset of the monsoon. Furthermore, most of the samples had measurable tritium concentrations, which ranged from 0.7 to 1.2 tritium units (TU). The cosmogenic tritium input of the Philippines is about 1–2 TU with an average value of about 1.5 TU. Groundwater mean residence time (MRT) was estimated to be about 1–12 years in most areas but MRT of more than 30 years was also found in Angeles. (Author's abstract)

**Keywords:** Pampanga River Basin, Water stable isotopes, Tritium, Physics

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 223  
2018 July,  
(Filipiniana Analytics)  
NP

0560

### **Characterization of Philippine tektites using x-ray methodologies**

*Cortes, Julian Carl Maverick, Sucgang, Raym*

The elemental composition and other characteristics of tektites reveal information about these glassy objects which are often found in strewnfields across the Earth's surface. In this study wavelength dispersive x-ray fluorescence spectrometry (WD-XRF), in conjunction with physicochemical parameters, was used to characterize tektite samples collected in the Philippines. Bulk analyses showed major element composition (Ca, Al, Si, Fe,

Mn), which can be deemed to be part of the natural crustal soil matrix. The accessions were calcareous and siliceous and some were anomalies observed in the major composition of a few samples. Statistical analyses further revealed groupings of samples and the data strongly suggest the possible presence of ejecta rays in the Philippines, having two major groups with two ungrouped samples and three present rays. The mass percentage differences in elemental composition can be due to different distances of the tektites from their source crater. The variation in the contents of CaO also indicates that there are different amounts of limestone that were involved during the formation. Scanning electron microscopy was used to produce photomicrographs of glass spherules which can give indication of the strewnfield origin of the tektites. **(Author's abstract)**

**Keywords:** *Tektites, Wavelength dispersive x-ray fluorescence spectrometry, Scanning electron microscopy, Physics*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 255  
2018 July,  
(Filipiniana Analytics)  
NP

0561

### **Effect of pH, light, and temperature to the anthocyanin extract from *Clitoria ternatea* flowers**

**Rubio, Peter Yuosef M. , Casais, Dominic , Yumang, Rowelain , Walde, Rikkamae Zinca Marie L. , Torres, Rosali**

Previous research suggest that synthetic colorants are detrimental to human health. *Clitoria ternatea* (blue ternate) is a possible source for natural colorants replacing the commercially available synthetic colorants. However, studies are needed to fully determine the potential of naturalbased pigments. Thus, this study determined the effect of pH, light, and temperature on the anthocyanin from *C. ternatea*. The flowers were subjected to aqueous extraction and anthocyanin extraction using acetone followed by chloroform partitioning. The aqueous extract was tested for phytochemical analysis and the anthocyanin content was analyzed in UVspectrophotometer at 520 nm and 700 nm. The absorbancies of anthocyanin extract at pH 1.0–11.0 under the temperature of 4–50°C (stored in light and dark areas) were measured at 527 nm. The total anthocyanin content was also determined. The aqueous extract contains leucoanthocyanins, flavonoids, and 137 mg L<sup>-1</sup> monomeric anthocyanins (cyanidin-3-glucoside). The color of *C. ternatea* anthocyanin extract solution turned red in acidic environment (pH 4.0) and purple at higher pH values (pH 11.0). Temperature and light also affected the anthocyanin content of the *C. ternatea* flowers with the solution stored at 4°C in dark area having the highest total anthocyanin content of 18.33 mg L<sup>-1</sup>. The solution stored in 50°C yielded the lowest anthocyanin content with 0.09 mg L<sup>-1</sup>. These results show that *C. ternatea* extract is pH-, light-, and temperature-labile. However, further studies on encapsulation of the pigments should be explored to protect the pigment for food and cosmetic application. **(Author's abstract)**

**Keywords:** *Anthocyanins, Blue ternate flowers, Clitoria ternatea, Physics*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 229  
2018 July,  
(Filipiniana Analytics)  
NP

0562

### **Feature extraction of a synchronized swimmer from underwater videos** *Pobre, Romeric F. , Mascardo, Elizabeth D. , Ong, Prane Mar*

Vision-based feature extraction of a synchronized swimmer doing *figures* was done in the hopes of correcting and improving a synchronized swimmer's ability to do *figures*. Extracted feature through image processing techniques plays an important role in understanding the synchronized swimmer's body kinematics and dynamics.

In gathering data, two cameras were used to video capture the swimmer's movements. One was stationed at a calculated distance above the water, and the other camera was placed underwater directly above the other camera. In this article only the underwater feature extraction of the three figures synchronized swimming, Porpoise, Neptunus, and Ballerina, and the essential image processing techniques used for the feature extraction were covered. The results showed that empirically extracted threshold limits for the skin region produced smooth feature extracted foregrounds. (**Author's abstract**)

**Keywords:** *Feature extraction, Figures synchronized swimming, Porpoise, Neptunus, Ballerina, Physics*

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Manila Journal of Science, Volume No. 6 Issue No. 1, 1-8  
2010,  
(Filipiniana Analytics)  
NP

0563

### **Irreversibility lines for REBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-δ</sub>**

*Roleda*

The irreversibility lines (ILs) for high quality REBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-δ</sub> crystals (RE = Y and Nd) were determined from complex magnetic susceptibility measurements. The effect of twins on the crystals was also investigated by comparing the ILs for the YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-δ</sub> samples with and without twins. The YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-δ</sub> single crystals were grown through the flux method while the intergrowth Nd<sub>1/2</sub>Y<sub>1/2</sub>Cu<sub>3</sub>O<sub>7-δ</sub> crystals were grown using the melt-textured growth technique. Stoichiometric analysis through XRD and EMPA showed a single phase YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-δ</sub> crystal and a dual phase (Nd/Y)Ba<sub>2</sub>Cu<sub>3</sub>O<sub>7-δ</sub> composite crystal. The ILs showed the same power law relation,  $H_{dc} \propto (1-t)^n$  for all samples investigated. The ILs were also found to be dependent on ac field amplitude and frequency. The ILs became steeper and shifted to higher temperatures for increasing ac field frequency. Opposite trends were observed for increasing ac field amplitude. The empirical formula  $H_{dc} = k[(1-t)/\ln(f_0/f)]^n$  was obtained that accounted for the simultaneous ac field amplitude and frequency dependence. The characteristic frequency  $f_0$  was interpreted to be some limiting parameter, a finding supported by the nonlinear flux diffusion model. The exponent  $n$  was found to be dependent on both ac field and frequency. It was found that detwinning increased the  $T_p$ - $H_{dc}$  dependence. In addition, there was a weak frequency dependence of the ILs for the intergrowth (Nd/Y)Ba<sub>2</sub>Cu<sub>3</sub>O<sub>7-δ</sub> in contrast to a highly responsive "clean" YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-δ</sub> single crystals. This difference strongly indicates an intrinsic characteristic of high TC superconductors. (**Author's abstract**)

**Keywords:** *Irreversibility Lines, Composite crystal, Nonlinear flux diffusion model, Physics*

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Manila Journal of Science, Volume No. 6 Issue No. 1, 1-21  
2010,  
(Filipiniana Analytics)  
NP

0564

### **Monte Carlo n-particle method dose calculations using gold nanoparticles in cobalt-60 radiation therapy**

*Rodriguez, A.L. , Trono, J.D. , Cruz,*

In this paper, amplification in dose due to the presence of gold nanoparticles was quantified using Monte Carlo N-Particle (MCNP) simulation. Simulation models included the irradiation of a 30cm × 30cm × 15cm pure-water—volume phantom with a beam of 1.17MeV and 1.33MeV Cobalt spectral emissions as source. Planar and concentric water panel detectors placed at a distance of intervals of 0.1cm from the center and the surface were

used to obtain radial and depth doses within. To verify the accuracy of the program codes and the phantom specifications used, baseline data using water phantom were compared to calibration data. Amplification in irradiation of a water phantom with spherical tumor and irradiation of a water phantom with varying concentrations GNP-embedded tumor was also determined. Statistical comparisons were done using analysis of variance (ANOVA) and T-test to determine the relationships among the data parameters garnered. As expected, GNPs amplified radiation dose through photoelectric effect showing an increase of 0.407% for 1mg/g and 8.54% for 7mg/g GNP concentrations. 1mg/g and 7mg/g GNP concentrations recorded 68.68% and 104.81% difference, respectively, in comparison with planar doses achieved in model B. A percent of difference of 128.51%, on the other hand, was obtained when planar doses of 1 mg/g and 7mg/g GNP-concentrations were compared. (**Author's abstract**)

**Keywords:** Monte Carlo N-Particle (MCNP), Cobalt- 60 Radiation Therapy, Gold nanoparticles, Physics

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Manila Journal of Science, Volume No. 8 Issue No. 1, 1-6  
2012,  
(Filipiniana Analytics)  
NP

0565

### **Surface imaging of cold dc magnetized air plasma treated poly(dimethyl siloxane) surfaces**

*Enriquez, Erwin P. , Culaba, Ivan B. , Aguila, Myrron Alb*

The surface morphology of poly(dimethyl siloxane) surfaces treated with cold dc magnetized air plasma had been investigated via scanning electron microscopy. The treatment parameters involved in the study were sample-cathode distance, discharge power, and discharge pressure. The plasma treated PDMS surfaces exhibit a variety of surface structures ranging from cracked film morphology to the presence of disordered buckling and aligned, corrugation depending on the treatment parameter studied. (**Author's abstract**)

**Keywords:** Surface modification, Plasma treatment, Air plasma, Poly(dimethyl siloxane), Scanning electron microscopy, EDX analysis, Physics

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Manila Journal of Science, Volume No. 7 Issue No. 1, 1-7  
2011,  
(Filipiniana Analytics)  
NP

## **SCIENCE AND TECHNOLOGY**

0566

### **AYUSH: Modi's innovation in Indian health systems**

*Santarita, Joeje Bu*

This study was conducted as the first attempt of reviewing Prime Minister Narendra Modi's almost four year-old ministry as an innovative health policy. Modi's administration has employed innovative strategies such as the embracement of indigenous transformation of health system side by side with the strengthening of modern medical technology and practices. This facilitated the birth of the Ministry of AYUSH. This paper analyzed the processes involving the development and implementation of Modi's innovations in India's health sector.

Through contextual analysis, data were generated from various online sources including reports and modules available in the Ministry of Ayush and other government offices' websites.

It showed that the set of trends identified by Cavalcante and Camoes was present in the ministry as a public management innovation in health care in India. These are the improvement of transparency mechanisms, open

government and accountability; promotion of e-government; ease access and citizen participation in public administration; new public policies that encourage more active role of citizens in the creation of political capital; networks and partnerships of state actors, social and private enterprises; and expansion of information technology to increase the quality and efficiency in the delivery of public services.

The establishment of the Ministry of Ayush and the policy on Indian System of Medicine and Homoeopathy is another example of indigenous transformation in public management in Asia which brings synergy between the traditional wisdom of AYUSH and modern diagnostic tools and technology. (**Author's Abstract**)

**Keywords:** *innovation, India, health, traditional system, Science and technology*

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Philippine Journal of Health Research and Development, Volume No. 22 Issue No. 4, 9-16  
2018/12,  
(Filipiniana Analytics)

0567

### **Chemical reaction networks: Filipino contributions to their theory and its applications**

*Mendoza, Eduardo R. , Lao, Angelyn R. , Pilar-Arceo, Carlene P.C., Jose, Editha C.*

This paper reviews the theory of chemical reaction networks and the contributions of Filipino scientists to it. The modern theory of chemical reaction networks began in the early 1970's with the work of American chemical engineers and chemists from Canada and Russia. The field was reshaped at the turn of the century with the emergence of systems biology and biologists, computer scientists, mathematicians, and researchers from other disciplines joining the collaborative efforts. Luis F. Razon, a chemical engineer, and Baltazar D. Aguda, a chemist, were the first Filipinos to contribute to the theory with their Ph.D. theses in 1985 and 1986, respectively. Over twenty-five years later in 2014, mathematicians from several Philippine universities revived the research – focusing on power law kinetic systems and biological applications – and contributing nine international publications since. The paper concludes with a description of their current research and some promising perspectives. (**Author's abstract**)

**Keywords:** *Chemical reaction networks, Filipino, History, Theory, Science and technology*

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Philippine Journal of Science, Volume No. 148 Issue No. 2, 249-261  
2019/06,  
(Filipiniana Analytics)  
NP

0568

### **Coupling school risk reduction strategies with LAMESA (life-saving automated “mesa” to endure seismic activity) for kindergarten**

*Mancao, Ma. Carmela T. , Arago, Nilo M. , Abulon, Edna Luz R. , Valenzuela, Ira C. , Morales, Marie*

The study linked school risk reduction and disaster preparedness strategy using a designed automated study desk for kindergarten. This desk, LAMESA (Life-saving Automated “Mesa” to Endure Seismic Activity), aimed to provide the education system with a resilient study desk for kindergarten. Design and development research used lightweight but highly strong and elastic materials to build the automated desk conforming to the kindergarten standards. The system and program designs ensured good peak ground acceleration (PGA) and a fix response time (4 sec.) to effectively and efficiently facilitate “duck (drop), cover, hold” actions of kindergartens to shield them from debris in the eventuality of a strong seismic activity. Purposively chosen experts (engineers, scientists, and programmers) and stakeholders (kindergarten teachers, the laboratory school principal, parents, and district supervisor) evaluated the automated desk as excellent in features, design, and visual; as a warning system when earthquakes occur; as safety infrastructure for students; and as a learning tool. For holistic packaging, the desk may undergo strength test and is also recommended to include ad materials and training kits. (**Author's abstract**)

**Keywords:** *Automated earthquake desk, Disaster preparedness, Disaster risk reduction, Kindergarten, Response time, Science and technology*



## **Creating a roadmap for building a sustainable genomics facility in the Philippines**

*Young, Alexan*

Genomics, bioinformatics, and high-throughput technologies provide a means to create breakthrough solutions for a remarkably wide diversity of fields—including medicine, agriculture, fisheries, livestock, and biodiversity. Significantly, the precision of genomics and DNA enable the creation of applications that are specifically optimized for the Philippines. Dissemination of these technologies throughout the country is accelerated by genomics facilities that provide access to core technologies. However, there are significant scientific and business challenges for creating a sustainable genomics facility in the Philippines. The historical successes and challenges of genomics and high-throughput technologies are reviewed, which point to potential solutions for creating a sustainable genomics facility in the Philippines. (**Author's abstract**)

**Keywords:** *Genomics, Bioinformatics, Drug discovery, Functional genomics, High-throughput DNA sequencing, Science and technology*

## **Design and development of kitchen-type brown rice huller**

*Martinez, Romualdo C. , Illustrisimo, Jayvee P. , Maja, Michelle I. , Gragasín, Mich*

The government promotes brown rice as staple food to achieve food self-sufficiency in the country. However, brown rice starts to deteriorate in three weeks. To address the short shelf-life of brown rice, this research developed and evaluated a "just in time hulling technology", a small capacity brown rice huller that can mill the brown rice requirement of households for three weeks. This research covered the design, fabrication of the prototype unit, and testing of the technology in the laboratory following the method of tests prescribed by the Philippine Agricultural Engineering Standard for rice mill. The developed brown rice huller has an input capacity of 80kg hr<sup>-1</sup>, with total length of 0.45m, width of 0.23m and height of 0.86m only. The technology features eight impeller blades and a rubber lining to remove rice hull from the rice grain. The huller is powered by 0.50hp single-phase electric motor. The brown rice and hull are separated through the innovative aspirator of the machine. The two major components of the brown rice huller, such as the huller and the aspirator, can be easily fabricated by local manufacturers. The technology provides milling recovery of 74–76% with head rice recovery of 75–80%, which is comparable to commercial modern rice mills. The technology is appropriate for household use, providing brown rice just in time for their needs, and thereby resolves the problem for its short shelf-life. (**Author's abstract**)

**Keywords:** *Brown rice, Brown rice huller, Rice mill, Science and technology*

### **Production of reference material for benzoic analysis in banana ketchup**

*Valdueva, Johanna Andrea C. , Veranga, April Rose C. , Dacuya, Aaron C. , Ebarvia, Beni*

An important tool in the quality assurance of analytical measurement is the use of reference materials. A reference material (RM) for benzoic acid in banana ketchup was developed, produced, and assessed according to ISO Guide 35 using previously validated high performance liquid chromatography with diode array detector (HPLC-PDA) and gravimetric sample preparation technique. Candidate banana ketchup, purchased from a local market, was homogenized, spiked with the desired benzoic acid content, and pasteurized before packaging into individual bottles. Analysis of variance (ANOVA) was used to determine the homogeneity of the analyzed samples (n=11) at 95% confidence level. The calculated F,  $F_{\text{calc}}=2.09$  is less than the critical F,  $F_{\text{crit}}=2.29$ . Furthermore, the absence of bottling trend and outliers were confirmed by regression analysis and Cochran's test, respectively. Short-term stability test (n=20) showed that transport condition is suitable up to 40°C for 3 weeks. On the other hand, long term stability (n=12) over a period of six months at 4°C was achieved. This was tested by regression analysis that showed that the slope is not significantly different from zero at 95% confidence level. The results of statistical evaluation carried out demonstrated that the developed RM is appropriate for accuracy-based proficiency testing schemes and for use by local testing laboratories for method validation and as quality control material in the analysis of benzoic acid in food products. **(Author's abstract)**

