Transactions
of the National Academy of Science and Technology

ABSTRACTS of PAPERS

Presented during the 34th Annual Scientific Meeting

Philippine Water 2050

11-12 July 2012

Published by the National Academy of Science and Technology Philippines

ISSN 0115-8848

Trans. Nat. Acad. Sci. Tech. Philippines
Vol. 34, Issue No. 1 (2012)

Published by the National Academy of Science and Technology, Philippines
3rd Level, Science Heritage Building
DOST Compound, Bicutan
Taguig City, Metro Manila 1631 Philippines
Website: http://www.nast.ph
E-mail: secretariat@nast.ph
Tel. No. +63.2.8372071 loc 2170-73
Telefax No. +63.2.8373170

Issue Editor: Academician Asuncion K. Raymundo
NAST Staff-in-Charge: Dexter L.A. Bautista

SCIENTIFIC POSTERS COMMITTEE

Chair
Academician Asuncion K. Raymundo

Members
National Scientist Benito S. Vergara
National Scientist Ernesto O. Domingo
Academician Evelyn Mae Tecson-Mendoza
Academician Reynaldo B. Vea
Academician Arsenio M. Balisacan
Dr. Merlyn S. Mendioro, OYS 1995
Dr. Arnel N. Del Barrio, OYS 2000
Dr. Czarina A. Saloma-Akpedonu, OYS 2007
Dr. Irene M. Villaseñor, OYS 1992
Dr. Raymond R. Tan, OYS 2004
Dr. Eva Maria C. Cutiongco-Dela Paz, OYS 2002

TABLE OF CONTENTS

AGRICULTURAL SCIENCES

SOCIAL SCIENCES

AGRICULTURAL SCIENCES

AS-01

ESTIMATION OF GENETIC VARIABILITY IN TWO MAIZE (*Zea mays* L.) POPULATIONS FOR DROUGHT TOLERANCE

Maria Alma B. Bautista, Artemio M. Salazar,
Jose E. Hernandez and Pompe C. Sta Cruz
Crop Science Cluster, College of Agriculture
University of the Philippines Los Baños
mariaalmabautista@yahoo.com

The experiment was conducted to estimate genetic variation in IPB Var 6 and IPB Var 13 using full-sib and S1 families and asses the performance of these two populations to drought stress imposed at flowering stage. Reduction in performance for morphological traits, yield related traits and grain yield itself was an evidence of the effect of water limiting condition to maize plants. However, it causes lengthening effect on days to anthesis and silking, leading to prolonged anthesis-silking interval. IPB Var 6 exhibited more tolerance to drought stress than IPB Var 13. Variance components quantified revealed sufficient variability for almost all traits which is useful in genetic enhancement of both populations. Heritability for yield was lower under drought compared to normal as genetic variance decreased more rapidly than environment variance with the onset of stress. The low rank correlation of the full-sib families for yield between normal and drought conditions suggests the need for separate evaluation under the two contrasting conditions to identify stable genotypes. But using S1 families, the rank correlation was high *i.e.* those good under normal are also good under drought. This suggests the efficiency of S1 testing when breeding for this particular stress.

Keywords: correlation, drought stress, genetic variability, heritability, maize

AS-02

UPLAND RICE LANDRACES AND TRADITIONAL VARIETIES OF BUKIDNON: *HOW DIVERSE? HOW VALUABLE?*

Rosemarie V. Cortes and Joy M. Jamago
Department of Agronomy and Plant Breeding, College of Agriculture
Central Mindanao University, Bukidnon; jjamago@gmail.com

Enhancing upland rice production is one of the small solutions to help achieve rice sufficiency in the country. Or, even if to just alleviate poverty in the upland agro-ecosystems. Improved genotypes contribute to this goal at a relatively low cost to farmers. This study determined the availability of upland rice landraces and traditional varieties (URLTVs) in selected areas in Bukidnon, estimated the diversity of available genotypes, and documented their use and importance. Twenty-four barangays from 10 municipalities and 2 cities were surveyed from November 2010 to May 2011. Interviews (n=45), seed sourcing, and evaluation of 13 seed traits were done. A total of 140 URLTVs were collected, of which 66 were from Barangay Matupe, San Fernando. Overall, 82 URLTVs (59%) were sourced from San Fernando, whose peoples were mostly of the Matigsalug tribe. As per ANOVA, lemma and palea color (LPC), caryopsis: pericarp color, and lemma: apiculus color (LAC) were variable among municipalities/cities. However, as per SWDI, 100 seed weight, grain length and width, grain thickness, caryopsis length and width, and LAC showed high diversity (H'=0.76 to 0.88). Thirteen significant associations among seed traits with r>0.50 were noted. The URLTVs were grown for household consumption, church offering, food for special occasions, and to reduce chemical inputs. For the Matigsalugs, their URLTVS serve to strengthen their cultural beliefs and are trademarks for their tribal group. Further collection from other areas of Bukidnon needs to be done to ascertain the available germplasm and the threats to these plant genetic resources.