**Keywords:** *Reference material, Benzoic acid, Banana ketchup, Science and technology*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 241  
2018 July,  
(Filipiniana Analytics)  
NP

### **Residual grade and waste abaca fibers as reinforcement for packaging and printing/writing papers from recycled fiber**

*Domingo, Emmanuel P. , Mari, Cesar O. , Torres, Adela S. , Austria, Erli*

Fiber dimensions of residual grade abaca (tow grade) and waste abaca fibers (tuxy and stripping wastes) were measured. The fibers were found extremely long with thin cell walls. Fiber slenderness or felting point, flexibility, Runkel, and Muhlsteph ratios all indicate suitability for papermaking. Soda-pulping of the fibers, tow, and Tx80Sw20 (*i.e.*, tuxy and stripping waste fibers combined at 80:20) at NaOH charges of 8, 10, and 12%, yielded tow pulp twice greater than Tx80Sw20 pulp. Beating evaluation of tow-grade fiber pulped at 8% NaOH and the corresponding handsheet tests showed that acceptable beating time is 15–30 min. The Tx80Sw20 blend, on the other hand, already had a low freeness of only 227 mL and thus needed no further beating. The pulps were used as reinforcement for the production of papers from recycled or secondary fibers. The 80:20 blends of tow and Tx80Sw20 pulps were used to replace 3–10% levels of old corrugated cartons (OCC) to produce packaging paper, or mixed office wastes (MOW) to produce printing/writing paper. Results of tests on the handsheets produced therefrom indicate significant improvement in strength properties, even at low levels of 3–5% of reinforcement. **(Author's abstract)**

**Keywords:** *Good quality paper, Recycled fiber, Reinforcement, Residual grade abaca, Waste abaca, Science and technology*

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Philippine Journal of Science, Volume No. 148 Issue No. 1, 349-358  
2019/03,  
(Filipiniana Analytics)  
NP

**Against federalism: why it will fail and bring us to the brink***Ocampo, Ro*

The proposed shift to a federal form of government is unlikely to succeed and may lead instead to the dismemberment of the Philippines. Given the dominant Pimentel model of the proposal, federalization will critically weaken the central government by sharing its sovereign powers, devolving most of its functions, and substantially more of its resources with the new component states. Rather than promote equitable development, federalization, according to this model, will promote interstate competition and thus enable the better-endowed regions to develop farther ahead of the others. The central government will be too emaciated to equip weaker states to catch up, aggravating their laggard conditions and may further fuel secessionist sentiments. While one possible effect of federalization may be to inhibit centrifugal tendencies, it also risks sufficiently arming defection-prone states to secede and leads to the breakup of the nation-state. This article argues that, for all its faults, the existing unitary system is better because it can do at least one thing a federal government can no longer do, that is, redress imbalances in favor of lagging regions and retrieve devolved power if it is misused. Moreover, the parliamentary system that the proponents put on top of their federal structure may be able to do far fewer things faster and will be less democratic than the central as well as areal division of powers embodied in the existing unitary system of the Philippine government. (Author's Abstract)

**Keywords:** *federalism in the Philippines, federal vs. unitary, government systems, Pimentel model, Social sciences*

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Philippine Journal of Public Administration, Volume No. 61 Issue No. 1-2, 96-126  
2017/12,  
(Filipiniana Analytics)

**Assessment of the implementation of the plastic bag reduction ordinance in Quezon City (2012-2016)***Braganza, Patricza Andh*

The Plastic Bag Reduction Ordinance has been implemented in Quezon City since 2012 to regulate the use of plastic bags in an attempt to address plastic pollution. This study assessed the implementation of the ordinance. Customers' use of recyclable bags was directly observed in four retail stores in the District 4 of Quezon City. A survey was also conducted among 120 residents from six barangays comprising Area 24, District 4 of the city to gather data on awareness of and compliance to the ordinance. Focus group discussions and interviews with city government officials and store managers, among other stakeholders, were also conducted to enrich quantitative data. Survey results showed high level of awareness of the ordinance, but lower level of awareness of the green fund. Results of the chi-square test of independence revealed that awareness significantly differed across barangays. It is also revealed that the ordinance affects stakeholders in different ways, and that it may have somewhat reduced the percentage of plastic waste collected from households in the city. Lastly, retail stores face administrative challenges in translating green fund into meaningful environmental programs. (Author's Abstract)

**Keywords:** *Plastic Bag Reduction Ordinance, green fund, policy implementation, Quezon City, Social sciences*

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Philippine Journal of Public Administration, Volume No. 61 Issue No. 1-2, 20-42  
2017/12,  
(Filipiniana Analytics)

### **Climate risk vulnerability assessment of municipalities in Ilocos Sur**

*Julian, Constante B. , Bucao, Dionisio S. , Alibuyog, Nathaniel R. , Utrera, Ro*

This study assessed and mapped the agricultural vulnerability of the province of Ilocos Sur to climate change from July 2016 to July 2017. The researchers used modeling and statistical analysis of climate impacts, climate variability, and socioeconomic variables. Four major commodities were included in the study: rice, corn, mango, and tomato. This study followed a standard framework developed by International Center for Tropical Agriculture and considered the following; (1) sensitivity index; (2) hazard index; and (3) adaptive capacity index (i.e., economic, natural, social, physical, and institutional). The weighting used for each indicator was 15% for exposure, 15% for sensitivity, and 70% for adaptive capacity. Results showed that the municipalities of Santa Catalina and San Esteban were had very high vulnerability to the impacts of climate change or climate risks. High vulnerability was observed in these municipalities, where there is a divergence of high exposure to hazards, high loss of climatic suitability in the future, and low adaptive capacity. On the other hand, the cities had lower vulnerability, where they typically ranked high among the five capitals of adaptive capacity like Vigan City and Candon City. Different capitals for the different municipalities should be increased to cope up with the hazards and to increase adaptive capacity, thereby reducing vulnerability. The identified climate resilient agricultural (CRA) practices in Ilocos Sur should likewise be applied to the highly vulnerable areas. Such CRA practices include using (1) improved variety of rice-corn rotation combined with organic fertilizer, (2) improved variety of rice-tomato rotation combined with organic fertilizer, and (3) integrated pest management for mango should be applied to highly vulnerable areas. **(Author's abstract)**

**Keywords:** *Vulnerability assessment, Sensitivity, Hazard, Adaptive capacity, Climate risk, Social sciences*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 306  
2018 July,  
(Filipiniana Analytics)  
NP

### **Comparing marital satisfaction of male and female BPO night shift workers in the Philippines**

*Vallejos, Regina*

The study presented and compared the level of marital satisfaction of male and female Business Process Outsourcing (BPO) night shift workers. Prior to this study, there are researches that looked into the effect of night shift or nonstandard work schedule on the workers' marital life. There are also studies that tried to connect shift work to the quality of married life of BPO workers in the Philippines but they were conducted using the perspectives of the wives only. Thus this study offered a holistic view on marital satisfaction because it takes into consideration the views of both husbands and wives. Sixty-six males and females in Metro Manila were purposefully selected and surveyed, of whom 11 were interviewed face to face. Data from the survey were analyzed using Mann-Whitney U Test of Significance. Information from the qualitative interview was used to validate quantitative data. Results showed that Male and Female BPO night shift workers were satisfied with their marriage. There is no significant difference in the level of marital satisfaction of males and females. It is very evident from the study findings that economic and financial capacity affects marital satisfaction. This study can also help practitioners of pre-marital counseling. It is found in the study that compatibility of the couples' expectations in the marriage and with each other influence marital satisfaction. **(Author's Abstract)**

**Keywords:** *marital satisfaction, night shift work, family life, BPO workers, Social sciences*

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Philippine Journal of Health Research and Development, Volume No. 22 Issue No. 1, 19-27  
2018/03,  
(Filipiniana Analytics)

### **Conceptual development of a giftedness program to address socio-emotional needs of underachieving gifted students in selected Philippine Science High School Campuses**

*Gragasin, Aimee Ma*

This research study was aimed to assess the profile (gender, scholarship categorization, and year level) and the socio-emotional needs (identity, autonomy, intimacy, achievement, overexcitability) of underachieving gifted students (UGS) and the support systems that are available to them in selected Philippine Science High School (PSHS) campuses. The study also aimed to conceptualize a giftedness program for the underachieving gifted students of PSHS. A descriptive-correlation approach and purposive sampling were used in this study. The underachieving gifted students, their parents, and their class advisers or former teachers or confidantes were the respondents. There were three tools used in data gathering; (1) a researcher-designed checklist of the socioemotional needs of the student-respondents, (2) gifted Checklist for the parents, and (3) the teacher nomination form. Results of the study showed that there is no significant difference in the socio-emotional needs of underachieving gifted students when they are grouped by gender, scholarship categorization, and year level. The giftedness program developed cut across all year levels, gender, and scholarship categorization and was based on the identity formation model and school-wide enrichment model. **(Author's abstract)**

**Keywords:** *Giftedness, Socio-emotional needs, Underachievement, Social sciences*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 273  
2018 July,  
(Filipiniana Analytics)  
NP

### **Critical challenges in implementing the citizen's charter initiative: insights from selected local government units**

*Saguin, Kidj*

Globally recognized as a best practice, the Citizen's Charters were developed under the paradigm of New Public Management (NPM), which uses business-like perspective and tools by bringing the public as a customer in the center of public service delivery. Building on these successes, the Philippine government launched an anti-red tape program based largely on RA 9485, which mandates the creation of Citizen's Charters for all frontline services of the government including local governments. This paper evaluates the compliance of selected charters to the provision of the law and reveals that the Citizen's Charters developed show absence of stakeholder involvement in their formulation, varying levels of compliance with the required information in the charter, inconsistencies in the information provided, and lack of customization and innovation on the part of the LGUs with respect to content and form of the charter. These findings indicate that the Citizen's Charter as implemented does not consistently hold the basic principles of NPM and "charterism." **(Author's Abstract)**

**Keywords:** *Citizen's Charter, new public management, local government, charterism, anti-red tape, Social sciences*

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Philippine Journal of Public Administration, Volume No. 57 Issue No. 1, by Kidjie Ian Saguin  
2013/06,  
(Filipiniana Analytics)

### **The development of Academic Self-efficacy Scale (ASES) for Filipino Junior High School Students**

*Dullas, Ang*

Realizing the importance of self-efficacy as a determining variable of academic performance (Hermita and Thamrin 2015) and given the limited published academic self-efficacy scale for Filipino junior high school students and the non-existence of published and established academic self-efficacy scale in Philippine context, this study sought to develop and validate a self-efficacy scale in the academic setting. Test Development anchored on Classical Test Theory was used as design. The respondents comprised of 4,759 junior high school students from selected 20 public and private schools in Nueva Ecija. The initial 240 items were validated by four expert judges (one psychologist, one educational psychologist, one guidance counselor, one high school principal). Results showed using Lawshe CVR and Intra Class Correlation that the expert validators highly agreed on the items of ASES. Moreover, UL-LL method, Cronbach alpha, split half method, item to total correlation, and Confirmatory Factor Analysis were also utilized to test the validity and reliability of test items. The factor structure verified the four iterations, which include Perceived Control (PC), Competence (C), Persistence (P), and Self-Regulated Learning (SRL) domains. The final form after the reliability and validity analyses consists of 62 items. Results of the study revealed that the ASES for K to 12 junior high school students is a reliable and valid measure of Academic Self-Efficacy. Future trend of the scale may use as instrument of assessment and intervention for Filipino students in the different facets of their academic life. **(Author's abstract)**

**Keywords:** *Academic self-efficacy, Test construction, Perceived Control, Competence, Persistence, Self-Regulated Learning, Social sciences*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 299  
2018 July,  
(Filipiniana Analytics)  
NP

0580

### **Difficulties in research writing of faculty members**

*Aspiras, La*

The strategic direction of the institution influences the level of concentration on each task given to faculty members. Indeed, faculty members are mandated to engage themselves in research endeavors. Thus, this qualitative study employing the descriptive method of research aimed to identify and assess the problems encountered by faculty members in writing research. A total of 25 participants were randomly selected to take part in an individual open-ended and in-depth interview. It was noted that various themes emerged, such as: overloaded with subject preparations, unequal distribution of research training opportunities, fear of statistics, collaborative research is not institutionalized, research writing is added burden, and only the best papers are given recognition and incentive during in-house reviews. On the other hand, to address the identified difficulties, a proposed enhancement program will be initiated, which focuses on strengthening the campus' culture of research, increasing the university's research activity, and identifying research collaborations in the campus' research focus areas. Thus, faculty members' concerns in the conduct of research blended with their inner drive, positive disposition, high level of knowledge and skills, and the University's conducive research environment may improve QSU Cabarroguis Campus' research productivity. **(Author's abstract)**

**Keywords:** *Training opportunities, Glitches and hitches, Collaborative research, Research writing, Qualitative approach, Social sciences*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 281  
2018 July,  
(Filipiniana Analytics)  
NP

0581

### **Eating attitude and body satisfaction of overweight and under weight adolescents**

*Medina, Daei P. , Cabrera, Gino A., Cantos, Kathleen Mae*

The study focused on the differences between overweight and underweight individuals in terms of their eating attitude and body satisfaction. This research involved 104 respondents from selected localities in the province of Quezon. The respondents were 11–20 years old and were proportionately categorized as overweight and underweight based on their school medical records. The variables of the study were gauged using the eating attitude test and body shape questionnaire. Results revealed that out of 52 overweight respondents, 22 were at risk of eating disorders in the area of dieting; 18 for bulimia and food preoccupation; and 12 for oral control. Among 52 underweight respondents, 15 were at risk of eating disorders in the aspect of dieting; 24 for bulimia and food preoccupation; and 22 for oral control. In terms of body satisfaction, overweight respondents, results showed that 4 respondents were markedly concerned; 15 were mildly concerned; and 18 were moderately concerned about their body shape. Among underweight respondents, 8 were mildly concerned and 2 were moderately concerned about their body shape. Statistical analysis using t-test identified differences in the respondents' eating attitude in the areas of dieting ( $t=2.119$ ;  $p=.037$ ), oral control ( $t=2.456$ ;  $p=.016$ ), and body satisfaction ( $t=6.118$ ;  $p=.0005$ ) between the two groups. Further analysis indicated that in dieting, overweight respondents have higher risk ( $M=8.807$ ) while in oral control, underweight respondents have higher risk ( $M=4.846$ ) of developing an eating disorder. Meanwhile, overweight respondents were more concerned about their body satisfaction ( $M=102.173$ ) compared to their underweight counterparts ( $M=65.307$ ). This study recommends psychoeducational approaches for adolescents who are at risk of developing eating disorders and those who show excessive concern for their body shape. **(Author's abstract)**

**Keywords:** *Adolescents, Eating attitude, Body satisfaction, Eating disorder, Social sciences*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 274  
 2018 July,  
 (Filipiniana Analytics)  
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0582

### **The effect of direct instructional approach to vocabulary performance of grade 7 students of Solano High School** *Tabor, Helen Gr*

An individual's capacity for comprehension depends on the availability of vocabulary. The richer the storehouse of vocabulary, the more one is able to understand a variety of concepts. The study aimed to enhance the vocabulary performance of the Grade 7 students of Solano High School by determining which approach is more effective in developing their vocabulary performance—the direct instructional approach or the common instructional approach. The study utilized the experimental correlation method to ascertain the effectiveness of direct instructional approach in enhancing the vocabulary performance of Grade 7 students in terms of their profile variables: age, gender, grade in first grading, number of siblings, monthly income of parents, birth order, father's highest educational attainment, mother's highest educational attainment, and reading materials available at home. The qualitative part of the study made use of post-selfevaluation-questionnaire modified from Schmitt's (1997) Vocabulary Learning Strategy Questionnaire (VLSQ), which divided into three items: word meaning, word parts, and context. The questionnaire is designed to gather information about how students go about English vocabulary learning. It was noted that in the field of education, no language teachers could afford to remain at a standstill. Language teachers should keep up with new findings, new materials, and teaching-learning experiences of the researcher for the development of the vocabulary performance of the students. From the findings of this study, the activities and instructional materials would motivate other language teachers to formulate materials that have direct relevance to the unique language teaching-learning situation. Teaching vocabulary to the K to 12 BEC using direct instruction has been proven effective. It is worthwhile, therefore, for other language teachers to make use of direct instruction to teach vocabulary in implementing the K to 12 BEC. **(Author's abstract)**

**Keywords:** *Vocabulary, Direct instructions, Language teaching, Strategy, Social sciences*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 300  
 2018 July,  
 (Filipiniana Analytics)  
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## The effect of domestic and international remittances on the consumption patterns of Filipino households

*Sebastian, Aireen T. , Mandac, Maris*

This study evaluated the impact of cash remittances on the consumption behavior of Filipino middle-income class households under several expenditure categories. In this regard, evaluating the difference among households' budget, by comparing household recipients to household nonrecipients, would demonstrate whether remittances resulted into a welfare gain for these Filipino families. The data utilized in this paper were the merged file of 2012 Family Income and Expenditure Survey and 2013 Labor Force Survey, consisting of 42,397 Filipino households. Propensity score matching (PSM) method was utilized in this study. It is commonly used in impact evaluation, in which the main goal is to estimate the average treatment effect (ATT) by matching the treatment group with the control group according to their similar characteristics. This treatment effect, expressed in real values, indicates the average annual increase or decrease in spending of a consumption category in relation to the receipt of the treatment variable. Three treatment variables form part in this study: receipt of international remittances, receipt of domestic remittances, and receipt of both forms of remittances. Findings from empirical analysis provided three key results: (1) there is an overall significant increase in the consumption of households receiving external remittances. ATT=P11, 054.77 (food), P1, 935.66 (health), P2, 680.20 (education), P7, 630.06 (housing and utilities), P44.95 (alcohol); (2) the highest percentage increase in consumption after receipt of remittances are attributed in health and education with 52.25% and 41.05% average increase, respectively; (3) international remittances augments Filipino households' income, and domestic remittances act as an insurance or safety net for future negative shocks. This paper suggests that remittances are beneficial not only for the national economy but also for the *social welfare development of the households* receiving it. It is also good to note that the findings relate to the idea that *long-term investments are highly prioritized* by Filipino households given their increased spending power. **(Author's abstract)**

**Keywords:** *Propensity score matching, Average treatment effect, Remittances, Consumption patterns, Social science,*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 301  
2018 July,  
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## Entent of information and communication technology among Solano High School student: a review

*Mutia, Florabel P. , Gacad, Emely D. , Agravante, Melba A. , Laguerta, Kathleen K*

The information and communication technology age has developed 21st century skills essential for students to have access to advancement. Computers, cellphones, and other gadgets have become indispensable to everyday needs and commonly utilized by everyone. This study aimed to determine the extent of use of these technologies among students in school, in the society, and at home. Survey questionnaires and focused group discussions were used to gather data from 2,634 students comprising 61 sections from Grade 7 to 11. Descriptive-qualitative analysis was employed in the study. Results revealed that 7 out of 10 students bring their cellphones to communicate with their parents and had Facebook accounts as their avenue of leisure. About 6 out of 10 students admitted to playing offline games using their gadgets as well as online games in computer shops near the school. The abovementioned results were from grade 8 students who were more technologically inclined than other grade levels on this aspect. Two out of 10 students use computers for research and assignments and only one of these two has internet connection. The extent of using information and communication technology for leisure is very high while using these technologies for educational purposes is quite low. **(Author's abstract)**

**Keywords:** *Extent, Information, Communication technology, Social sciences*

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**Finding the soul in Philippine regulation: Amartya Sen, social justice and the urban development and housing act of 1992**

*Flores, Herisa*

This study explores the limitations of the economic theory of regulation and finds that: (i) it fails to explain why some regulations pursue ethical and moral objectives; and (ii) it does not provide much normative guidance on how regulation could be used to bring about desirable social outcomes (e.g., social justice). In this light, the ideas of Amartya Sen on social justice are presented as a complementary, if not an alternative, approach in explaining and evaluating the pursuit of ethical objectives through regulation. A cursory assessment of the regulatory provisions of the Urban Development and Housing Act of 1992 and their implementation was done to demonstrate the feasibility of using Sen's approach in this type of undertaking. In doing so, content analysis of the law, as well as a review of existing studies by other authors on its implementation, was employed in a summary study approach. The conclusion summarizes the insights from the assessment exercise and asserts the practicability of Sen's approach. (**Author's Abstract**)

**Keywords:** *Amartya Sen, regulation, social justice, urban development and housing, Social sciences*

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Philippine Journal of Public Administration, Volume No. 57 Issue No. 2,  
2013/12,  
(Filipiniana Analytics)

**Formulation and validation of a specialized anti-drug abuse health education program aimed to instil anticipatory socialization in the youth**

*Sucgang, Raymond , Lago,*

The paper reports the preparation and validation of an anti-drug abuse health education module aimed to enhance the basic organizational, judgemental, and perfunctory skills of adolescents to make anticipatory decisions regarding use and misuse of recreational drugs and drugs of abuse. A health module on drug abuse education and prevention was prepared and validated using a pool (N=120) of Grade 6 pupils randomly selected as test respondents. The module was anchored on a continuum ranging from the cognitive through the affective to the behavioural domain of health education. The validation of the module was made by using it in actual classroom courses. Pretest and posttest were used as the instruments of the study. The experimental group (n=60) used the module while a control group (n=60) was not given the module. The same pretest was administered as posttest to the test subjects, except that the arrangement of items in the pretest was rearranged in the posttest. The arithmetic mean of the test scores in the experimental group was statistically different (using equal variances 2-sample t-test, Stat 500 software) and higher compared to the arithmetic mean of the test scores from the control group ( $t=-4.5$ ;  $t_{crit}=\pm 2.34$ ). The module was very useful and relevant to facilitate learning in classroom instruction on drug abuse prevention education for Grade 6 pupils. (**Author's abstract**)

**Keywords:** *Anti-drug abuse, Anticipatory socialization, Module, Social sciences*

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NP

**Gender participation in the fisheries sector of Lake Taal, Philippines**  
*Fermaran, Michelle Joy L. , Magistrado, Mylene L. , Mutia, Maria Theresa M., Muyot, Myla*

Fisheries has always been considered as men's domain and women's participation is often overlooked. This study started with gathering of data on socio-economic characteristics of fisherfolk and was followed by the documentation of gender roles in the fisheries sector of Taal Lake. Further, the project identified and implemented livelihood projects for the fisherfolk that will help uplift their living conditions. Fishers in Taal Lake 31–40 years old with low education. The roles of both men and women in fisheries were categorized into three sectors: capture, postharvest, and aquaculture. Both genders are engaged in all sectors but men dominate open fishing and aquaculture while women play a great part in trading and activities that ensure the reproduction of labor force. Most of the fisherfolk in Taal Lake, if given a chance, would like to engage in other types of livelihood or to start their own business. The top three livelihood programs suggested by the respondents are additional fishing gears/equipment, livestock, and processing equipment. Livelihood trainings were conducted but it is recommended that additional support be given to fisherfolk to ensure the sustainability of the program. In conclusion, this study showed that men and women have equal level of participation in the fisheries sector in Lake Taal. **(Author's abstract)**

**Keywords:** *Gender role, Fisheries, Livelihood program, Social sciences*

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 2018 July,  
 (Filipiniana Analytics)  
 NP

**Good manufacturing practices of food caterers in Northern Cebu, Philippines**  
*Quinones, Hubert G. , Macachor, Corazon P. , Castro, Char*

Catering services are one of the livelihoods of Northern Cebu residents. This study assessed the good manufacturing practices and hazard analysis critical control point implementation of food caterers in Northern Cebu, Philippines. This study utilized the descriptive method of research using a questionnaire with 30 respondents for the period of six months. Half (50%) of the respondents were male and 50% were female aged 27 years old and above (30%), 24–26 years old (30%), 21–23 years old (20%), and 20 years old and below (20%). The level of good manufacturing practices, especially hand washing before and after serving food, and hazard analysis critical control point implementation during catering services were observed by the food caterers in the northern part of Cebu. Good manufacturing practices were fully implemented, and hazard critical control point observation was moderately implemented during catering services. Hence, crew in these food catering services need to be upgraded in terms of hazard analysis critical control point aspect. **(Author's abstract)**

**Keywords:** *Food safety, Catering services, Sanitation, Social sciences*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 280  
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 (Filipiniana Analytics)  
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**Health as an electoral currency in the Philippines: insights from political ethnography**  
*Arguelles, Cleve*

This article aims to contribute to the literature on health and politics in the Philippines. So far, the wealth of studies on the intersection of these two in the local context has been mostly focused on issues of health sector reform and specific health policies/legislations. Unlike elsewhere, the use of health in elections in the Philippines, the most

important political activity in any democracy, remain largely understudied. This article attempts to fill this gap by studying the ways health was used in the 2016 Philippines elections. To do this, I mapped the ways health is used as an electoral currency, meaning as a means for vote brokerages, during local elections.

The observations that informed this study are based on a political ethnographic study in Quezon City. In-depth interviews, focus group discussions, and participant observations were conducted among voters and politicians of two vote-rich electoral districts in the city. The transcripts and notes from the data gathered were coded and thematically analyzed.

Voters and politicians use health as means of transactional exchange of votes during local elections- an electoral currency. Politicians use their control of public health facilities and services to secure votes while voters simultaneously use their vote as a leverage to gain access to these health facilities and services and improve its delivery in their communities. So while politicians use health to reinforce patron-client ties during elections, voters take advantage of its opportunities to improve their everyday life. (**Author's Abstract**)

**Keywords:** *health, election, politics, ethnography, clientelism, Philippines, Social sciences*

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Philippine Journal of Health Research and Development, Volume No. 22 Issue No. 1, 44-54  
2018/03,  
(Filipiniana Analytics)

0590

### **A historical perspective of the mandatory service policy in the Philippines: a document analysis**

**Ting, Mikko Anthony L. , Sepe, Demi Arantxa C. , Cengca, Ma. Rhenea Anne M. , Agbon, Azar G. , Avelino, Michelle D. , Lara, Aubrey B. , Bardelosa, Danika Joy D. , Paolo Victor N. Medina,, Guevarra, Jonathan P. , Antonio, Carl Abelard**

The Philippines has, mandatory service policies to address the insufficiency and maldistribution of human resources particularly for health services. Despite being perceived as an appropriate intervention to bridge the aforementioned HRH gaps, the past and present implementations of such programs in the country have never been formally studied.

This paper aimed to present the history of mandatory service programs in the Philippines, look at their natures, and see how their different implementations relate to each other. Using a qualitative document analysis method, administrative issuances and reports relevant to past and current implementations of mandatory service policies in the Philippines were obtained and reviewed.

Mandatory service programs have been implemented in the country by institutions from both the private and public sectors as early as 1968. The focus of such has been mostly for government positions and specialized professions including physicians and scientists. While extensive efforts have been made through the years, the policies demonstrated fragmentation and recurring gaps in implementation. Such gaps include the lack of enabling policy mechanisms, formal monitoring and evaluation, and program institutionalization.

The historical narrative of return service programs in the country is a potential source for the development of an overarching mandatory service policy framework for human resources in the Philippines, one that is specific to the context and setting of the country. By articulating policy issues identified, this paper provided a stepping-off point for future mandatory service program policy planning, implementation, evaluation, and institutionalization in the Philippines. (**Author's Abstract**)

**Keywords:** *mandatory service, human resources for health, return service agreement, Philippines, Social sciences*

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Philippine Journal of Health Research and Development, Volume No. 22 Issue No. 3, 1-12  
2018/09,  
(Filipiniana Analytics)

## From imitation to innovation: The complexity of global innovation capacity in an open model of technological change

Sy, Dominique

The advent of the Network Age has increased the premium placed on technological capacity, making it imperative for laggard economies to improve national innovative capabilities. To study the determinants of national innovative capacity, this paper marks a departure from previous works in its analysis of the multinational patterns of technological specialization using a Neo-Schumpeterian approach—i.e., with the common innovation infrastructure framework, cluster-specific innovation environment framework, and the open model of technological innovation. Moreover, it accounts for the spillover effects generated by a nation's inward foreign direct investment (FDI) as well as the legal institutions surrounding innovation such as the intellectual property regime (IPR) and rule of law. In line with this, using data from the World Bank, the Fraser Institute, and the USPTO, this study uses Poisson panel regression analysis on a global panel and subsets of leading innovators, emerging innovators, and laggard nations, in order to examine the key drivers of innovative capacity for each subset. Globally, it was found that knowledge stock, a strong rule of law, excellent university-to-industry collaboration, and FDI inflows have the most significant effect on innovative capacity. For leading countries, intertemporal spillovers take precedence over international spillovers. For emerging countries, legal institutions, a weak IPR regime (imitation to innovation), and cluster-specialization are most beneficial. Lastly, for laggard nations, legal institutions and public education policy are the most beneficial for innovation. In conclusion, strengthening academeindustry linkages, as well as fostering the enablers of growth: sound institutions, good education, and robust international linkages are recommended. **(Author's abstract)**

**Keywords:** *Innovation economics, Technological change, Complexity theory, Economic complexity index, National innovative capacity, Social sciences*

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NP

## Improving human resource capacity: exploring certification in local governments

Calugay, Zita Concepc

The proposed institutionalization of certification pathways for local government officers and staff is a step towards the continuing capacity building to raise the qualifications standards and improve the professionalization of the local government bureaucracy. Certification as a concept serves to validate that the local officers and staff possess and are able to demonstrate the required competencies for the job in accordance with set standards, and thus counteract the common perception that they are inefficient, lacking in skills, and hired based on political influence. Two existing and comparable certifications systems, namely, the Technical Education and Skills Development Authority (TESDA) national certification system for technical and vocational skills, and the Local Government Training Package in Australia are analyzed in formulating a model for local government certification system. The proposed local government certification system will require policy reforms geared towards the recognition of the local government sector as an industry and establishment of a qualifications framework for the local government industry. Different institutional arrangements or modalities including the centralized, collaborative, privatized and mixed models may also be explored in pursuing the certification system. **(Author's Abstract)**

**Keywords:** *certification, human resources management, local government, local government personnel, certification in local government, Social sciences*

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Philippine Journal of Public Administration, Volume No. 57 Issue No. 2,  
2013/12,  
(Filipiniana Analytics)

## **Islam, Bangsamoro and democracy**

*Rasul-Bernardo,*

Despite its potential for growth and development, the Bangsamoro region has seen decades of demographic marginalization, repression, and underdevelopment. These social problems, which were attributed to colonialization, are further aggravated by armed conflict between rebel groups and the government, and weak legal framework for regional autonomy. In her speech, Amina Rasul-Bernardo argues that the Bangsamoro conflict can only be addressed with a better understanding of its history and context. Rasul-Bernardo urges the passage of a Bangsamoro Basic Law that strengthens regional autonomy and ensures genuine, sustainable development in the region. **(Author's Abstract)**

**Keywords:** *Bangsamoro conflict, Bangsamoro history, regional autonomy, Social sciences*

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Philippine Journal of Public Administration, Volume No. 61 Issue No. 1-2, 91-105  
2017/12,  
(Filipiniana Analytics)

## **Is it enough? A fiscal analysis of the effects of taxes and transfers on the 4PS beneficiaries in the Philippines**

*Wu, Alexander Nixon , Go, Ralph Kenric , Magbitang, Niki*

Tax burdens on the poor are tolerable if they are associated with sufficient transfer programs. Previous studies have shown that although tax and transfer systems are depicted as poverty-reducing and progressive, they still contribute to poverty as a substantial portion of the poor are made poorer (or non-poor made poor). This study aims to analyze the effects of tax, specifically VAT, and the 4Ps in the Philippines using empirical and theoretical models of fiscal incidence. In implementing a series of tests for the measurement of fiscal incidence, the authors have considered at least two factors: income and taxes. The researchers aggregated the FIES dataset to create consumption shares of the different goods and services such as food, clothing, education, utilities, housing, and transportation. Essentially, the method consists of allocating taxes and transfers to derive four income concepts (i.e., market income, disposable income, consumable income, and final income). It then assesses the impact using different models of inequality and poverty reduction such as the Lorenz curve, Gini coefficient, headcount index and poverty gap. Results showed that the poorest decile are the ones who benefit most from the transfers, which means that the 4Ps program is deemed as pro-poor. On the other hand, the Philippines' direct taxation on Filipino households is more concentrated among the top 20%. Taxes however shows that the poorest experience more burden on indirect taxes while the richest experience more burden on direct taxes. From these results, it can be observed that there is a trend wherein the Gini coefficient, headcount index and poverty gap increased with the presence of a direct and indirect tax, and decreased when there were subsidies, transfers, and in-kind transfers. This goes to show that the tax system of the Philippines really hurts the poor and the conditional cash transfer program (4Ps) has a minute contribution to poverty reduction. **(Author's abstract)**

**Keywords:** *Fiscal incidence, 4Ps, Inequality, Poverty, Taxation, Social sciences*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 284  
2018 July,  
(Filipiniana Analytics)  
NP

**The level of awareness, compliance, and implementation of anti-smoking ordinance No. 165, S. 1994 among the stakeholders of Solano High School, Solano, Nueva Vizcaya**