Keywords: upland rice, *Oryza sativa*, landraces, traditional varieties, Bukidnon, plant genetic resources, food security, genetic diversity

AS-03

SOYBEAN BREEDING AT CENTRAL MINDANAO UNIVERSITY FOR HIGH SEED PROTEIN AND SEED YIELD

Joy M. Jamago, Rush A. Tinhay, Mitchel G. Villanueva, Hope T. Ramirez, and Grace Glend R. Gabisay
Department of Agronomy and Plant Breeding, College of Agriculture
Central Mindanao University, Bukidnon; jjamago@gmail.com

Soybean is largely consumed in the country in various ways but mainly as animal feed but local production is very inadequate. Importation of soybean meal, oil and other products has increased through the years. Currently, there are few outstanding soybean varieties developed in the Philippines and breeding efforts have declined. Availability of high-yielding (HY) and high-protein (HP) cultivars could encourage local production, since on average Philippine varieties have about 33% protein. Soybean breeding at CMU commenced in 2008. Seed yield and protein concentration are generally negatively correlated but Jamago and Nelson's (2007) protocol had been promising in hurdling this breeding bottleneck, and was employed for this study. Using locally available germplasm, 22 F_2 populations were developed in 2009. In 2010, selections were made at the F_2 based on stand, maturity, pods per plant, and overall morphology. A total of 370 F2 selections were evaluated for yield in 2011 as $F_{2:3}$ families with PSB Sy2 as check. Days to flowering, maturity, plant height, lodging score at maturity, 100 seed weight, seed yield, and crude protein concentration (CPC), among others were measured. Mean CPC of $F_{2:3}$ lines ranged from 34.66% to 47.34% (F_3 NSIC Sy8 x PSB Sy2). PSB Sy2 had 40.77% CPC. All lines with CPC either higher or comparable to PSB Sy2 will be advanced as HP populations from whence lines variable for yield may be selected. Desirable HP and HY lines are hoped to be identified in the F_5 or F_6 generation.

Keywords: soybean, *Glycine max*, soybean breeding, seed protein concentration, seed yield, Central Mindanao University, CMU

AS-04

INDUCED CHLOROPHYLL VARIATION IN PINEAPPLE CV. 'QUEEN' BY GAMMA IRRADIATION (^{60}COBALT)

Lolita DC. Valencia
Crop Science Cluster, Institute of Plant Breeding, College of Agriculture, University of the Philippines Los Baños; lolit_valencia@yahoo.com

Irradiation using gamma rays (^{60}Cobalt) coupled with *in vitro* culture techniques was undertaken to induce variation or mutation in pineapple. Calli from crown meristem tips of pineapple cv. 'Queen' [*Ananas comosus* (L.) Merr.] were initiated using Murashiege and Skoog's basal medium supplemented with 10mg/liter 4-amino-3,5,6-trichloro-2-pyridinecarboxylic acid (Picloram). High percentage of growth and shoot proliferation was observed in basal medium supplemented with 50 µM benzene adenine purine (BAP) and 10 µM gibberrelic acid (GA) after 8 weeks *in vitro*. Regenerants derived from shoots using different doses of gamma rays (0, 5, 10, 15, 20, 25 and 30 Gy) were evaluated under laboratory conditions. Of the different doses, 15 Gy produced the most variegation in young shoots (chlorophyll variants) maintained *in vitro*. The variants appeared to have yellow and green color combinations on the young leaves of pineapple 'Queen' variety. When transplanted inside the greenhouse, high percentage of plantlets survival was observed, ranging from 90-95%. Of the different irradiation doses, variegation in young leaves was observed at 15, 20, 25 and 30 Gy. Further assessment on the effect of irradiation is currently being undertaken under screenhouse conditions. The variants produced could serve as basis for selection of ornamental-type pineapple. In addition, protocols developed on the use of *in vitro* culture techniques could be utilized as a tool for induced mutation breeding in pineapple.

Keywords: chlorophyll variants, *in vitro* culture technique, irradiation, gamma ray, Murashiege and Skoog, mutation breeding, pineapple cv. 'Queen'

AS-05

SCALING UP OF SSNM MAIZE TECHNOLOGY FOR WIDER ADOPTION IN THE PHILIPPINES

Apolonio M. Ocampo[1], Jocelyn D. Labios[2], Romeo V. Labios[2], Julie Mae Pasuquin[3] and Mirasol Pampolino[3]

[1]Institute of Plant Breeding, Crop Science Cluster, [2]Agricultural Systems Cluster, University of the Philippines Los Baños, [3]International Plant Nutrition Institute (IPNI), Southeast Asia Program, Malaysia; polman49@yahoo.com

The Site-Specific Nutrient Management for Hybrid Maize (SSNM Maize) Technology was developed for the Philippines through collaborative research in 3 key maize areas in 2005-2008. Using the same approach, wider scale on-farm trials (OFT) were conducted in key sites in sixteen regions from 2008 to 2010 with the goal of improving productivity and profitability in wider maize areas in the country. Through OFTs the project was able to a) quantify maize yield gaps, b) quantify attainable yield and yield responses to fertilizer NPK, c) evaluate the agronomic and economic performance of SSNM, and d) estimate the contribution of Bio-N and organic matter application. Results showed that there are significant opportunities for increasing maize production, where the yield gap between farmers' yield and attainable yield is 2.1 t ha^{-1}. Research data showed that the national average yield is lower than that obtained by progressive farmers and that there is a wide range of attainable yield obtained across regions. Field results likewise showed that Bio-N and organic fertilizers can substitute 23 kg N/ha of total N requirement of maize and are more effective when combined with inorganic fertilizer. Farmer participatory evaluation (FPEs) was done in some sites in 2010-2011 dry and 2011 wet season involving more farmers and with bigger plot sizes. The Nutrient Expert for Hybrid Maize™, a decision support software developed by the International Plant Nutrition Institute (IPNI), and the Quick Guides for fertilizing maize in large areas, developed through the project, are two significant outputs of the SSNM Maize activities in the Philippines and are planned for wider dissemination.

Keywords: maize, site-specific nutrient management, SSNM Maize technology, Bio-N, Nutrient Expert for Hybrid Maize™

AS-06

CHEMICAL FERTILIZER REPLACEMENT CAPABILITY OF MYKOVAM BIOFERTILIZER FOR INCREASED GROWTH AND FRUIT YIELD OF OKRA

Adoracion T. Guy[1] and Nelly S. Aggangan[2]
[1]Soils and Agro-ecosystem Division, Agricultural Systems Cluster, College of Agriculture, [2]National Institute of Molecular Biology and Biotechnology
UP Los Baños; nelly_aggangan@yahoo.com

Okra (*Abelmochus esculentus* L. Moench) is one of the Philippines' major fresh vegetable for export. In 2010, 4,500MT of okra was exported to Japan valued at $15M (about P600M). A field trial was conducted to assess the capability of MYKOVAM biofertilizer (containing mycorrhizal fungi) in replacing chemical fertilizer for increased growth and marketable fruit yield of okra. The experiment was established at the Central Experimental Station, UP Los Baños, Laguna from February to July 2011. Treatments were applied during seed sowing (Mykovam), transplanting (NPK) and two and four weeks (urea) after transplanting. Highest total fruit yield was obtained from those treated with the full Recommended Rate of Chemical (RRC) fertilizer (14-14-14 and 46-0-0) and RRC+Mykovam, with increases of 92 to 94% over the control which had the lowest (5,477g/1m x 5m plot). Fruit yield and number were significantly increased with Mykovam+1/2RRC which were comparable with those treated with RRC and RRC+Mykovam. Moreover, Mykovam+1/2RRC gave comparable height, root collar diameter, and total dry weight with those treated with RRC+Mykovam. Total dry weight was increased by 100% compared with 71% only by the latter. The uninoculated unfertilized control had the lowest height (66cm), root collar diameter (1.63cm) and total dry weight (91.8g/plant). In conclusion, Mykovam can replace half of the recommended NPK fertilizers with growth comparable with those treated with full chemical fertilizer rates. Mykovam treated plants gave more marketable fruits than with chemical fertilizers.

Keywords: *Abelmochus esculentus*, mycorrhizal fungi, complete fertilizer, urea

AS-07

BIO-FORTIFICATION OF ZINC IN RICE (*Oryza sativa* L.) GRAINS THROUGH SOIL AND WATER MANAGEMENT

Jonathan C. Descalsota[1] and Pearl B. Sanchez[2]
[1]Institute of Plant Breeding, Crop Science Cluster, [2]Soil and Agro-Ecosystems Division, Agricultural Systems Cluster, College of Agriculture, University of the Philippines Los Baños; jdescalsota@yahoo.com

Rice is considered as the staple food of most Asian countries however milled rice is mainly carbohydrate and has relatively low concentration of crude protein, crude fat, crude fiber, minerals and vitamins. Efforts are now undertaken to increase the level of minerals (i.e iron, zinc, etc.) in rice grains. In line with this, a pot experiment was conducted to study the influence of chicken manure application and water management on zinc concentration in rice grains. The treatments consist of two soil type (Buguey clay loam and Alimodian silty clay), two rice varieties (MS13 and IR72), two water management (saturated and flooded) and two levels of chicken manure application (0 and 3 t ha^{-1}). The sixteen treatment combinations were replicated three times and laid out in randomized complete block design. Results showed that application of additional chicken manure significantly increased grain yield, straw yield and Zn as well as uptake of other nutrients like N, P, K in grains since chicken manure provided additional source of these nutrients. Flooding combined with chicken manure application resulted in highest grain yield. Zinc concentration and uptake as well as grain yield were higher in varieties grown on Alimodian silty clay. Grain yield and Zn uptake of MS13 was not significantly influenced by water management whereas flooding increased grain yield and Zn uptake of IR72.

Keywords: rice, zinc, bio-fortification, uptake, grains

AS-08

SINGLE NUCLEOTIDE POLYMORPHISMS IN THE WATER BUFFALO (*Bubalus bubalis*) LEPTIN GENE ASSOCIATED WITH HIGH MILK YIELD WITH IMPLICATIONS TO THE PHILIPPINE CARABAO CENTER'S DAIRY BUFFALO BREEDING PROGRAM

Jesus Rommel V. Herrera, Amie S. Villanueva,
Jennifer F. Maramba and **Ester B. Flores**
Molecular Genetics Laboratory, Genetic Improvement Program Unit,
Philippine Carabao Center, Nueva Ecija; jrvh4171@yahoo.com

Traditional selection of dairy buffalo cows involves collecting milk performance data for 2-3 lactations and ranking them based on the milk production, taking 6-7 years to identify a good milker. In the case of bulls, milk performance data of daughters are evaluated to identify animals with high genetic merit, taking around 8 years. Using available performance records coupled with single nucleotide polymorphisms (SNPs) associated with milk production traits, identification of good dairy animals can be dramatically shortened while increasing the accuracy of selection. This study aimed to identify potential SNPs of the water buffalo leptin gene that are associated with milk yield and milk component traits. Deoxyribonucleic acid (DNA) samples of buffalo cows with milk performance data were used in the study. Since the buffalo genome has not yet been sequenced, primers used to amplify the coding regions were based on the gene sequence of cattle. Association studies revealed that animals with the 'CC' and 'CT' genotypes have statistically higher milk yield compared with animals carrying the 'TT' genotype. SNPs associated with milk yield and milk component traits will be used as a selection tool in conjunction with Best Linear Unbiased Prediction (BLUP). Pre-selection of young bulls carrying the favourable genotype can reduce the number of bulls entering the progeny testing program, thus, lowering the cost of running the program. Moreover, potentially good replacement heifers can be selected by genotyping even at a young age, thus, shortening the generation interval.