*Absalon, Maria Concepc*

The information campaign on anti-smoking has advocated the message that smoking is bad for the health of every individual. Local government units have adopted national laws and formulated ordinances to strengthen the campaign. The study determined the level of awareness, compliance, and implementation of the Anti-Smoking Ordinance No. 165 s. 1994 among the stakeholders of the school. A survey questionnaire, composed of 20 items multiple choice set, was administered to the respondents. Descriptive-qualitative method, with focus group discussions, was utilized. The study revealed that students had high level of awareness of the latest national laws but had very low awareness of the municipal ordinance. There was also poor compliance of the said ordinance, as reflected on the varied cases caught in school and seen along the streets and stores. Discussion also brought out daily encounters of people who freely smoke without any hesitation. The absence of consistent implementation had led people to frequently violate the ordinance. Hence, strict compliance and implementation among the authorities must be evident. The school, being one of the implementing units, should strengthen its campaign on antismoking policies in order to provide a more child-friendly, safe, and motivating environment. **(Author's abstract)**

**Keywords:** *Anti-smoking, Awareness, Compliance, Implementation, Social sciences*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 302  
2018 July,  
(Filipiniana Analytics)  
NP

**NPM, business process re-engineering and local governments: the case of local business permitting and licensing system regulatory reform**

*Ilago, Simeon A*

The article explores the process of re-engineering in the business permitting and licensing systems (BPLS) of local governments over a five-year period (2010-2015). Review of secondary data and official documents on the BPLS reform program and process analysis of the streamlining approaches used by two local government units (LGUs) for their BPLS procedures both reveal differences, limitations, and constraints in implementation at the local level. The article argues that, despite the attempt to converge BPLS streamlining efforts by issuing uniform standards and guidelines, implementation varies due to the decentralized and political context, the local government officials' understanding of the process and its elements, and their perception of the policy problem. The article then suggests areas for future research along this line. **(Author's Abstract)**

**Keywords:** *new public management, business process re-engineering, business permitting and licensing system, local government units, Social sciences*

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Philippine Journal of Public Administration, Volume No. 61 Issue No. 1-2, 1-17  
2017/12,  
(Filipiniana Analytics)

**Online games addiction of college students**

*Manalo, Johndell Eugry , Jimenez, John Carlo , Horena, Brian Joseph , Benitez, Kitt , Castillo, Melani L., Santilles, Maric*

Playing online games is a common interest among students nowadays. However, too much engagement in online games may result in its addiction. The main thrust of this study is to determine the status of online gaming addiction and to identify the symptoms of addictions and its effects on the respondents. The study utilized descriptive research methods, while sample was selected through random sampling. A total of 85 respondents participated in the study, and were composed of college students from Calamba City, Laguna. The data were collected through survey and face-to-face interviews. Online gaming addiction was determined using the six core components developed by Griffiths (2014), which also serve as the framework for this study. Findings showed that the percentage of male online game players is much higher than that of female players. Social and achievement factor and emotion-content satisfaction appeared to be the main reasons for causing online games addiction. The symptoms found were preoccupation, craving for playing, mood modification, and conflict. It also revealed that engagement in online games did not affect much of the student's academic performance; the effect was more on the respondents' emotions. Thus, students must be well-guided by their parents and must be advised to put some limitations and restrictions in their online gaming habit. **(Author's abstract)**

**Keywords:** *Online games, Game addiction, College students, ICT, Online gaming effects, Social sciences*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 287  
 2018 July,  
 (Filipiniana Analytics)  
 NP

**0598**

### **Perceived frequency and intensity of academic stress of the senior high school students of Solano High School**

*Mutia, Florabel P. , Stuart, Jenifer , Lacaden, Ela*

Senior high school students' life is packed with frustrations, deadlines, and demands, which they consider as stress. Stress is usually described as a negative idea that can affect one's health. The study aimed to determine the frequency and intensity of academic stress in the following categories: subject, schedule, teacher, classmate, and school facilities of the 217 senior high school students both enrolled in Academic and Technical-Vocational and Livelihood Track. Survey questionnaires and focused group discussions were used to gather data. Descriptive-qualitative and quantitative analysis were employed. Students' frequency of academic stress was "sometimes" in all the categories. The intensity of stress commonly scaled as "mild" for all the categories. However, using t-test, only the frequency and intensity of stress on the subjects and schedule had significant differences between students under Academic Track and Technical-Vocational and Livelihood Track. The findings were traced from the varied specialized subjects in both tracks. Furthermore, thematic clustering was done in the specific responses of the students. The students in Academic track were more open and generous in expressing their sentiments than those in Technical-Vocational and Livelihood track. The subjects in Senior High School were found to be "difficult" due to huge amount of researches and projects. Schedule was very hectic due to the shifting scheme applied. Teachers were revealed to be very strict in the class and inconsiderate. Their classmates were also irresponsible, noisy, and disrespectful with one another. Issues in school facilities include lack of comfort rooms, lack of classrooms, and limited outlets of school canteen. Hence, the frequency and intensity of the academic stress depends on the track chosen by the senior high school student. The school, being their second home, needs to continuously improve to have a child-friendly, gender-sensitive, safe, and motivating learning environment. **(Author's abstract)**

**Keywords:** *Academic stress, Frequency, Intensity, Senior high school, Social sciences*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 288  
 2018 July,  
 (Filipiniana Analytics)  
 NP

**0599**

### **Perceptual learning style preferences of PSHS-CVC students**

*Manuel, Alice C. , Lugares, Elnora S., Gragas, Aimee Marie*

This research was conducted to respond to the need to maximize the learning potentials of students. It assessed and mapped out the perceptual learning style preferences of the subject students when grouped according to some none-intellective (gender, year level, and scholarship categorizations) and intellective (year level weighted average) variables. The research employed the descriptive-normative, survey, comparison-research design, in which the scores of the respondents in the four elements of perceptual learning style preferences (auditory, visual, kinesthetic and tactile) were compared in terms of selected intellective (year-level weighted average) and non-intellective (gender, year level, and scholarship categorization) variables. The results of the study showed that the (1) typical *auditory* students are fourth-year females, enjoying the special scholarship categorization, and whose YLWA is within 1.51–2.00; (2) typical *kinesthetic* students are first-year females, enjoying the Partial 2 scholarship categorization, and whose YLWA is within 2.51–3.00; (3) typical *tactile* students are first-year males, enjoying the Partial 1 scholarship categorization, and whose YLWA is within 2.01–2.50; and (4) typical *visual* students are fourth-year females, enjoying the Special scholarship categorization, and whose YLWA is within 1.51–2.00. **(Author's abstract)**

**Keywords:** *Student potential, Scholarships, Learning styles, Social sciences*

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NP

0600

### **Personality, socioeconomic background, and punishment mechanisms as determinants of cooperation and free-riding behavior**

*Marasigan, Mariella Jasmin P. , Carlos, Franz Nic*

Although economic theory predicts that voluntary provision of public goods leads to suboptimal results because free-riding is the dominant strategy, previous studies have provided evidence that individuals contribute non-zero amounts; total free-riding is not always observed. With the knowledge that observations are mostly foreign, we were inspired to focus more on the Philippine setting through conducting experiments that involved the students of the University of the Philippines School of Economics. This study tested a variation of a public goods game with punishment mechanism, which has been shown in previous studies to reduce free riding. We tested if punishment would continue to induce cooperative behavior under different conditions. Test of means was used to check if there were differences in the contributions among players, while regression analysis was done to dissect the effects of different factors in cooperation and freeriding behavior in the game. Age showed positive effect on cooperative behavior while some factors related to academic background seemed to encourage free-riding behavior. It was observed that personality traits, such as neuroticism, had a negative effect on cooperation while agreeableness had a positive effect, but only under certain conditions. Exclusion as a punishment was highly effective in reducing free-riding, but this observation did not hold when higher thresholds were introduced. **(Author's abstract)**

**Keywords:** *Public goods, Free-riding, Cooperation, Personality traits, Social sciences*

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2018 July,  
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NP

0601

### **Philippine social welfare and development: institutionalizing organizational performance and result-based performance management system**

*Bautista, Ll*

The influence of New Public Management in reforming bureaucracies is manifested in the shifting of government focus from rules and processes to results and outputs, thus, giving premium to the concepts of efficiency and



accountability. In the Philippines, part of the national government's effort to reform public expenditure management is the adoption of a results-based management system through the formulation and implementation of the organizational performance indicator framework (OPIF) and the results-based performance measurement system (RBPMS). Performance measurement, as well as employee motivation, is important in the operationalization of the OPIF as a results-based management approach. This article looks into the strategic value of results management in government agencies' efforts to attain its development goals. In the case of the Department of Social Welfare and Development (DSWD), the strategic value of a results management framework is to clearly identify the desired development results, intermediate outcomes, and outputs to be produced. The OPIF contributes to the efficient allocation of resources in the DSWD through results-based monitoring and accounting. Areas of strength and improvement in each of the eight phases in the OPIF and RPBMS were assessed to identify problems, gaps, and challenges encountered in the conceptualization and implementation of results management in the DSWD. (**Author's Abstract**)

**Keywords:** *results management, new public management, organizational performance indicator framework, results-based performance management system, Social sciences*

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Philippine Journal of Public Administration, Volume No. 57 Issue No. 1, 1-29  
2013/06,  
(Filipiniana Analytics)

0602

### **Planning and budgeting linkage at the local level: status, policy responses and prospects** *Celestino, Ali*

Linking planning and budgeting functions in both national and local governments is important in producing development results and providing a more effective and efficient delivery of goods and services. This article examined the horizontal disconnect in planning and budgeting at the local level, and the vertical disconnect between national and local government planning and budgeting under a decentralized system of governance. The article provides a historical account of the development of the Philippine government's planning and budgeting functions. The study probed how the government addressed the disjoint in planning and budgeting functions through its policies, issuances, and programs that have been enacted and implemented both at the national and local levels. This study also assessed the prospects and opportunities for a strengthened planning and budgeting linkage at the local level with the end view of producing the desired development results and effecting a more efficient and responsive public service delivery system. (**Author's Abstract**)

**Keywords:** *budgeting, planning, planning-budgeting linkage, local government, decentralization, Social sciences*

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Philippine Journal of Public Administration, Volume No. 57 Issue No. 2,  
2013/12,  
(Filipiniana Analytics)

0603

### **Privacy issues and concerns in the use of social media**

*Malipol, Maria Lourdes C. , Leus, Jella Marie , Javier, Danica Joy , Bautista, Jomel M. , Cerda, Jomarie Mae C., Mallete, Hazel Janne , Velasco, Mariene*

Social networking sites (SNS) are the fastest growing entity on the internet. Social media are now used by more than half a billion users around the world and have become a major platform for communication and interaction between users. The variety of personal information being shared has led to the success and advancement of social interaction. At the same time, however, it raised much critique and concerns with respect to users' privacy. This study is identified the issues and concerns of the respondents on the use of social media. It also identified the effects of social media on the respondents and the actions they took to overcome the negative effects. A survey questionnaire was used as the main data gathering instrument. The respondents were selected students from Junior High School of Calamba City, Laguna. The results showed that respondents were still not aware of the risks associated with uploading their information on social media. In addition, the negative effects of privacy

issues moderately affect them. The researchers conclude that proper guidelines and deeper knowledge of privacy concerns and issues should be initiated to improve the use of social media. Along with this, this topic should be further studied since social media interaction has become increasingly popular components of our everyday lives in today's globalizing society. (**Author's abstract**)

**Keywords:** *Social media, Privacy concern, Social networking sites, Technology, Social sciences*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 291  
2018 July,  
(Filipiniana Analytics)  
NP

**0604**

### **Public administration as a scholarly discipline today—and how ICT will affect it** *Drechsler, Wo*

After sketching out how Public Administration (PA) scholarship looks today, this lecture asks how information and communication technology (ICT) will, or might, influence it in the near future. First, we look at what information and communication technology can already do today and how it has changed our life-world by 2017. Two critical, interlinked phenomena are then analyzed: MOOCs (massive open online courses) and their effects, and the current ability of algorithms to write a certain type of texts. These may have the effect to strongly enforce, even lock in, the current tendencies of PA, but they may also give rise to an altogether different kind of development of scholarly inquiry in the discipline and beyond. (**Author's Abstract**)

**Keywords:** *Public Administration, ICT, algorithms, MOOCs, Social sciences*

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Philippine Journal of Public Administration, Volume No. 61 Issue No. 1-2, 127-141  
2017/12,  
(Filipiniana Analytics)

**0605**

### **Public administration as design** *Ocampo, Ro*

Since the close of World War II, Public Administration students have been urged to move from the concept of the discipline as doing and deciding to that of designing, i.e. elaborating prescriptions in the manner suggested for policy vs. academic research. Design had long been a part of planning for the built environment (architecture, city planning, and urban design). Since the publication of Herbert A. Simon's *The Sciences of the Artificial*, however, design has been taken up increasingly in the literature of public policy and administration. While still basically goal-oriented, this literature puts greater emphasis on the institutional context, on problem-definition and alternatives-generation, and on decision-making as a framework. Theoretical perspectives, concepts, strategies, and techniques have been developed for public policy making, implementation, and organizational design. This article attempts to assess the progress of design ideas, glean fundamental points from the literature, and suggest how design may deal meaningfully with some PA issues in the Philippine context, with the hope that they will apply as well to larger contexts. (**Author's Abstract**)

**Keywords:** *design, decision-making, policy design, social planning, heresthetics, bricolago, Social sciences*

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Philippine Journal of Public Administration, Volume No. 57 Issue No. 2,  
2013/12,  
(Filipiniana Analytics)

## **Refuge and solicitude of the metropolis: an early assessment of the establishment of the MMDA workers' inn**

*Gomez, Jose Edgardo*

Since its inauguration in May 2007, the Metropolitan Manila Development Authority (MMDA) Workers' Inn has served as a fairly successful metro governance experiment in shelter provision for blue-collar workers. Operated as a bed-bath-&-shop facility, the Gwapotel, as it was first nicknamed by its proponents, has come to serve as refuge for the laboring under class, and occasionally, the rejects of urban society—thus drawing MMDA into the role of intermediary between a diverse public of resource-challenged or distressed individuals, and a wider administrative network that is supposed to provide frontline social services, yet which has come to rely on MMDA's growing capacity to handle such problems. The research frames the situation using concepts of institutional coping vis-à-vis the patterns of informality, behavior, and social capital replacement that metro government faces. The research arrives at the tentative conclusion that MMDA's administrative innovation has become a unique but replicable magnet in urban space that inadvertently rises to the position of a dominant social safety net provider for its vicinity in the metropolis. This is a growing role not initially targeted by MMDA, but one which has become a solution that matches unaddressed needs of the population. (**Author's Abstract**)

**Keywords:** *workers' inn, Metropolitan Manila Development Authority, new public administration, metropolitan governance, welfare governance, Social sciences*

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Philippine Journal of Public Administration, Volume No. 57 Issue No. 1,  
2013/06,  
(Filipiniana Analytics)

## **A review of citizen participation issues, responses, and prospects for reform in local development councils**

*Medina-Guce, Czarina, Galindes, Mart*

This article conducts a review of citizen participation in local governance within the context of the local development councils (LDCs). It argues that the Local Government Code has prescribed citizen participation with a limited set of standards, namely, the 25% civil society membership in the LDC and the administrative indicators of activities that the LDC must perform. The Code and subsequent LGU performance measures it influenced have insufficiently addressed the roles to play and capacities needed by civil society to realize higher levels of citizen participation in the LDCs. Moving forward, the study takes stock of citizen participation initiatives that make explicit the roles and capacities of civil society organizations in local decision making and draws lessons to suggest prospects for deepening and increasing citizen participation in LDCs. The article ends with a note that citizen participation should be in the core agenda of proposed amendments in the Code. (**Author's Abstract**)

**Keywords:** *local development council, local government units, citizen participation, Social sciences*

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Philippine Journal of Public Administration, Volume No. 61 Issue No. 1-2, 43-70  
2017/12,  
(Filipiniana Analytics)

## **Socioeconomics and family dynamics analysis of agta indigenous people (IPs) farmers in Albay, Bicol Region for Palayamanan system**

*Aguilar, Ferdinand, Canilao, Jacqueline Lee O., Puerto, Jaily N., Nuñez, Gina*

A baseline characterization of the indigenous people (IPs), ethnolinguistically classified as Agta, was done in this study to formulate policy recommendations and serve as reference for researchers and development managers

eyeing for potential interventions. Agtas are involved in upland and unfavorable rainfed lowland rice farming in Tiwi and Polangui, Albay. Socioeconomic characterization and family dynamics studies were utilized in the analysis of this project. The socioeconomic component described the social conditions and the production and income forces of the communities, and a study on family dynamics revealed factors affecting their family decisions. The researchers found that farming in Danao, Polangui, located in the uplands-maximized rice production, was still on hold due to its limited resources but conducive for diversified crops. The site in Tiwi covering barangays Misibis, Joroan, and Mayong had very low rice production in the uplands, but had thrived in abaca production. The family dynamics analysis in both sites revealed that Agta IP farming families have closed family system due to demographic and cultural aspects, which made it challenging to introduce new things, such as the palayamanan systems. However, this should not limit effective development interventions to help them. Overall, the communities' geographical conditions, rice and agri-based farm practices, disposals, market access, beliefs, and family-knits have affected their way of living, agricultural practices, and decision making. (**Author's abstract**)