Keywords: water buffalo, milk production, leptin, DNA, SNP, breeding program

AS-09

GROWTH PERFORMANCE OF SHEEP FED WITH FORMULATED RATION AND UREA MOLASSES MINERAL BLOCK

Benito B. Balneg, Corazon Diana A. Pastor and Roseminda R. Sair
Mariano Marcos State University Batac, Ilocos Norte
misdi_gabriel@yahoo.com

Aside from the breed of sheep to be raised, roughages or grasses also play an important role in sheep production especially during the dry season wherein grasses are not enough and of low quality for animal nourishment. This study was conducted to determine the growth performance of growing-fattening sheep fed with formulated ration (FR) and Urea Molasses Mineral Block (UMMB). The study was laid-out in Randomized Complete Block Design with four treatments (Napier alone, Napier + FR, Napier + UMMB and Napier + FR + UMMB) and replicated three times. Based on the result, cumulative bi-weekly weight showed that sheep fed with napier + FR + UMMB consistently gained more than those fed with napier alone and napier + FR but comparable to those fed with napier + UMMB. The average daily gain in weight of sheep fed with napier + FR + UMMB gained significantly more per day (57.14g) but comparable to those fed with napier + UMMB (50.79g). Sheep fed with napier alone had the least gained in weight per day (32.80g). The ability to convert feeds into body weight was not significantly affected by the supplementation. However, sheep fed with napier + UMMB required least amount of feed, 13.69 kg feed/kg gain in weight. Sheep fed with napier alone required the greatest amount of feed, 20.26 kg of feeds/kg gain in weight. Sheep fed with napier + FR + UMMB incurred significantly higher expenses (P127.58) as compared to the other treatments. Thus, UMMB supplementation can increase production with lesser expenses.

Keywords: Sheep, Napier, Ration, UMMB, Supplementation

AS-10

DEVELOPMENTAL COMPETENCE AND MIDKINE EXPRESSION OF WATER BUFFALO (*Bubalus bubalis* L.) OOCYTES IN MEDIA SUPPLEMENTED WITH RETINOIC ACID DURING *IN VITRO* MATURATION

Lilibeth A. Cajuday[1], Annabelle A. Herrera[2] and Danilda H. Duran[3]
[1]Bicol University, [2]University of the Philippines Diliman, [3]Philippine Carabao Center, Nueva Ecija; lacajuday125@yahoo.com

Retinoic acid (RA), a vitamin A metabolite, regulates cellular growth, embryonic morphogenesis and differentiation. In this research, two studies were conducted to examine the effects of all-trans RA on the developmental competence of water buffalo oocytes. In Study 1, the desired concentration and effects of all-trans RA was determined by examining its action on cumulus expansion, nuclear maturation, and embryo development and quality after *in vitro* fertilization. In Study 2, the midkine (MK) expression of the cultured oocytes was analyzed to examine its molecular effect. Midkine is a product of a retinoic acid responsive midkine gene (MDK) reported to enhance development of oocytes. Oocytes were retrieved from slaughterhouse derived ovaries and *in vitro* matured in maturation medium containing 0 (vehicle), 1, 3 and 5 μM all-trans RA. Vehicle used was ethanol. Oocytes matured without vehicle and RA in the maturation medium was used as Control group. Results showed that cumulus expansion, development to Metaphase II, cleavage and blastocysts development as well as blastocysts quality were improved in the presence of all-trans RA in the *in vitro* maturation medium. The presence of all-trans RA improved the MK expression but without all-trans RA, MK expression diminished during *in vitro* culture as evidenced by the faint band observed in the immunoblot and very weak signal detected by immunostaining with FITC in the Control group. The findings demonstrated that all-trans RA enhanced *in vitro* maturation of water buffalo oocytes to positively influence the development of embryos after *in vitro* fertilization.

Keywords: *in vitro* maturation, carbohydrate uptake, midkine expression, water buffalo, retinoic acid

AS-11

IMMUNE RESPONSE OF *Macrobrachium rosenbergii* IMMERSED WITH HOT-WATER EXTRACT FROM *Gracilaria edulis* CHALLENGED WITH *Vibrio alginolyticus*

Mary Beth B. Maningas[1,2], Eldrin M. Abquina[1], Patrick Raymond G. Gonzalez[1], Maribon M. Obias[1], Rainier S. Pausanos[1] and Jyacinth Lucille Y. Siapno[1]
[1]Department of Biological Sciences, College of Science, [2]Molecular Biochemistry and Biotechnology Laboratory, Research Center for the Natural Sciences, University of Santo Tomas; mbmaningas@mnl.ust.edu.ph

Macrobrachium rosenbergii is the species most favoured for freshwater shrimp farming purposes and remains by far the major subject of cultivation for commercial farming. However, despite their innate immunity, shrimp farms have been experiencing decreased production brought by viral and bacterial disease outbreaks. *Vibrio alginolyticus* is a bacterial pathogen responsible for high mortality of cultured shrimps worldwide. *Gracilaria edulis*, a species that is abundantly distributed all over the country has not yet been tested for its immunostimulant properties. Here we report for the first time the efficiency of hot-water extracts from *G. edulis* as an immunostimulant in *Macrobrachium rosenbergii*. Immune parameters, including total haemocyte count (THC) and phenoloxidase (PO) activity were examined, as well as resistance to *V. alginolyticus* infection. Upon immersion in 0.1g/L of the extract, the shrimps exhibited higher THC and greater PO activity compared to the control group. Shrimps immersed in 0.1g/L dosage, significantly increased percentage survival at the end of the challenge test, highlighting its capability in inducing bacterial resistance particularly against *V. alginolyticus*. Furthermore, it was found that doses larger than 0.1g/L are detrimental to the health of shrimps. The hot-water extract from *G. edulis* has an immuno-stimulatory effect on freshwater shrimp *M. rosenbergii*. Overall, the results demonstrated that exploring the Philippine *Gracilaria* species and their application as immuno-stimulants might pave the way in the development of local feeds for the country's aquaculture industry.

Keywords: *Gracilaria edulis*, *Macrobrachium rosenbergii*, *Vibrio alginolyticus*, total hemocyte count (THC), phenoloxidase (PO)

AS-12

CYTOTOXIC POTENTIAL OF THE INVASIVE WEED SPECIES *Chromolaena odorata* L. IN THE ZAMBOANGA PENINSULA

Lina T. Codilla[1,2], Ephrime B. Metillo[1]
[1]Department of Biological Sciences, Mindanao State University-Iligan Institute of Technology, [2]JH Cerilles State College, Zamboanga del Sur
ephrime.metillo@g.msuiit.edu.ph

Chromolaena odorata is an aggressive invasive plant species that has spread in vast areas of the Philippines including many farmlands in the main island of Mindanao. The species is highly competitive and is known to contain strong allelochemicals, but specific bioactive compounds vary in composition with sampling locality. In this study, ethanol and aqueous crude extracts of *C. odorata* leaves were prepared, and their effects on tomato seed germination and seedling growth and onion root cells mitotic index were investigated. Ethanol crude extracts significantly inhibited germination and seedling growth in tomato, and reduced the mitotic index in onion root tips. The ethanol extract was subjected to column chromatographic elutions and eleven (11) fractions were obtained subjected to bioassay. Results revealed that only fractions 4 and 5 inhibited tomato seed germination at 25% concentration by volume. Phytochemical screening revealed that fractions 4 and 5 are positive for the presence of alkaloids and steroids. These two chemical components were believed to be primarily responsible in inhibiting seed germination and seedling growth in tomato as well as reducing the mitotic index in onion root tips. The inhibitory properties of these bioactive compounds operate at the cellular level, and may help attribute to their successful invasion in the Zamboanga peninsula.

Keywords: *Chromolaena odorata*, Zamboanga Peninsula, invasive plants, mitotic index, crude extracts, germination inhibition

AS-13

ASSESSMENT OF THE VARIABILITY OF RAINFALL AND TEMPERATURE IN ILOCOS NORTE, PHILIPPINES FOR CROP PRODUCTION MANAGEMENT

Evangeline S. Galacgac and Charito G. Acosta
Mariano Marcos State University Batac; eva_galacgac@yahoo.com

Climate change is now widely recognized as a major environmental problem facing the globe. In the Philippines, the variability of rainfall and temperature had already been generally analyzed but limited studies have been conducted so far to determine the extent of this phenomenon in specific localities. In view of this, it is therefore important to analyze the local weather data to have better understanding of the changes that have been occurring and to come up with coping mechanisms or climate change adaptation strategies and thereby minimizing its negative impacts. This study aims to provide decision-makers with the needed information and tools to manage or mitigate the risks brought about by the changes in rainfall and temperature in the province of Ilocos Norte. Thirty-five-year (1976-2010) daily weather data on rainfall and temperature from MMSU-PAGASA Agrometeorological Station in Batac, Ilocos Norte and 30-year (1981-2010) tropical cyclone data from Laoag City, Ilocos Norte Synoptic Station were analyzed to determine the variability of rainfall, temperature, and cyclone patterns in Ilocos Norte. Annual and monthly variations were determined using descriptive statistics and simple linear regression analysis was used to determine the degree of annual change. Average data from 1976-1990 (normal base period) and 1991-2010 were compared to find out if there were changes that occurred during these periods. Result showed that there is an increase in annual temperature and this was found to have deviated from the normal-base period. With respect to rainfall, the annual trend is variable but there is a significant change in monthly pattern and a slight change in the frequency of maximum rainfall events. On the other hand, the number and intensity of tropical cyclone increases annually and deviated from the normal. Likewise, monthly trend and intensity posted a remarkable change.

Keywords: climate change, rainfall, temperature, Ilocos Norte, crop production management

AS-14

ELEVATED SOIL ORGANIC CARBON TURNOVER IN LIMED ACID SOILS: CONTRIBUTIONS OF PRIMING EFFECT OF LIME TO ATMOSPHERIC CO_2 EMISSIONS

Wilfredo A. Dumale, Jr.[1], Kenta Hirai[2], Taku Nishimura[2] and Tsuyoshi Miyazaki[2]
[1]Department of Plant Science, Nueva Vizcaya State University, Bayombong, Nueva Vizcaya; dumalewajr@yahoo.com, [2]Department of Biological and Environmental Engineering, The University of Tokyo, Japan

Agricultural ecosystems are significant terrestrial sources of atmospheric CO_2. Management practices like liming of acid soils were initially found to accelerate CO_2 emission due to the mineralization of lime-carbonates. We used ^{13}C-labeled calcium carbonate [$Ca^{13}CO_3$ (13C 99%)] as lime and tracer in a 33-day constant temperature laboratory incubation experiment. We were able to distinguish and quantify lime-CO2 and soil organic carbon (SOC)-CO_2 from an acid soil and identified contribution of liming to the turnover of native SOC. It was confirmed that 67.01–67.43 % of total CO_2 emission was lime-CO_2, indicating that it is the major source of CO_2 emission during liming. SOC turnover ($^{12}CO_2$) between limed and non-limed samples indicated a priming effect (PE) of 47.44–51.01 %. PE are short-term increases in SOC turnover due to moderate treatment of the soil. $^{12}CO_2$ turnover was higher by 8.69–8.81 mg kg-1 dry soil in limed samples. To determine the source SOC pool of the extra $^{12}CO_2$ emission in limed samples we have separated the stable SOC fraction using a combined chemical dispersion and physical fractionation procedure. It was confirmed that the increased turnover of SOC have originated from the labile SOC fraction and not from the stable pool. Considering the extent of global acid soils and world utilization of lime, we need to incorporate the contribution of the priming effect of lime in our CO_2 simulation and modeling studies in terrestrial ecosystems.