**Keywords:** *Socioeconomic, Family dynamics, Indigenous peoples, Palayamanan, Social sciences*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 295  
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NP

0609

### **State audit, budgetary appropriations and their implications to regulatory governance** *Muñez, Jephthe*

With the change of leadership in 2010, a change in regulatory climate has been anticipated. Compliance with statutory requirements and administrative regulations was expected to be further reinforced to strengthen and support regulatory governance reforms through monitoring and control across the main branches of the government, providing symbiotic participation from the private sector and civil society. As defined by law, state audit is "the analytical and systematic examination and verification of financial transactions, operations, accounts and reports of any government agency for the purpose of determining their accuracy, integrity and authenticity and satisfying the requirements of law, rules, and regulations." It is a function conducted by the Supreme Audit Institution of the country, grounded on the values of integrity, transparency, and accountability. This article explores the relationship between the extent of budgetary appropriations profile across the national government agencies (NGAs), which includes the executive, legislative, judiciary, and constitutional commission, vis-à-vis the NGAs audit compliance profile. (**Author's Abstract**)

**Keywords:** *state audit, regulatory governance, budget appropriations, transparency, Social sciences*

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Philippine Journal of Public Administration, Volume No. 57 Issue No. 1,  
2013/06,  
(Filipiniana Analytics)

0610

### **Student engagement of freshman college students in their English classes** *Pastor, Danica Hanna A., Lino, Marlina*

The study aimed to determine students' level of physical engagement in terms of positive body language, consistent focus, verbal participation and student confidence, level of mental engagement, relationship between their level of physical engagement to their level of mental engagement, and the factors affecting such. Levels of different engagement were measured using the Likert's scale. Direct interviews to students were done to gather the needed data. The descriptive-qualitative method was employed in order determine and interpret the data gathered. Results showed that students generally had high level (3.72) of physical engagement. Specifically, students exhibit average level (3.27) of positive body language, high level (3.97) of consistent focus, average level (3.37) of verbal participation, and very high level (4.27) of student confidence. In terms of the level of mental

engagement, 1.8% had very high level, 6.6% had high level, 22.4% had average level, 42.6% had low level, and 26.6% had very low level. Furthermore, the results revealed that there was a significant relationship between students' level of physical engagement and their level of mental engagement. The factors affecting the level of physical engagement of student include teacher factor, environmental factor, and student factor. The factors affecting the level of mental engagement include student factor, exam, and learning process. With these findings, teachers should develop activities that will actively engage their students to improve their academic performance. Likewise, students should also actively participate in the activities designed by the teachers. **(Author's abstract)**

**Keywords:** *Student engagement, Physical engagement, Mental engagement, Social sciences*

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 2018 July,  
 (Filipiniana Analytics)  
 NP

**0611**

### **Subjective well-being, job satisfaction, and resilience of married working mothers**

*Dullas, Angelo , Villanueva, Ma. Carolina Bern*

Different studies have found out that subjective well-being and resilience is correlated to one another (Diener and Ryan, 2009). However, studies are still lacking on the major relationship between these two variables and job satisfaction, specifically on working mothers. Thus, the study focused on exploring the levels and interrelationship of subjective well-being, job satisfaction and resilience among married working mothers. The study utilized correlational design and analyzed, using Pearson  $r$ , 50 working mothers. The standardized scales used were (1) Satisfaction with Life Scale [SWLS] by Pavot and Diener; Positive Affect; (2) Negative Affect Scale [PANAS] by Watson, Clark and Tellegen; (3) Job Satisfaction Survey by Spector; and (3) Resilience Scale by Wagnild and Young. Results revealed that working mothers had high level of Subjective Well-being (SWB), specifically on their positive emotion and satisfaction with life. They also had high levels of job satisfaction and very high level of resilience. Job satisfaction was significantly correlated with subjective wellbeing domains, i.e., positive emotion ( $r=.47$ ,  $p=.03$ ) and satisfaction with life ( $r=.56$ ,  $p=.041$ ). Moreover, scores on resilience scale was significantly correlated with positive emotion ( $r=.58$ ,  $p=.032$ ) and satisfaction with life ( $r=.66$ ,  $p=.026$ ). Results revealed that when working mothers have high SWB, their satisfaction towards their job also increases and the likelihood to have high level of resilience to buffer different challenges also increases. **(Author's abstract)**

**Keywords:** *Risky behavior, Social networking sites, Self-esteem, Social sciences*

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 2018 July,  
 (Filipiniana Analytics)  
 NP

**0612**

### **Supply and demand and key players of garlic (*Allium sativum*) in Ilocos Region, Philippines**

*Julian, Constante B. , Esteban, Zenaida H. , Lucas, Marilou P., Rafael, Lory*

Garlic (*Allium sativum*) is an indispensable ingredient in any food preparation. This study analyzed the supply chain of this high-value commodity to understand and determine the presence or absence of inefficiencies in the system. The respondents were composed of garlic farmers, members of cooperatives, households, and institutional buyers. Primary data were gathered through focus group discussions and key informants interviews using structured interview schedule. Secondary data on the macro level sourced from the Philippine Statistics Authority 2015 data were also used in this study. Data were analyzed using descriptive statistics and supply chain analysis. The province of Ilocos Norte has the highest hectareage planted and production that accounts 94% and 95%, respectively (11,933 ha and 6,934.49 MT), and only about 6% of the area planted and 5% of the production are shared by the provinces of Ilocos Sur and Pangasinan. La Union did not produced garlic. Ilocos Region remains

the top producer of garlic in the country, however, production showed a decreasing trend. Garlic produced in Ilocos Region accounts the biggest share (69.7%) nationwide. The domestic supply can meet the requirements of the region with a surplus of 75.53 MT, but there is a shortage of 133,989.92 MT throughout the country. Monthly price of garlic was highly variable. The key players in the supply chain performed their activities independently from one another. There were inefficiencies in the supply chain. **(Author's abstract)**

**Keywords:** *Garlic, Inefficiency, Supply and demand, Supply chain, Social sciences*

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Transactions of the National Academy of Science and Technology, Volume No. 40 Issue No. 1, 298  
2018 July,  
(Filipiniana Analytics)  
NP

0613

### **Surface judgments, profound questions: a homosexual male's phlebotomy experience**

*Dumagay, Teresita E. , Cenizal, Paul Martin Anthony C. , Sy-Su, Chadwi*

Two of the authors, one heterosexual and one homosexual, both voluntarily donated blood to a well-known health institution in the Philippines. As they were filling out the paperwork, one of the authors' attention was called by one of the questions in the form: "Nakipagtalik ka na ba sa iyong kauri?," which can be literally translated as "Have you had sex with your own kind?". This erroneously phrased question is the sole question interrogated and problematized in the study.

Reviews of Standpoint Theory and the methodology associated with it and, in effect, used in the study, form part of the critique, divided into individual narrations and interpretations by each author. A third co-author, a hematologist, lends her insight on the logistics and issues of phlebotomy. Institutional ethnography is brought to bear on the narratives.

This three-author collaboration is presented as a claim that an interdisciplinary approach may open new vistas to a phenomenon that has long existed but been ignored. Reviews of Standpoint Theory and curriculum planning for health professionals are recommended. **(Author's Abstract)**

**Keywords:** *phlebotomy, communication, Standpoint Theory, homosexuality, blood donation, institutional bias, Social sciences*

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Philippine Journal of Health Research and Development, Volume No. 23 Issue No. 4, 11-16  
2019/12,  
(Filipiniana Analytics)

0614

### **Traditional use of rice as medicine in Rizal, Palawan**

*Caguiat, Xavier Greg U. , Gonzales-Esmero, Diadem , Gonzales-Gado, Charisma Love , Manuel, Floper Ge*

This study, conducted in 2016, investigated the different traditional rice varieties (TRV) commonly used for medicinal purposes in the town of Rizal, Palawan. This aimed to determine the existing local knowledge and practices on the medicinal value of TRVs. Using qualitative research methods of data collection (i.e., key informant interviews and focus group discussions), the researchers gathered data from community members, community-recognized herbalist, and barangay health workers. The knowledge level of younger generation was also surveyed among the high school students in the community. Seven TRVs were recognized as medicinal. The method of treating diseases varied and did not necessarily require eating the rice grain. Other parts of the plant, such as leaves and roots, were also used for medicinal purposes. The sicknesses being treated with TRVs include simple colds and fever, urinary tract infection, and other types of allergies. Some also use rice bran for aesthetic purposes, particularly in treating pimples, which appears to be the only familiar medicinal value among the younger ones. The common diseases treated by these rice varieties were also the recorded common causes of morbidity in the area. Further laboratory analysis is required to probe the potent components and healing properties

of these TRVs. Nevertheless, the medicinal value of rice further denotes the cultural significance of these rice varieties and the continuous propagation of these rice cultivars. **(Author's abstract)**

**Keywords:** *Ethnobotany, Rice, Medicine, Local knowledge, Social sciences*

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0615

### **Valuing the Hinatuan Enchanted River underwater cave system using the travel cost method**

**Taglucop, Ely Rose B. , Ramirez, Jeff Dalton P. , Mitchao, Marjorie P. , Magarin, Ricmar P. , Gomez, Rechie P. , Cordova, Meraluz A. , Comagon, Vherna C. , Balomaga, Catherine A. , Apdohan, Julie R**

The Zonal Travel Cost Method was used to estimate the economic value of the Hinatuan Enchanted River Underwater Cave System, which is one of the prime tourist destinations of Surigao del Sur. It was assumed that visitors take the trip for a single purpose of wanting to visit the said recreational site. A total of 84 zones were identified based on the country's geographic division by province. The data of the total travel cost per trip for zones were analyzed using the regression analysis in the SPSS software. The equation that relates the visits per capita to travel cost has been depicted as  $\text{visits}/1000 = 1.468 - 0.0000632 * (\text{Travel Cost})$ . Using the equation, the demand function for the average visitor per added value to the travel cost was estimated starting from an addition of PHP 1,000.00, which can stimulate 63,738 visits. An addition of PHP 23,300 to the travel will cause the total loss of tourist visiting the site. The consumer surplus was calculated using the spandrel formula given as  $(a/b)/3$  resulting in a total estimate of economic benefits. The result revealed that in a span of eight months (March–October 2017) after the reopening of the Enchanted River for its recreational uses, the total estimate of economic benefits from the site was PHP 465,730,850 or PHP 9,196 per visit (PHP 465,730,850.00/50,643). This reveals that despite its closure for more than two months and despite the new policies implemented, the site still has high recreational value and continues to generate economic activities through the tourism industry. **(Author's abstract)**

**Keywords:** *Zonal Travel Cost Method, Hinatuan Enchanted River Underwater Cave System, Tourism, Social sciences*

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0616

### **A VSO-Bahaginan framework for active citizenship**

**Alampay, Erwin Gas**

This article is based on a commissioned work for the Volunteer Service Organization (VSO)-Bahaginan to develop its organizational framework for active citizenship. The primary objective of the paper is to define the role of VSO-Bahaginan in the development of active citizenship in individuals and communities. The resulting framework derived in this paper was based on surveys, interviews and focused group discussion with various VSO-Bahaginan stakeholders, including volunteers and staff. This complemented other workshop outputs and secondary data provided by VSO-Bahaginan. Taken together, these inputs were used in crafting an active citizenship framework that is culturally sensitive to Filipino values. It discusses how VSO-Bahaginan volunteers describe the progression of active citizenship, from kamalayan (awareness) to kamulatan (consciousness) to having a paninindigan (conviction), as an agent of change. **(Author's Abstract)**

**Keywords:** *VSO-Bahaginan, active citizenship, volunteerism, civic engagement, Social sciences*

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### **Vulnerability of Quiaoit River Watershed (QRW) communities to common vulnerability and exposure (CVES)**

*Ayson, Roseller R. , Utrera, Rodel T. , Pajinag, Grace Ann I. , Tolentino, Josabette S. , Alibuyog, Nathanie R. , Pastor, Floramante C., Cruz, Rex Victor*

This study was conducted to assess the vulnerability of communities to common vulnerability and exposures (CVEs) in the Quiaoit River Watershed (QRW), Batac City, Ilocos Norte. The assessment was done through direct household surveys using the Livelihood Vulnerability Index- Intergovernmental Panel on Climate Change (LVI-IPCC) framework. Considering the diversity of socioeconomic and environmental conditions in the watershed, vulnerability analyses were done across three geographical locations (upstream, midstream, and downstream). The LVI-IPCC scale used was from -1.0 (least vulnerable) to +1.0 (most vulnerable). Results showed that communities in all the three geographical locations had negative value ranges in adaptive capacity and exposure, which indicate that they are less vulnerable. However, they would have been more vulnerable if sensitivity was considered, with a positive range from 0.43 to 0.96. Overall, downstream communities in the watershed were the most vulnerable (0.67). This is attributed to their higher sensitivity and low adaptive capacity, which is notably influenced by the high dependency ratio of both young and old population (77.54%). Midstream communities were moderately vulnerable (0.47) while upstream communities were the least vulnerable. Results clearly showed the contributory factors to vulnerability. It could be adaptive capacity, sensitivity, or exposure. Most notable factor/s must be given consideration in any effort to strengthen the communities or lessen their vulnerability to CVEs. (Author's abstract)

**Keywords:** *Vulnerability, Exposure, Sensitivity, Adaptive capacity, Social sciences*

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## **VETERINARY MEDICINE**

### **Intestinal histology and immune status of semi-anemic piglets fed lactoferrin, meat, or meat extract**

*Purchas, Roger W. , Thomas, David G. , Wilkinson, Brian H.P. , Rutherford-Markwick, Kay , Rapisura-Flores, Josephine A., Morel, Patrick C.H*

This study assessed the effects of dietary lactoferrin, meat, or meat extract on immune status and small intestine morphology of 24 three-week-old semi-anemic piglets (six per group) over 28 days, after a one week acclimatization period. Blood samples collected from the piglets at 4 and 8 weeks of age were subjected to whole-blood proliferation and phagocytic activity assays. The leukocyte phagocytic activity and lymphocyte cell proliferative responses of the piglets to concanavalin A and phytohemagglutinin were significantly ( $p < 0.05$ ) improved by the meat-extract diet. This demonstrated that meat extract is a potential immuno-modulating feed ingredient particularly after the period of weaning when piglets are highly susceptible to infection. For intestinal histology, each piglet was euthanized at 8 weeks of age while under anaesthesia and had its small intestine removed. No diet effects were observed for some histological parameters (villus height, crypt depth, and mucosal thickness). However, meat and meat-extract diets significantly ( $p = 0.003$ ) increased the number of goblet cells / 100µm of villous epithelium, which suggests that the meat extract and meat diets stimulated mucin secretion. (Author's abstract)



**Keywords:** Bioavailability, Histology, Immunity, Iron, Meat, Veterinary medicine

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## ZOOLOGY

0619

### **Genetic improvement of bovine populations in Ilocos Norte through phenotypes, molecular markers, and gene dynamics analysis**

*Santiago, Christian Jeremy Q. , Batara, Don Carlo R. , Icalia, Peter James C., Batuyong, Mae Ann R*

This study generated a holistic strategy in genetically improving bovine populations in Ilocos by considering growth-related genes and characteristics such as expected progress from one generation to another through evaluating the shifts in gene and genotype frequencies. Phenotypic characteristics of 230 cattle population were evaluated using the FAO guidelines. Growth performance was associated with growth hormone (*GH1* and *GH2*), and growth hormone-receptor (*GHR*) genes. Phylogenetic analysis showed genetic differences of the cattle population across location. *GHR* was found to be monomorphic, indicating and that this gene cannot be a potential molecular marker. Three genotypes were observed for both *GH1* and *GH2*, which were found to be associated with body weight (BW) having correlation coefficient of +0.110 and +0.251, respectively. Complete dominance exist between the alleles for *GH2*, where the homozygous dominant (*PP*) and the heterozygous animals (*PJ*) had higher BW (+0.1346 and +0.1817) than the mean performance of the population. In *GH1*, codominance was observed, and the favored genotype is the heterozygous (*PJ*). In the interest of addressing the declining growth rate of local genetic groups, it is very important to consider these molecular markers. A shift in the growth performance is projected if the homozygous or heterozygous genotype for *GH2*, along with the heterozygous for *GH1*, would be selected as parents for the next generation. (**Author's abstract**)

**Keywords:** Cattle, Growth hormone genes, SNP, Genetic diversity, Population, Zoology

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Carpio, Marinette Rose M.	0184	Ceballo, Flor A.	0249	Chung, Kuo-Fang	0151
Casais, Dominic	0561	Cejalvo, Reneliza D.	0370	Cinense, Veronica A.	0126
Casas, Jupiter V.	0362	Celestino, Alicia B.	0184	Ciocon, Jan Luziane Marie Kristine M.	0209
Casimiro, Jerile	0135	Celestino, Ma. Theresa F.	0195	Clemente, Jennyrose C.	0329
Castañeda, Soledad S.	0559	Cengca, Ma. Rhenea Anne M.	0208	Clemente, Jhoirene B.	0300
Castañeto, Elmer T.	0091	Cenizal, Paul Martin Anthony C.	0602	Climaco, Jolly C.	0404
Castañeto, Yolina T.	0448	Cerda, Jomarie Mae C.	0590	Co, Gregory Allan C.	0540
Castigador, Loren Christian	0399	Cerrero, Christine Joy D.	0613	Co, Kim Carmela D.	0132
Castillo, Agnes L.	0156		0603	Cochon, Kim L.	0515
			0467		0517
				Cocson, Lucricia Conchita G.	0048

Coloma, Maria Lourdes B.	0484	Cruz, J.T.P.	0564	Daljog, Charmaine S.	0190
Comagon, Vherna C.	0615	Cruz, Jayvee	0177	Dalmacio, Leslie Michelle M.	0141 0486
Comblicer, Marilyn S.	0003 0263	Cruz, Maria Katrina Diana M.	0422	Daloyoc, Kaisey Jien Marion	0409
Conato, Marlon T.	0291	Cruz, Paolo Tristan F.	0558	Dalumay, Rhazzel Jane A.	0312
Concepcion, Mae Anne	0549	Cruz, Patricia Anne D.	0327	Damian, Ruth	0316
Constantino, Rose E.	0439		0068	Dancel, Joselito M.	0085
Contreras, Anthony Joseph M.	0228	Cruz, Rex Victor O.	0346	Danting, Ma.	0375
Corbita, Nova Cyrell S.	0238		0411	Jodecel	0379
Cordel, Macario O. II	0313		0617	Dator, Dominico Carlo S.	0509
Cordero, Cynthia P.	0495	Cruz, Rolando T.	0074	Datoy, John Jayson	0548
Cordova, Meraluz A.	0615	Cruz-Flores, Mary Jane	0228	David-Padilla, Carmencita M.	0307
	0240	Cu, Jeanne Terese T.	0273	Dawal, Karlen C.	0559
Coritico, Fulgent P.	0246	Cuadrado, Jerry T.	0180	Day, Michael D.	0221
	0150	Cuario, Marlo A.	0171	Dayao, Liere Roe	0278
Cornista, Joel C.	0159		0193	Dayo, Maria Helen F.	0125
	0230	Cudal, Maricris	0354	de Asis, Agnes	0330
Corpuz, Mary Jho- Anne	0275	Cuevas, Leonardo S.	0450	de Castro, Alyssa	0259
Corpuz, Raiza	0451	Cuevas, Pearl Ed G.	0439	de Chavez, Emmanuel Ryan C.	0155
Corpuz, Verna	0400	Culaba, Ivan B.	0565	de Chavez, Hidelisa D.	0111
Cortes, Angelbert D.	0261	Cullano, Archie	0442	de Guzman,	0367
Cortes, Julian Carl Maverick	0560	Cuña, Anna Margarita D.	0159	Asuncion B.	0380
Cortiguerra, Emelyne C.	0416	Cunanan, Elaine C.	0531	De Guzman, Camille Rose V.	0273
Costa, Ma. Azileira V.	0364	Dacuya, Aaron C.	0241 0571	De Guzman, Ma. Lourdes Rossana E.	0132
Costan, Editio B.	0211	Dadgardoust, Pariessa D.	0522	De Guzman, Margaret LC.	0489
Crandall, Keith A.	0233	Dahonog, Luigi	0339	de Jesus, Donna Trixia O.	0047
	0004	Dahse, Hans-Martin	0536 0537		0089
Crisostomo, Speedy D.	0041	Dajay, Leah C.	0404	de Leon, Alma	0107
	0095	Dalida, Maria Lourdes P.	0326		
Critica, Ma. Fatima	0003		0025	De Ocampo, Joshua Mari D.	0250
Cruz, Eric Jhon D.	0082	Dalisay, Teresita U.	0158 0072	de Ocampo, Marjorie P.	0073



De Torres, Rachele L.	0031 0033	Dela Cruz, Thomas Edison E.	0461 0241	Desamero, Ruel Z.B.	0273
De Ungria, Maria Corazon A.	0186		0158		0015
Decena, Katherine Mae M.	0477		0259	Descalsota, Jesse	0021
Decio, Kenneth Q.	0450		0028		0066
del Castillo, Cynthia	0514		0031		0117
Del Isagan, Margareth	0077	Dela Cueva, Fe M.	0033	Descalsota, Jonathan	0021
del Mundo, Crisfel R.	0508		0049		0066
Del Mundo, Jocelyn C.	0131		0061	Destura, Raul V.	0212
Del Mundo, Michael Dominic C.	0131	dela Luna, Kim Leonard G.	0072	Devanadera, Mark Kevin P.	0243
Del Pilar, Rose Anne C.	0070		0088	Develos, Maribel Montesa	0419
del Rosario, Ernesto J.	0047 0279	Dela Peña, Geralyn D.	0248	Devora, Kristina	0543
del Rosario, Joanne Marie M.	0212		0552	Diaz, Desiree	0431
Dela Cerna, Patricia	0548		0145	Diaz, Leslie Joy	0308
	0177	Dela Peña, John T.	0367	Diaz, Ma. Genaleen	0051
dela Cruz, Arlen A.	0052		0380	Diaz, Mark Jeffrey S.	0202
	0085	dela Peña, Jusua D.	0372	Diesmos, Arvin C.	0358
dela Cruz, Christopher	0004		0174	Diesmos, Mae Lowe L.	0358
Dela Cruz, Dorothea C.	0439	Delfin, Evelyn F.	0367	Dimabayao, Jerome	0451
Dela Cruz, Fe M.	0331		0380	Dinglasan, Jaime Lorenzo N.	0244
Dela Cruz, Jeane A.	0241		0040	Dionglay, Mariluz SP.	0215
Dela Cruz, Lea Mae S.	0368 0389	Delfin, Frederick C.	0055	Dionisio, Jin Kevin S.	0385
Dela Cruz, Michael Leo	0308	Dellosa, Sophiya	0056	Divina, Cynthia C.	0268
Dela Cruz, Nina Mae	0330	delos Reyes, Francisco	0115	Dizon, Janine Margarita R.	0476
dela Cruz, Norvie J.	0111	Delos Reyes, Mitch Joe	0267	Dofitas, Adrian Bernard A.	0128
Dela Cruz, Quirino D.	0087 0126	delos Santos, Ernesto	0270	Dollete, Una Grace M.	0188
Dela Cruz, Renmar M.	0069	delos Santos, Virginia	0186	Dollosa, Christian Michael	0322
		Demandante, Sosima R.	0398	Domingo, Doreen	0135
		Demayo, Cesar G.	0544	Domingo, Emmanuel P.	0572
		Desamero, Nenette V.	0135	Domingo, Florida A.	0126
			0015	Dominguez, Jochebed Dianem C.	0271
			0117		
			0368		
			0116		
			0084		
			0233		
			0074		
			0436		

Dominquez, Kim Joshua	0512	Ebarvia, Madelaine L.	0241	Enriquez, John Oscar S.	0090
	0017		0075		
Donayre, Dindo King M.	0045	Ebuña, Helen LV.	0264	Enriquez, Rachel Ann	0539
	0067		0276		
Dones, Luz Barbara P.	0307	Edañol, Yasmin D.G.	0309	Epie, Margie S.	0001
Dones, Valentin C. III	0469	Edar, Mary Flor Joy Y.	0481	Ersando, Cherry Anne P.	0119
	0505				
Doño, Andrew C.	0329	Ediza, Marilou	0354	Escuadra, Catherine Joy	0472
	0336				0539
Drechsler, Wolfgang	0604	Eggoy, Errol L.	0035	Espallardo, Richard Marvin R.	0489
Duante, Charmaine	0549	Egloso, Mary Bernadette V.	0359	Espenilla, Mel Bryan L.	0291
Duante, Charmaine A.	0551	Elazegui, Erwin P.	0200	Espinas, Jay Roy	0348
			0357		
Duca, Ma. Salome V.	0045	Elegado, Aileen M.	0069	Espineli, Clarisse A.	0338
Dulalia, Allissa Rose T.	0172	Elegado, Francisco B.	0206	Espino, Reil Vinard S.	0476
Duldulao, Malvin D.	0042	Elepaño, Arnold R.	0057	Espinosa, Teresita S.	0343
	0071				
	0611	Elomina, Kevin	0523	Espiritu, Emilyn Q.	0348
Dullas, Angelo R.	0579	Elumba, Merlene E.	0133	Estacio, Leonardo R.	0426
Dumagay, Teresita E.	0613	Elumba, Monina Dyan R.	0119	Esteban, Carmelo J.	0084
Dumagsa, Geraldine Rheigniére G.	0525	Embate, Mary Valerie	0071	Esteban, Edmund Edison A.	0320
Dumalaog, Jasper S.	0284	Emmanuel, Ernesto	0163	Esteban, Ronell Angelo	0496
	0081		0245		
Dumaoal, Aleta E.	0446	Encarnacion, Elyson Keith	0332	Esteban, Zenaida H.	0612
			0029		
Dumilag, Richard V.	0172		0101	Estilo, Emil Emmanuel C.	0188
Dumo, Joan Ruby	0348	Endonela, Leah E.	0111	Emmanuel C.	0398
					0548
Duque, Ma. Johna C.	0177		0149	Estrada, Miriam	
	0085		0208	Estrada, Sean	0330
Duran, Peregrino G.	0102	Enicola, Elmer E.	0040	Estrada, Sherilyn B.	0223
Duron, Marc John M.	0314	Enoveso, Rose Abigail D.	0477	Evangelista, Jojo R.	0458
Duya, Mariano Roy M.	0173	Enriquez, Anna Lea	0478	Evangelista, Jr., Pablo C.	0228
Eballe, Rustan C.	0372	Enriquez, Eliza B.	0331	Fabella, Ronald Allan M.	0515
	0293		0558		0517
Ebarvia, Benilda S.	0571	Enriquez, Erwin P.	0565	Fadrilan-Camacho, Vivien Fe F.	0477
		Enriquez, Gerard Joseph	0543	Faminialagao, Charice	0350
				Faustino Eslava, Decibel V.	0023

Faustino, Gem P.	0074		0194	Galindes, Martha	0607
Fekih, Rym	0229		0014	Galit, Sherwin	0512
	0331	Franco, Samuel S.	0329	Galo, Ma. Rosnah	0293
Feliciano, Chitho P.	0558		0535	Galvez, Hayde F.	0435
Feliciano, Rodney J.	0188	Franzblau, Scott G.	0536	Galvez, Leny	0161
Fermaran, Michelle Joy L.	0587		0537	Gamalinda, Eve F.	0180
Fernandez-Gamalinda, Eve V.	0201	Frio, Mika Ana S.	0507	Gamido, Ma. Angelika B.	0528
Fernandez, Ashley Zane B.	0022	Fronteras, Jennifer P.	0550	Gamit, Andrei Luis P.	0234
Fernandez, Mathessa D.	0110	Fucio, Roel L.	0023	Gan, Florence Rochelle	0538
Fernandez, Proceso L. Jr.	0300		0393	Ganareal, Kathlene Claire	0107
Fernandez-Gamalinda, Eve V.	0237	Furio, Elsa F.	0374	Gandia, Angenica	0402
Fernando, Edwino S.	0257		0376	Gandia, Jayson L.	0056
			0381		0089
Fernando, Trinidad	0177		0383	Gantioque, Geraldine	0107
Ferrater, Jedeliza B.	0238	Gaban, Paula Blanca	0392		0402
Ferrer, Ma. Salvacion R.	0166		0146		0403
	0042	Gabbuat, Sheena Angela V.	0519	Ganzon, Samantha Jane P.	0139
	0050	Gabrie, Marie Jessica	0412	Gaoat Cecile A.	0194
Ferrer, Marilyn C.	0071	Gabriel, Alonzo A.	0547		0143
	0432	Gabriel, Maura Luisa S.	0048	Garan-Giller, Elizabeth Aileen	0509
			0446	Garcia, Angelita T.	0504
Ferrer, Patricia Janelle D.	0333	Gabriela, Marie Jessica	0347	Garcia, Emmanuel	0277
Flores, Charles Lois	0339	Gacad, Emely D.	0584	Garcia, Florida C.	0087
Flores, Erika Louise	0482	Gacho, E.H.	0335	Garcia, Gernerlyn G.	0383
Flores, Herisadel P.	0585	Gacu, Nereen Y.	0350	Garcia, Lawrence George P.	0529
Flores, Mary Jane C.	0242	Gadiane, Jr., Alex	0020	Garcia, Ma. Celina U.	0488
Flores, Nicko Amor	0385	Gadong, Joshua Vincent Y.	0128	Garcia, Nadine Kristel A.	0188
Folio, Fatima Mae P.	0217	Gaid, Ruth D.	0372		0191
Fontanilla, Ian Kendrick C.	0155		0024	Garcia, Roberta N.	0191
	0173	Galacgac, Evangeline S.	0063	Gardon, Roselle Wednesday	0444
Fortuna, Jenny	0400		0083		
Francia, Fred Jan A.	0122		0108	Garma, Sergia P.	0213
	0080	Galan, Gloria	0354		0415
Francia, Fredi Jan	0134	Galang, Madel	0114	Garrido, Alfredo Jr.	0039
Franco, Prima Fe R.	0143	Galinato, Richard G.	0054	Gaspar, Jerandel M.	0045

	0393	Gonzales, Daniel M.	0420	Guerrero, Jan-Ervin	0332
	0254	Gonzales, Ines	0021	C.	
	0363	Gonzales, Jonar D.	0211		0515
Gatdula, Norvida C.	0374	Gonzales, Marcial	0059	Guevarra, Jonathan	0517
	0376	A.		P.	0590
	0381	Gonzales, Maricel	0171	Guevarra, Maria	0118
	0392	Gonzales-Esmero,	0614	Luisa D.	
Gavinio, Samuel	0322	Diadem		Guevarra, Precious	0431
Gemperoso, Joshua	0294	Gonzales-Gado,	0614	R.	
P.		Charisma Love		Guevarra, Shirley V.	0315
Genavia, Shana	0250	Gonzalez-Andaya,	0490	Guzman, Angelica I.	0493
	0149	Agnes M.		Guzman, Maria	0348
	0002	Gonzalez-Suarez,	0544	Aileen Leah G.	
Gentallan, Jr.,	0101	Consuelo B.		Habunal, Rosteo R.	0434
Renerio P.	0111	Gonzalvo, Karla	0311	Halili, Servando Jr.	0475
	0208	Jane P.		Hall, Rosalie Arcala	0343
Gentallan, Renerio		Gordiel, Garyl	0442		0482
P.	0383	Gordoncillo,	0553	Hallare, Arnold V.	0141
Gente, Angelie A.	0402	Normahitta P.			0489
Gervacio, Rose-Ann	0128	Gorospe, Alloyssius	0339	Hay, Fiona R.	0149
Gestuveo, Rommel		E.G. B.		Heredia, Maria	0013
J.	0364	Gorospe, Jessie G.	0233	Cristina C.	
Gibaga, Cris Reven			0367	Hermoso, Gerard	0322
L.	0413	Gorospe, Jocelyn N.	0380	Hernandez, Emilio	0224
Gibe, Monica	0450		0577	Hernandez, Hidelisa	0289
Giron, Michael		Gragasin, Aimee	0599	P.	
James D.	0556	Marie C.	0452	Hernandez, Jonathan	0257
Gironella, Glen		Gragasin, Jr.,	0114	O.	0074
Melvin P.	0491	Virgilio P.	0089	Hernandez, Jose E.	0094
Gloria, Christopher	0594	Gragasin, Ma.	0570		
Ed C.	0532	Cristina		Hernandez, Maria	0348
Go, Ralph Kenric	0542	Gragasin, Michael	0303	Larisse	
		A.	0058	Hernandez, Rebecca	0002
Gomez, Ivan Neil	0606	Grageda, Maria	0090	P.	
	0538	Elizabeth M.		Hernandez, Rica	0114
Gomez, Jose	0615	Gramaje, Leonilo V.	0051	Rose	
Edgardo A. Jr.	0166		0319		0375
Gomez, Ma. Felisse	0511	Gregorio, Glenn		Hilario, Joyce	0379
Carmen	0265	Grutas, Rhommel	0043		0170
Gomez, Rechie P.	0211	Guarin, Keith	0404	Hingco, Jonas	0239
Gomez, Rosalie N.		Marielle B.	0334	Hipol, Roland	0046
Gonzaga, Alex C.		Guerra, Melissa O.		Hipolito, Josephine	0417
Gonzaga, Nelda R.		Guerrero, Gino		H.	
Gonzales, Aderito		Apollo			
G.					