Keywords: liming, mineral-associated organic carbon, soil organic carbon, priming effect, CO_2

AS-15

GIS-AIDED CROP SUITABILITY ASSESSMENT AND DESIGN OF CROP INTENSIFICATION AND DIVERSIFICATION MODELS FOR MAJOR SOIL SERIES IN UPLAND NON-RICE-BASED FARMING SYSTEMS IN BATANGAS, PHILIPPINES

Jacob B. Labita and Rodrigo B. Badayos
University of the Philippines Los Baños; jacoblabita@yahoo.com

Effective and feasible land use planning at present requires systematic evaluation of inter-relationship among attributes of land to acquire optimum and sustained crop yield. Adopting the 1976 FAO framework, land evaluation was performed for major upland land units (LUs) in non-rice-based land utilization types (LUTs) in Batangas to characterize the major upland soils, assess the suitability to important crops and design the development models in agreement with the cropping intensification and diversification potential of the area using Geographic Information Systems (GIS). Pertinent biophysico-chemical variables of LUs were considered for crop-land suitability analysis. Results show that considerable portion of eight soil series analyzed by quick fertility test had moderate nutrient availability while Sibul and Taal series were moderately low and Tagaytay was high. Generally, most of the crops were classified as moderately (S2) and marginally suitable (S3) due to limitations on topography (t), soil physical condition (s) and fertility (f). Coconut-banana intercrop and single corn system models can be intensified (S2wstf-S2wst and S3tsf, respectively). For corn-sweet potato double crop, land use shift to pineapple cultivation (S2tfs rating and PhP 130,381 ha^{-1} net benefit) is recommended due to severe limitations of Tagaytay sandy loam (8-16% slope) and current unsuitability to corn production (U1fts). Diversification models are focused to recommend modifications on vegetable and sugarcane LUTs. Sitao (S2tws) is socially-accepted and suitable to vegetable production models. Green pepper (S2wsft) and goat integration in sugarcane farming model is expected to gain a net benefit of PhP393,976 ha^{-1}. When the schemes are applied in certain areas, farmers can adopt the identified combination of specific component technologies. Since crop yields are location and season specific, the models can be subjected to validity thru field trials to determine the actual increase on productivity and profitability in the area.

Keywords: intensification, diversification, GIS, component technology

AS-16

PHENOTYPIC DIVERSITY IN A POPULATION OF RICE BLACK BUGS, *Scotinophara molavica* (HEMIPTERA: PENTATOMIDAE) FROM BUUG, ZAMBOANGA SIBUGAY, PHILIPPINES

Mark Anthony J. Torres[1], Grayvimin S. Figueras[1], Aprille Joy M. Luceño[1], Ma. Lotus E. Patiluna[1], Muhmin Michael E. Manting[1], Rolliebert B. Rampola[1], Ravindra C. Joshi[2], Alberto T. Barrion[2], Leocadio S. Sebastian[2] and Cesar G. Demayo[1]
[1]College of Science and Mathematics, MSU-Iligan Institute of Technology, Iligan City, [2]Muñoz, Nueva Ecija; torres.markanthony@gmail.com

Rice black bugs (RBB) are believed to be a serious pest of rice infesting all growth stages of the plant. Different management approaches have already been applied to control and regulate populations of this pest. However, control efforts have been muddled by lack of understanding of the taxonomy of this insect resulting from immense intra- and inter-population diversity in phenotypic traits. Here, a total of thirty one traits were scored from an outbreak population consisting of one hundred and twenty female rice black bugs from Buug, Zamboanga Sibugay and analyzed using principal component analysis. Plots of the two principal components summarizing 68.8% of the total variation and subsequent K-means clustering showed that this population of RBB belong to at least four groups distributed as follows: group 1 – 14 individuals; group 2 – 12; group 3- 60 and group 4 – 34. These individuals are polymorphic for nine traits only, specifically on the length of relative lengths of the Tylus and the Jugum, presence of Cicatrices humps, number of antennal segments, shape and reach of the Scutellum, Shape of the junction of vein R+M in the outer wing, number of closed marginal cells, lnumber of ongitudinal veins below discal cell, and Proboscis reach. The importance of these traits to intra-population divergence and life history of the RBB has yet to be determined. Thus, further studies should be conducted to determine the genetic and functional bases of the observed diversity. This information is necessary for the proper formulation of management strategies for the control and regulation of populations of this insect.

Keywords: Rice Black bugs, phenotypic diversity, K-means clustering, principal component analysis, *Scotinophara molavica*

AS-17

DIETARY EFFECT OF SAPONIN AND/OR YUCCA ON GROWTH, ANTIOXIDANT CAPACITY AND METABOLIC RESPONSE OF NILE TILAPIA *Oreochromis niloticus* L.

Laila N. Gallego[1], Isagani P. Angeles, Jr.[1, 2],
Quirino D. Parallag[1] and Yew-Hu Chien[2]
[1]Provincial Institute of Fisheries, Isabela State University Roxas,
Isabela, [2]Department of Aquaculture, National Taiwan Ocean University
ipangelesjr_15@yahoo.com

The use of synthetic substances that were found to increase the efficiency of feed utilization by animals such as antibiotics and steroid hormones as animal feed additives are currently prohibited in several countries. In this context, search for natural, biologically active, and renewable plant products that could be used to replace hazardous synthetic growth stimulants are relevant. Saponin (S) can be a potential replacement since it can enhance the growth performance as well as the immune response and resistance of fish. This study evaluated the effects of S and/ or yucca (Y) on growth, antioxidant capacity and metabolic response of Nile tilapia *Oreochromis niloticus* (1.9 ± 0.08 g). The commercial diet served as the control (C). Fish were fed diet containing 150 mg kg^{-1} S, 150 mg kg^{-1} Y or combination of 75 mg kg^{-1} S and 75 mg kg^{-1} Y (S/Y) for 8 weeks. Weight sampling was conducted every 2 weeks while survival was monitored everyday. Antioxidant capacity and metabolic response were analyzed after 8 weeks of feeding. The S/Y-fed fish had the highest weight gain among treatments. On the other hand, no significant difference was observed in survival. S/Y-fed fish had the lowest SOD level among treatments. On the other hand, glucose level of S-, Y- and S/Y-fed fish was decreased by 26, 42 and 60%, respectively as compared to the C. These results indicated that S/Y in the diet improves the growth performance, enhances the antioxidant activity and stabilizes the metabolic response of fish.

Keywords: antioxidant capacity, *Oreochromis niloticus*, metabolic response, saponin, yucca

AS-18

CAGE CULTURE AND LAKE MANAGEMENT PRACTICES IN LAKE DANAO, SAN FRANCISCO, CENTRAL PHILIPPINES

Ricardo B. Gonzaga, Serapion N. Tanduyan and Berenice T. Andriano
Cebu Technological University; sntanduyan@yahoo.com

Lake Danao of Camotes Island was studied to find out its status and government initiatives to conserve the lake being the source of livelihood and a tourist destination in the Islands of Camotes. The interview guide and actual field visits were used to gather data. Results show that fishing with the use of gill nets and fish pots topped among the activities of the inhabitants in Lake Danao, followed by soli-soli gathering for mat weaving and other articles, ecotourism, aquaculture and nipa shingles making. Government initiatives in conserving and sustaining the lake includes the legislative supports which are declaring Lake Danao as flora and fauna sanctuary; requiring barangay captains of six lakeshore barangays to implement activities for lake protection; declaring September 18 of every year as Municipal Clean Up Day in the marine and lake waters of San Francisco; prohibiting slash and burn farming on lakeshore; prohibiting cutting of mangroves and other tropical trees in the lake; ban on bird hunting around the lake; soli-soli plant cutters/weavers to secure mayor's permit; prohibiting the use of motorized vessels, carabao bathing and washing of clothes and laundry along lakeshore; prohibiting construction of dwellings and other structures twenty meters from lakeshore; adopting and implementing of articles 51 and 52 of RA 1067 prohibiting solid waste and garbage dumping in the lake; collecting entrance fees from Lake Danao visitor and creation of San Francisco Lakewatch. Aquaculture activities in the lake are only given to BFAR, LGU and other agencies to control proliferation of cages and maintain the carrying capacity of the lake. BFAR-7 had a quarterly restocking of the lake with 50,000 tilapia fingerlings and imposing the standard size of gillnets to be used in fishing. The Cebu Technological University and BFAR-7 conducted limnological researches of the lake to monitor lake health and sustainability.

Keywords: cage culture, Lake Danao, Central Philippines, Camotes Island

AS-19

ANTIOXIDANT CAPACITY AND METABOLIC RESPONSE OF RED STRIPED SNAPPER (*Lutjanus erythropterus* Bloch, 1790) FED DIETS WITH ASTAXANTHIN AND/OR OXIDIZED OIL

Isagani P. Angeles, Jr.[1], Quirino D. Parallag[1] and Yew-Hu Chien[2]
[1]Provincial Institute of Fisheries, Isabela State University Roxas, Isabela
[2]Department of Aquaculture, National Taiwan Ocean University, Taiwan
ipangelesjr_15@yahoo.com

Marine fish diets contain large amount of highly unsaturated fatty acids (HUFA) which are easily oxidized. The oxidized HUFA might lead to oxidative stress in fish. Aside from pigment-enhancing property of astaxanthin (AX), it is commonly supplemented to fish diet to act as a powerful antioxidant against oxidative stress. This study evaluated the effects of AX on antioxidant capacity, metabolic response and liver AX content of red striped snapper (Lutjanus erythropterus) (20.05±1.65 g) fed diet with or without oxidized oil (OX). The commercial diet served as the control (C). Fish were fed diet containing 240 mg kg^{-1} AX, 100 ml kg^{-1} OX or combination of 240 mg kg^{-1} AX and 100 ml kg^{-1} OX (AX+OX) for one day. Antioxidant capacity and metabolic response were monitored at 0, 6, 12, 24, 48 and 72 h and liver AX content was analyzed at 72 h after feeding. The AX-fed fish (AX and AX+OX) had significantly lower antioxidant capacity and metabolic response at 6 and 12 h than the non AX-fed fish (C and OX). On the other hand, OX-fed fish resulted in higher GPx at all sampling times, except 24 h, as compared to the non OX-fed fish. Moreover, OX-fed fish had higher GR, glucose, triglycerides and lactate at 6 and 12 h than the non OX-fed fish. Additionally, treatments that received AX showed significantly higher liver AX content. These results indicated that AX could enhance the antioxidant capacity and metabolic response of *L. erythropterus*.

Keywords: antioxidant capacity, astaxanthin, *Lutjanus erythropterus*, metabolic response, oxidized oil

AS-20

FORMULATION AND EVALUATION OF DIFFERENT MUTTON RECIPES

Corazon Diana A. Pastor, Benito B. Balneg and Roseminda R. Sair
Mariano Marcos State University Batac; misdi_gabriel@yahoo.com

Sheep is easy to raise, require less capital, has short production cycle and prolific. However, farmers are raising limited number of sheep because there was no ready market for fresh mutton. Disposing and selling the animals at a right time has a greater impact on income derived from venturing to animal production. To encourage farmers to venture on sheep production, ways must be designed and developed on how to utilize mutton or lamb aside from fresh meat. Two recipes (burger patty and skinless sausage) were formulated and prepared. The products were cooked and subjected for organoleptic test. The products were evaluated for aroma, taste, texture, appearance and general acceptability using the 9-point Hedonic scale. Five different groups served as evaluators. The products were also subjected to microbial analysis and descriptive analysis was used in the study. In terms of aroma, taste, texture and general acceptability, both the burger patty and skinless sausage were rated *Like Very Much*. For appearance of the products, skinless sausage rated *Like Very Much* while the burger patty was rated *Like Moderately*. Rating for the appearance was attributed to the color of the processed product. Skinless sausage was attractive due to the added food color to the product because mutton is whitish in nature. Results of the microbial analysis showed that just after slaughter, *E. coli* was detected. This maybe because parts of the animal such as skin, hooves, rumen and intestines contained enormous counts of bacteria. However after processing the products, no trace of *Salmonella*, *Staphylococcus coagulase* and *Listeria monocytogenes* were found in the processed products. Based on simple cost and return analysis, skinless sausage cost P9.62 per piece while one piece of burger patty cost P8.05. Mutton can be processed into skinless sausage and burger patty and can satisfy the taste of the Ilocano consuming public.