Hofilena, Joy G.	0137		0471		0376
Honrado, Maria		Jain, Rishi	0527		0381
Lourdes D.	0186	Jainhuknan, Jaran	0203		0392
Horena, Brian			0078	Joy Guisando,	0367
Joseph	0597		0079	Miahnie P.	0380
	0331	Jamago, Joy M.	0110	Joyce, Daryl C.	0099
Hosoda, Masahiro	0558		0266	Juan, Mart Blas	
		Janairo, G.C.	0335	Angelo P.	0509
Hufana-Duran,	0102	Janairo, J.I.B.	0256	Juayong, Richelle	
Danilda		Japitana, Rowena A.	0201	Ann B.	0300
Hughes, Mark	0151	Jarana, Annalhea	0432		0060
Ibana, Franklin	0460	Jaratrungtawee,		Julian, Constante B.	0120
Ibay, Cecilia Anne	0542	Amornmart	0203		0575
Icalia, Peter James	0619	Jariol, Rafael Jims			0612
C.		C.	0011	Juliano, Marizka	0368
Ignacio, Katrina	0422	Javier, Abigaile Mia	0195	Jumawan, Jess H.	0197
Hannah D.		V.			0219
Ignacio, Sharon D.	0422	Javier, Danica Joy	0603	Jumawan, Joycelyn	
Ilagan, Yolanda A.	0147	Javier, Gabriel		C.	0183
Ilago, Simeon		Alfonso B.	0498		0235
Agustin	0596	Javier, Michelle	0010		0361
Ilao, Joel P.	0313	Javier, Pio A.	0195	Jung, Yu Jin	0086
Illustrisimo, Jayvee	0570	Javier, Richard S.	0424		0088
P.		Jemena, Fedelyn M.	0424	Justo, Valeriana P.	0248
Imbat, Resureccion	0048	Jerick Viz,	0436		0107
Bernadette C.	0446	Jimenez, John Carlo	0597	Juvinal, Joel	0400
Imperio, Kevin	0487		0019	Kalaw, Justine M.	0413
Brendt		Jimenez, Juanito P.	0317	Kalaw, Sofronio P.	0268
Inabangan-Asilo,	0094	Jr.	0318		0331
Mary Annie		John Sylvester B.		Kanda, Reiko	0558
Indong, Rocel Amor	0012	Nas,	0234		
Ines, Ryan John S.	0062		0096	Kang, Kwon-Kyoo	0086
Ismail, Abdelbagi	0073	Jomao-as, Joshua G.	0153	Kayonga, Sam	
M.			0181	Precieux	0487
	0412			Kiatyanyong,	
Israel, Kyle Pierre	0337	Jomuad, Ma.	0409	Thanattha	0271
R.	0410	Darielle Lou		Kim, Jillen P.	0234
	0347	Jones, Huw	0432	Kinoti, Moses	
Itong, Tyrill Adolf	0155	Jos, Isagani B.	0453	Murithi	0487
B.		Jose, Editha C.	0567	Kiswa, Cynthia	0021
Iwaoka, Kazuki	0331		0393	Ko, Marie Selene	0542
	0558	Jose, Ellaine C.	0254	Koh, Rhosener Bhea	0161
Jacinto, Anna	0525		0363	Kokoska, Ladislav	0145
Muriel T.	0528				

Kretchzmar, Tobias	0432	Langngag, Rex S.	0098	Ledesma, Jamella	0009
Kung, Edward	0442	Lantican, Darlon V.	0434	Michaela Ezra S.	
Labargan, El Shaira A.	0555		0435	Ledesma, Rene	0034
Laborde, Gladys	0398	Lao, Angelyn R.	0567	Geraldo Guerrero	
Mae	0548	Lao, Stephanie M.	0480	Lee, Allen Marbert S.	0280
Labrador, Alexis M.	0503	Lapoot, Carmelito	0021	Lee, Han Ung	0443
Lacaden, Elaine B.	0598	Lapuz, Bianca	0482	Lee, Hayan,	0443
Lacaden, Loreto	0035	Louise		Legaspi, Noralyn B.	0032
Max P.		Lapuz, Rebecca B.	0215	Legaspi, Ruth Shane E.	0129
Lacap, Angelyn T.	0099	Lapuz, Resean R.	0268		
Lacap, Karen L.	0184	Lara, Aubrey B.	0590	Lelis, Myrah Joan H.	0495
Lacayanga, Jonathan E.	0441	Larracas, Joan Michelle U.	0546		
	0103		0020	Leoveraz, Ma. Elizabeth	0134
Lachica, John Albert	0152	Larubis, Esmael	0408	Leus, Jella Marie	0603
	0189		0409	Leyva, Francine Nicole	0399
Laco, Nico	0322	Lasam, Ann Nicole	0006	Li, Kuo-Yuan	0251
Ladeza, Angela Mariz	0539	Latina, Romnick A.	0434	Liabres, Victorino T.	0546
Ladia, Villamor	0013	Latonio, Anna Ma. Lourdes S.	0067		
Lador, John Erick O.	0345	Latorre, Angelica Anne E.	0130	Licuanan, Wilfredo Y.	0198
	0168			Ligisan, Aileen R.	0089
Lador, Richie P.	0345	Laude, Antonio F. Jr.	0483		0225
Lagamayo, Mark	0510		0013	Lillo, Edgardo P.	0414
Lagana, Arielle Marie	0406	Laude, Tonette	0051		0140
			0066	Lim, Brian M.	0344
Lagman, Rachel Ann Z.	0518		0009	Lim, Ciara	0185
	0546	Laude, Tonette P.	0433	Christianne Y.	
Lago, Ralph	0586			Limbasan, Grace M.	0169
Laguerta, Kathleen Kaye P.	0584	Laurel, Niño R.	0072	Lin, Che-Wei	0151
			0026	Lina, Eusebio R. Jr	0455
Lainez, Carmina Alicia N.	0305	Laurena, Antonio C.	0049	Lingdas, Charmaine A.	0424
			0206		
Lalas, James Kason P.	0228		0255	Lino, Marlina L.	0610
	0041	Laurente, Maribeth R.	0525		0543
	0049		0528	Lipardo, Donald S.	0518
Lalusin, Antonio G.	0149	Laurio, Christian D.	0332		0546
	0255		0020	Lituañas, Chris Rey M.	0240
Lam, Hilton Y.	0425	Layna, Joed	0408		0144
			0409	Li-Yu, Julie	0481
Landicho, Venz	0407	Lazaro-Llanos, N.	0256		0499
Timothy Wesley C.		Leasi, Francesca	0233		

Lizada, Joy C.	0343	Lumakin, Charles	0550	Magbanua, Louise	0467
Llagas, Johnson	0548	Luke U.		Jan J.	
Llamas-Clark,		Lumanog, Johannah	0005	Magbitang, Nikita	0594
Erlidia	0506	Mariz J.		San	
Llames, Jo-Hannah			0367		0047
S.	0179	Lumasag, Gil J.	0380		0088
Lofranco, Vivian S.	0480	Lumista, Hannah	0354	Magdalita, Pablito	0207
Lomboy, Lawrence			0003	M.	0248
Alfred Q.	0492		0232		0258
Lomboy, Marian Fe		Luna, Amelita C.	0263	Magday, Ehlich	
Theresa C.	0477		0346	Ray J.	0171
Longalong, Wargin			0411	Maghirang, Rodel	0076
P.	0305	Luna, Keith	0135	G.	0270
Lopez, Eudinel		Luna, Zaldy O.	0124	Magistrado, Mylene	
Joshua	0543	Lupisan, Socorro	0512	L.	0587
	0386		0063	Magnaye, Ann	
	0388		0083	Mylalulex A.	0002
Lopez, Grace DV.		Lutap, Leticia A.	0121	Magsino, Al Jerome	0294
	0394		0123	Magsino, Analita	
	0377		0460	dM.	0119
Lopez, Lani Lou			0243	Magsino, Elmer R.	0322
Mar A.	0070	Macabeo, Allan	0535	Magsombol, Frances	
Lopez, Mark Louie		Patrick G.	0536	Anne D.	0310
D.	0220		0537	Maja, Michelle I.	0570
Lopez, Mary Jane	0476		0588	Majam, Jude	0350
Lopez, Rolando A.	0540	Macachor, Corazon		Malab, Geovannie	
Lorenzo, Jaira T.	0238	P.		Stanley S.	0269
Lorenzo, Patrick		Macadangdang,	0513	Malabanan-Bauan,	
Henry	0521	Santi		Katrina B.	0002
Lorido, Marry		Macandog, Damasa	0219	Malabonga, Teejay	0398
Lorraine F.	0146	M.			0347
Lorilla, Aaron P.	0550	Macasaet, John Paul	0433	Malabrigo, Pastor Jr.	0412
Lu, Sophia		A.			0257
Francesca DP.	0428	Maceda, Cyrus	0399	Malabuyoc, Julianne	
	0015	Junior		Marie A.	0250
Luar, Lovely	0117	Macyon, Danny T.	0001	Malaki, Archiebald	0414
Lubaton, Christine		Jr,		B.	0225
Diana S.	0099	Madalipay, Jasper	0352	Malaza, Gelinemae	0485
Lubenia, Patrick		Magarin, Ricmar P.	0615	G.	0531
Vincent N.	0534	Magatalas, Maybelle	0402		0003
Lucas, Marilou P.	0612	Magbanua, Faith	0375		0257
Luchavez, Jennifer	0512	Loraine	0379	Maldia, Lerma SJ.	0232
Luczon, Adrian U.	0173	Magbanua, Francis	0165		0263
Lugares, Elnora S.	0599				

	0346	Mancera, Clarisse	0321	Marges, Rosemarie L.	0553
	0411	Mandac, Maristel G.	0583		
Malida, Pretty Lou S.	0550	Mandario, Angelica Marie	0539	Mari, Cesar O.	0572
Malinao, Jasmine A.	0300				0007
Malipol, Maria Lourdes C.	0603	Mandigma, Mark John P.	0536		0008
Malipot, Jessa Joy C.	0407		0537	Marin, Mellprie B.	0011
Mallari, Rachelle P.	0223	Mane, Ashish	0527		0037
Mallari, Romina Grizelda O.	0484	Manegdega, Ferdinand G.	0315		0105
Mallari, Thea	0513	Mangaya, Demy Q.	0142		0260
Mallete, Hazel Janne	0603	Mangelen, Sheila Farisha K.	0462	Marin, Rico A.	0104
Malto, Zabrina Bernice L.	0202	Mangonon, Verinna Charisse B.	0175		0260
Mamauag, Angelica T.	0092	Mangulaban, Jezzah R.	0140	Marjes, Mariel	0387
Mamuad, Felomino V.	0102		0344	Maron, Lyza	0187
Mamuad, Roselle Y.	0312	Maningas, Mary Beth B.	0250	Marquez, Menandro C.	0282
Manalo, Johndell Eugry	0597	Manipol, Marjorie M.	0263		0274
	0515	Manlapaz, Donald	0539	Martin, Janine L.	0230
Manalo, Jorel A.	0517	Manohar, Anand Noel C.	0095	Martinez, Jaymie Lauren	0525
Manalo, Ronniel	0334	Manting, Muhmin Michael E.	0218	Martinez, Norberto V.	0528
	0071	Manuel, Alice C.	0599	Martinez, Romualdo C.	0491
Mananghaya, Teodora E.	0223	Manuel, Floper Gershwin	0614	Mary Ann J. Ladia,	0570
	0268	Manzanillo, Vincent Luke J.	0466	Masanga, Anna Regina L.	0495
Manangkil, Jennifer M.	0223	Manzano, Jr., Virgilio Julius P.	0038	Masanga, Anna Regina L.	0155
	0268			Masangcay, Shirlamaine Irina G.	0154
Manangkil, Oliver E.	0065	Manzon-Reyes, Lou Ver Leigh A.	0490	Mascardo, Elizabeth D.	0252
	0085				0562
	0403	Mapile, Maria Reynalen	0210	Mata, May Anne E.	0133
Manaois, Rosaly V.	0287	Marasigan, Mariella Jasmin P.	0600	Mateo, Nel Oliver B.	0015
	0405				0117
Manapsal, Mark Anthony	0170	Maravilla, Ana Mikaela B.	0055	Mathias, Mark Lester M.	0535
Manaquil, Jelyn M.	0065		0115	Matinong, Kathleen Erica D.	0128
Manasan, Criston Van	0500	Marcelo, Maria Gabrielle	0399	Maximo, Angela Mae	0399
				Maylem, Minerva	0107
Mancao, Ma. Carmela T.	0568	Marcos, Juanita M.	0486	Mayor, Anna Beatriz R.	0243
			0556		



McCouch, Susan	0187	Menguito, Charito M.	0559	Molina, Gernelyn Shaira C.	0519
Medallon, Kim Gerald	0542	Mercado, Danica Marie	0109	Molina, Victorio B.	0477
Medellada, Charles Roy	0020	Mercado, Vivienne Francesca	0544	Monaya, Karmelie Jane M.	0401
Medina, Daei P.	0581		0462	Monde, Patience	0487
Medina, Michael Arie P.	0104		0485	Mondejar, Cielo Luz C.	0106
Medina-Guce, Czarina	0607	Mercado-Asis, Leilani B.	0494	Mondoñedo, Melinda	0010
Membrebe, Bernard Niño Q.	0188		0527	Mondoy, Melisa	0512
Mendez, Raine A.	0144		0538	Mondragon, Josefino S.	0166
Mendioro, Merlyn S.	0207	Mergal, Vicky C.	0487	Monson, Brian Miguel F.	0169
Mendoza,	0153		0271		
Bernadette C.	0222	Merilles, Ma. Lourdes	0350	Montalban, Bryan	0203
Mendoza, Camille	0291	Mesina, Flordeluna Z.	0504	Montalbo, Reynaldo Carlos	0296
Mendoza,	0331		0533		
Christopher O.	0558	Migalang, Gilden Maecah M.	0171	Montecalvo, Melissa	0025
	0515		0058	Montecillo, Ma. Ericha V.	0353
Mendoza, Eden C.	0517	Millas, Renneth A.	0090		0337
Mendoza, Eduardo R.	0534			Montecillo, Roselynn Grace G.	0171
	0567	Mina, Renz Jimwel S.	0456	Montessa, Michael Thomas T.	0525
	0538	Mira, Nona Rachel C.	0554		0528
Mendoza, Erick S.	0462				0116
	0527	Miranda, Jessa	0109		
	0061	Miro, Dharel	0211	Montojo, Ulysses M.	0355
Mendoza, Jay-Vee S.	0033	Mistades, Voltaire Mallari	0304		0368
					0384
Mendoza, John Paul A.	0325	Mitchao, Marjorie P.	0615	Monzaes, Janine M.	0230
Mendoza, Jose Javier	0539	Moises, Minerva T.	0166		0403
		Mojica, Elmer-Rico E.	0273	Morales, Amelia V.	0405
Mendoza,	0430				0555
Kristofferson G.		Mojica, Jennifer	0134	Morales, Carlos	0010
Mendoza, Ma. Laura Isabel D.	0492	Mojica, Loida E.	0553		0301
		Molano, Alberto Ma. V.	0498	Morales, Marie Paz E.	0306
Mendoza, Ma. Victoria E.	0525				0568
	0528	Moleño, Eugene P.	0420	Morato-Espino, Paulin Grace	0542
Mendoza, Mary Joy	0025	Molina, Agustin	0158	Morel, Patrick C.H.	0618
Mendoza, Norman DS.	0559	Molina, Daryne Claire F.	0228	Morong, Lea Joy M.	0192
			0367	Mosteiro, Audel V.	0215
Mendoza, Renier G.	0445	Molina, Dionel L.	0380		

Motol, Rich Kevin C.	0338	Natividad, Gaudencio M.	0297	Nuñez, Gina C.	0608
Moya, Tolentino B.	0365	Natividad, Lexter R.	0297	Nunez, John Paolo	0066
Mozo, Michael Jason L.	0441 0103	Natividad, Robert A.	0317 0318	Oasan, Ruchel	0398 0548
Muaña, Eva P.	0211	Natividad, Thad Nuel	0539	Obara, Mitsuhiro	0223
Mulig, Justine Christian H.	0191	Navales, Edgardo Antonio R.	0519	Obel, Darwin	0524 0015
Muñoz, Jephthe Olimpo	0609	Navarra, Sandra V.	0507	Oberthur, Thomas	0117
Munji, Jeremy James C.	0521	Navarrete, Ian	0482	Obinguar, Sarah-Lou N.	0216
Muñoz, Maria Nilda M.	0503	Navarro, Mark Anthony J.	0420	Obinque, Adoracion	0116 0368
Muñoz, Nilda M.	0473	Navarro, Rafael	0512 0420	Obispo, Cynthia P.	0092
Musni, Merwen Mitchel Q.	0546	Navarro, Victor R.	0367 0380	Obleopas, Romula A.	0212
Mutia, Florabel P.	0584 0598 0350	Ndaa, Andy William	0487	Obra, Glenda B.	0178 0224
Mutia, Maria Theresa M.	0370 0395 0587	Nebres, Vivian	0116	Obusan, Marie Christine	0210
Muyot, Frederick B.	0370 0350	Ng, Alex Carl L.	0285	Ocampo, Apolonio M.	0015 0117 0100
Muyot, Myla C.	0395 0587	Ngelangel, Corazon	0501		0152
Nacido, Ma. Christi B.	0166	Ngo, Joenavin D.	0499	Ocampo, Eureka Teresa M.	0189 0013
Nacis, Jacus S.	0486	Nicmic, Jean C.	0410		0027
Nacorda, June Owen	0289	Nietes, Aurfeli D.	0240 0042	Ocampo, Melody Anne B.	0236 0140 0344
Nagaosa, Lena Q.	0045	Niones, Jonathan M.	0043 0223 0268		0356
Nagpala, Michael Joseph M.	0160	Nique, Jem Erika A.	0477	Ocampo, Romeo B.	0573 0605
Nalundasan, Marylis A.	0032	NMBanjo, Edwige	0432	Ocampo, Virginia R.	0195
Nañola, Cleto L. Jr.	0133	Nochete, Charmane	0350 0454		0375
Naredo, Maria Elizabeth B.	0435	Nocon, Ederlina G.	0455	Oclos, Ma. Theresa T.	0379 0383
Narida, Camille	0116 0368	Nogoy, Franz Marielle	0086	Oclos, Melvin	0379
Natividad, Alessandra D.	0146	Nonato, Maribel G.	0461	Odulio, Eiana Joshier A.	0227
		Notarte, Kin Israel R.	0243	Oh, Young-Sook	0214
		Nudalo, Jiezel L.	0211	Okuda, Noboru	0165
		Nuevo, Ritchie U.	0225 0414		
		Nuezca, Arman P.	0171		

Oliveros, Maria Cynthia R.	0222	Pagala, Czarmayne B.	0466	Paril, Jefferson	0013
Olmoges, Recelle A.	0007	Pagarigan, Stephanie Claire	0496	Pariñas, Jelly	0114
Omaña, Trisha Mae G.	0227	Pagudpud, Melidiosa V.	0449	Pariñas, Julieta F.	0085
Ona, John Patrick F.	0502	Pagudpud, Peter Paul P.	0449	Parrish, John J.	0102
Ondoy, Juareyn L.	0207	Paguidopon, Cyril L.	0128	Pasamonte, Donaryn V.	0533
Ong, Clement	0442	Paguio, Jenniffer T.	0307	Pascua, Abegail	0053
Ong, Darvy P.	0328	Pagutayao, Kenneth S.	0008	Pascua, Miriam E.	0121
Ong, Perry S.	0173	Pajinag, Grace Ann I.	0617	Pascual, Cecilia B.	0112
Ong, Prane Mariel B.	0562	Pak, Liia B.	0487	Pasion, Rotsen R.	0329
Opiso, Einstine	0193	Palad, Lorna Jean H.	0558	Pastor, Claire D.	0307
Opulencia, Rina B.	0160	Palisoc, Caesar P.	0306	Pastor, Danica Hanna A.	0610
Oquina, Julius R.	0200	Paliza, Arnelfa C.	0493	Pastor, Floramante C.	0068
Oquinena, Maria Teresa I.	0544	Palongpalong, Alfer	0408		0617
Orcino, Jose A.	0085	Pampolino, Mirasol	0015	Patalen, Chona F.	0551
Orcullo, Oliver James	0399		0117	Patricio, Jonathan A.	0280
Ordanel, Ivy D.	0300	Panelo, Isabella R.	0150		0282
Ordas, Jorge Anton D.	0209	Pangan, Hyacinth	0406	Patricio, Jonathan N.	0274
Ordonio, Reynante	0177	Pangga, Gina V.	0097		0284
Orolfo, Diana	0515		0125	Payawan, Jr., Leon M.	0276
Dalisay A.	0517	Pangilinan-Behino, Cecil Margarette E.	0429		0309
Ortinero, Cesar V.	0297	Pante, Christopher V.	0406	Pecundo, Melissa H.	0243
Osi, Marina	0275	Paolo Victor N. Medina,	0590	Pedrasa, Jhoanna Rhodette	0328
Osoteo, Gloria M.	0085		0165	Pedroso, Fiona	0375
Pableo, Lei-yonnah S.	0037	Papa, Rey Donne S.	0220	Pelovello, Marvin V.	0212
	0053	Paquit, Joseph C.	0104	Peng, Ching-I	0151
Pacada, Imeldalyn G.	0436	Paraguison-Alili, Rubigilda	0069	Pequero, Rudeno B.	0171
	0052	Paraiso, West Kristian	0299	Peralta, Arnold B.	0307
	0122	Paraoan, Cielo Emar M.	0139		0116
Padilla, Carmencita D.	0495	Parcon, Raymond	0077	Peralta, Deserie	0368
Padilla, Celynne O.	0069			Peralta, Elfritzson	0165
Padilla, Phillip Ian P.	0128			Peralta, Mary Jane A.	0035
Padolina, Thelma F.	0085			Peralta, Matt Daniel	0102
Pagaduan, Marc	0543			Perdigones, Begie	0352
				Pereda, Jacqueline Marjorie R.	0175
				Perelonia, Karl Bryan S.	0355
					0384

Perez, Loida M.	0071	Punzalan, Ma.	0163	Rafael, Rosalie R.	0297
Perez, Marco A.	0382	Regina	0245	Ragasa, Consolacion Y.	0137 0138
Perez, Maria Teresa M.	0206	Puppalar, Gaurav	0527	Ragasa, Lorenz Rhuel P.	0244
Perlas, Leah A.	0549	Purchas, Roger W.	0618	Raloso, Jessa D.	0525
	0556	Purificacion, Marynold V.	0433	Ramirez, Jeff Dalton P.	0615
Perpetua, Aida D.	0420	Que, Gerard Clinton L.	0155	Ramirez, Marcellus Francis L.	0502
Pescadero, Iris R.	0265	Que, Yoko Jane L.	0519	Ramos, Chester C.	0477 0140
Pestaño, Hannah Grace	0107	Querubin, Genevieve Anne R.	0509	Ramos, Glicerica B.	0344 0063
Pestaño, Lola Domnina B.	0333	Quiao, Maria Alma	0145		
Pham, Laura J.	0222	Quibod, Ma. Niña Regina M.	0221	Ramos, Jonathan R.	0121 0123
Pico, Marietoni B.	0547	Quilala, Rayesha Azzedine Ma.	0496	Ramos, Ma. Louise Margaret A.	0323
Pilar-Arceo, Carlene P.C.	0567	Quilang, Janet B.	0030	Ramos, Marie Angeli	0249 0206
Pili, Arman N.	0358	Quilantang, Jaime R.	0017	Ramos, Rowena E.	0215
Pinca, Alexandrinne M.	0018	Quilinguen, Vanessa Ferl A.	0333	Rañeses, Mary Ann M.	0432 0050
Pineda, Dwight Krystienne	0399	Quilloy, Erwin P.	0115	Rañola, Rey Alfred G.	0216
Pineda, Ernest Guiller S.	0281	Quimado, Marilyn O.	0257 0263	Rao, Govind	0340
Pineda, Karen Leslie	0496	Quimbo, Ricardo Victorio	0545	Rapanut, Julius Matt	0512
Pineda, Rence Marrion M.	0146	Quimpang, Victoria	0193	Rapisura-Flores, Josephine A.	0618
Pinote, Maristil I.	0238	Quimque, Mark Tristan L.	0535 0536	Rasco, Jhun Laurence S.	0049 0255
Pobre, Romeric F.	0562	Quinaya, Pher Errol B.	0319	Rastrullo, Rasty M.	0364
Pol, Rose Tifanny A.	0175	Quinones, Hubert G.	0588	Rasul, Janel Zahra P.	0250
Policarpio, Anna Francheska G.	0492	Quiñones, Mariefe B.	0367 0380	Rasul-Bernardo, Amina	0593
Pondoc, Dionesio C.	0329	Quizon, Romeo R.	0477	Raymundo, Asuncion K.	0249
Poniente, Jennifer A.	0174	Racadio, Charles Darwin T.	0559	Rayos, Charmaine Eljie R.	0297
Prevendido, Hazel D.	0360	Racelis, Ma. Elenita L.	0182	Rayos, Joseph Christopher C.	0396
Pueblos, Kirstin Rhys S.	0535	Racelis, Renz Mark M.	0467		
Puerto, Jailyn N.	0608	Rafael, Lory B.	0612		
Pulan, Dennis E.	0257	Rafael, Ronalie B.	0297		
Puno, George R.	0351				

Razal, Ramon	0334	Riña, John Jaymar	0308	Roldan, Marri	0156
	0004	Rivarez, Mark Paul	0248	Jmelou	
Reaño, Consorcia E.	0095	S.		Roleda, L.S.	0563
	0149	Rivera, Adovich S.	0425	Rollon, Analiza P.	0365
Rebamba, Pamela	0357		0386	Romana, Nadia	0526
Joy N.		Rivera, Eleanor L.	0388	Beatrice S.	
Recio, Kristine Rey	0445			Romero, Ellen S.	0069
O.		Rivera, Emmanuel	0377	Romero, Kyle	0407
		T.		Maxinne R.	
Recuenco, Mariam	0292		0163	Romero, Marissa	0071
C.		Rivera, Ramon L.	0245		
Recuenco, Monalisa	0010		0095	Romero, Rose	0190
Reed, Mark H.	0325		0163	Glendelyn T.	
Regino, Jocel M.	0544	Rivera, Susan M.	0245	Rondilla, Roberth	0461
Relles, John Moises	0026		0095	Riggs L.	
G.			0233	Roño, John Gregor	0173
Relos, Dara Chelsie	0357	Roa, Elnor C.	0372	A.	
Jade R.			0367	Rosal, Aurea Z.	0450
Remolacio, Mario I.	0120	Roa, Lyndon L.	0380	Rosales, Joseph	0526
Renovalles, Eunice	0115			Mariuz B.	
M.		Roa, Rey L.	0372	Rosales, Mary	0474
Rentutar, Juleen A.	0234	Roasa, Francis V.	0491	Camille E.	0526
	0178	Roberto, Louise	0322		0414
Resilva, Sotero S.	0224	Angelo		Rosales, Raamah C.	0225
		Robillos, Christian	0111		0458
Revale, Ida Francia	0162	D.			0474
Reyes, Bianca	0321	Robles, Danica Jane	0526	Rosales, Raymond	0497
Patrica		S. J.		L.	0522
Reyes, Jans Nexus I.	0410	Rodriguez, A.L.	0564		0526
Reyes, Jerica Isabel	0473	Rodriguez, Jae	0186		0529
L.		Joseph Russell B.		Rosales, Raymund	0054
	0100	Rodriguez, Maria	0076	Julius G.	0269
Reyes, Jose Arnel O.	0027	Cielo Paula B.	0270		
		Rodriguez, Marietta	0549	Rosario, Jeremiah T.	0333
Reyes, Josephine	0464			Rosario, Joselito	0213
Joy		Rodriguez, Mary	0196	Rosario, Rachel	0501
Reyes, Julius Ceazar	0530	Grace dP.		Rosas, Andre T.	0271
H.		Rodriguez, Myrna S.	0298	Rosialda, Patricia	0221
Reyes, Ma.	0321	Rodriguez, Raffy B.	0555	Bea R.	
Christine			0091	Roxas, Celine	0512
Reyes-Otadoy, Leny	0465	Rodriguez, Ramil S.	0448	Bernice	
Ricarte, Juan	0506			Roxas, Chelsea	0234
Antonio		Rodriguez, Ron	0526	Kaye F.	
Rigor, Melchor R.	0372	Christian Neil T.		Roxas, Proserpina	0420
	0043	Roggo, Silvio	0541	G.	
Rillon, Juliet P.	0085	Rola, Agnes C.	0343		

Ruazol, Aeron A.	0015 0117	Salcedo, Stefani Joyce F.	0253	Sanchez, Helen Juvy A.	0437 0159
Rubia, Marnelli C.	0382	Salde, Kathyleen	0201	Sanchez, Henrison	0352
Rubio, Peter Yuosef M.	0561	Salera, Leila	0514	Sanchez, Libertine Rose S.	0205
Rubite, Rosario Rivera	0151	Salolog, Mary Cor S.	0193 0246	Sanchez, Ma. Alma	0013
Rufino, Leslie Ann A.	0138	Saloma, Cynthia	0163 0245	Sanchez, Rowena Grace R.	0188
Ruflo, Honie S.	0110	Saloma, Czarina	0444	Sandoval, Judaeo B.	0022
Rustia, Jessica	0089 0107 0114	Saludares, Alaica Q.	0234	Sangel, Percival P.	0018
Rutherford-Markwick, Kay	0618	Saludares, Guia G.	0036	Sanguillosa, Jerry B.	0255
Saballa, Almindor V.	0448	Saludares, Rica Amor	0051	Santarita, Joefe Buga ay	0566
Sabanal, Alvin Quiel	0076 0270	Salvacion, Maria Lourdes Dorothy S.	0307 0437	Santiago, Anna Theresa A.	0359
Sabban, Emilia Andrea V.	0179	Salvacion, Salvo	0097	Santiago, Christian Jeremy Q.	0619
Sabilla, Roseller G.	0420	Salvador, Jazelyn M.	0186	Santiago, Elyss	0403
Sabino, Noel G.	0153 0206	Salvador, Joanna Luisa Z.	0504	Santiago, Gilely DC.	0085 0042
Sace, Chito	0080	Salvador-Membreve, Daile Meek C.	0162	Santiago, Jaec C.	0043 0050
Sacmar, Lindel A.	0228	Samaniego, Arlene A.	0424	Santiago, Jasmin II	0436 0065
Sacupaso, Cristopher	0083	Samaniego, Jessie O.	0364	Santiago, Jianessa	0400
Sadisa, Alexander	0512	Samia, Frances Rowena M.	0142	Santiago, Karen	0278
Sagsagat, Franklin C.	0108	Samia, Geanne Samantha	0012	Santiago, Karen Joyce B.	0320
Sagsagat, Karizma Joy	0135	Samsam, Charito L.	0213 0415	Santiago, Maria Carmela S.	0488
Sagsagat, Maria Stephanie Jean D.	0407	Samson, Jeantte J.	0372	Santiago, Nerissa D.	0043
Saguin, Kidjie Ian	0578	San Agustin, Norman Val	0545	Santiago, Rene C.	0190
Salamangkit-Mirasol, Emie	0329 0341	San Diego, Chiedel Joan	0408	Santiago, Sharmaine	0543
Salarda, Marissa Y.	0372	San Pascual, Alangelico O.	0258	Santilles, Maricris	0597
Salazar, Artemio	0013	San Valentin, Genaro O.	0106	Santos, Irmalyn V.	0200
Salazar, Gerardo B.	0526	Sana, Erlyn A.	0307 0424	Santos, Joy Ann P.	0212
Salcedo, Alan Rodelle M.	0285			Santos, Julia L.	0227
				Santos, Marissa Krizelda	0470
				Santos, Maura Mercedes	0152

	0174		0252	Simora, Rhoda Mae C.	0401
	0175		0288		
	0369		0345	Siongco, Paula Ruth L.	0474
	0373		0349		
	0377		0361	Sison, Maria Luz J.	0118
Santos,	0378	Serrano, Edralina P.	0047	Sister, Lorna E.	0111
Mudjekeewis D.	0385	Servañez, Niccol	0496	Sombrero, Lydia	0512
	0386		0016		0310
	0388	Sevilla, Fortunato B.	0413	Soriano, Allan N.	0314
	0389	III	0340		0327
	0394		0285	Soriano, Merlyn S.	0410
	0397	Sevilla, Tiphannie P.	0509	Sta. Cruz, Kristian T.	0142
	0021	Sevilleja, Jesus		Stacey, Martin	0185
	0015	Emmanuel AD	0422	Stern, David	0233
Santos, Primitivo	0055	Shah, Agam	0527	Stuart, Jenifer	0598
Jose A.	0115	Shaleh, Sitti	0447	Suarez, Consuelo	0463
	0117	Raehanah Muhamad			0560
	0369	Shapawi, Rossita	0447	Sucgang, Raymond J.	0586
Santos, Sherwin	0373	Shiah, Fuh-Kwo	0251		0559
	0397	Shinotsuka, Riona Shelly C.	0139	Sularte, Rainer P.	0201
Saracanlao,				Sulatorio, Kristoffer M.	0078
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Transactions of the National Academy of Science and Technology