Keywords: sheep, mutton, formulated, sausage, patty

AS-21

GROWTH PERFORMANCE OF *Eucalyptus robusta* Sm. AND *Pterocarpus indicus* Willd. TO WEEDING AND SPACING TREATMENTS IN BUKIDNON, PHILIPPINES

Rico A. Marin
College of Forestry, Central Mindanao University, Bukidnon
ricomarin@yahoo.com

Eucalyptus robusta Sm. and *Pterocarpus indicus* Willd. are promising plantation species in Bukidnon. The former species is exotic while the latter is endemic in the Philippines. The study was conducted to evaluate the effects of various weeding and spacing treatments on the growth performance of the two tree species planted under smallholder-farm conditions. It was laid-out in split plot design replicated three times. Spacing treatments comprised the main plot of the study while the weeding treatments served as the subplot. The study was carried out in Lantapan, Bukidnon with a duration of three (3) years. Findings revealed significant difference in stem diameter increment and degree of termite infestation in *E. robusta*. On the other hand, significant difference in height growth was observed in *P. indicus*. *E. robusta* has a diameter increment of 5.5 cm in ring weeding treatment while only 4.2 cm. in strip brushing treatment. Degree of termite infestation was also lesser in ring weeding with 32.9% compared to strip brushing treatment with 39.2%. In *P. indicus*, wider spacing (2 meters x 4 meters) presented taller height growth with 216.8 cm while the treatment of closer spacing (2 meters x 2 meters) had only 171.8 cm. Furthermore, ring weeding treatment was slightly higher in height growth for *P. indicus* with 197.4 cm as compared to strip brushing with 197.3 cm. On farmers' evaluation, ring weeding treatment was preferred over strip brushing since the former accordingly was easier to perform with less time spent in carrying out the activity. Frequency of conducting ring weeding in the plantation was lesser (2 times a year) as compared with strip brushing which was between 3-4 times a year. In terms of spacing, farmers prefer wider spacing since there was lesser number of trees maintained for weeding operations.

Keywords: *Eucalyptus robusta* Sm., *Pterocarpus indicus* Willd., Strip brushing, ring weeding, spacing

AS-22

PRIORITY PROTECTION, CONSERVATION AND DEVELOPMENT AREAS OF MAKILING-BANAHAW GEOTHERMAL AREA, PHILIPPINES

Susana M. Maligalig[1], Emmanuel R.G. Abraham[2], and Amelita C. Luna[3]
[1]HES Specialist and Environmentalist, CHEVRON, [2]Consultant and [3]University Researcher, Office of the Coordinator for Research, Extension and Linkages (OCREL), College of Forestry and Natural Resources, University of the Philippines Los Baños; luna_amelita@yahoo.com

As one of the environmental stewards of the area, CHEVRON Geothermal Philippines Holdings, Inc. (CGPHI) and Aboitiz Power Renewable Inc. (APRI) intends to pursue its important role of fostering responsible use of this area's life sustaining ecological resources for present and future generations through community-based ecological initiatives, pollution prevention activities, resources management programs, awareness and education. The general spatial distribution of priority protection, conservation and development areas within the ecological influence areas of Mak-Ban was determined by analyzing slope, elevation, vegetation cover and location of facilities. The study map of priority protection, conservation and development areas such as soil and water conservation and forest biodiversity areas. Areas with slopes of more than 50% should be considered as priority protection areas and these areas are concentrated in the Sipit headwaters in Mt. Makiling, which are still with natural forest cover. Potential conservation areas or areas that have moderate to steep slopes and may or may not adequate vegetation cover. Relative to CGPHI facilities, all slopes at Mt. Bulalo poses threat, with the greatest towards the western slopes because of more facilities that would be affected. Vegetation cover can help mitigate the risks inherent in steep areas. As these areas are being cultivated, farming and land use strategies that promote soil and water conservation and promote biodiversity should be encouraged and sustained. Strict protection would be necessary for these areas and risk reduction studies maybe appropriate for potential impact areas.

Keywords: ecological areas, priority protection, conservation, development areas, headwaters

AS-23

DEVELOPING SITE INDEX EQUATION FOR SMALLHOLDER TREE PLANTATION USING HEIGHT – AGE RELATIONSHIP

Richmund A. Palma
Institute of Agriculture, Misamis Oriental State College of Agriculture and Technology, richmundp@yahoo.com

Site index is an essential component in determining yield and a basis for sound and effective management of smallholder tree plantation for wood production and carbon sequestration. The study was conducted to develop a site index equation using height – age relationship and construct site index table for mangium (*Acacia mangium* Willd.) in Claveria, Misamis Oriental. Mangium is one of the important smallholder tree plantation species and commodity for wood industry in the region and the country. Data on total height and age were produced from direct measurements of height and age of 3,910 trees. The study had generated site index equation, logSI = logH + .8955(logA – logBAGE) and site index table (ages 3 to 18 years and total height 5 to 40 meters). Based on the equation, the mean annual height increment of a smallholder Mangium plantation is 2.88 meters at site index 25 and 1.36 meters at site index 12. At age 10, mangium planted at site with an index of 12 could attain a total height of 15 meters while those at index 25 could attain 30 meters. The site index equation can be employed as a basis for efficient management and development of smallholder Mangium plantations. The tree farmers could make use of the site index table in determining site quality and estimated height. It can also be used in determining economic rotation, cut schedule, plantation development schedule and business projection. The equation had been developed for plantations located in Claveria, Misamis Oriental. The equation was applicable outside the study area but careful validation should be done to ensure effective *A. mangium* tree plantation establishment and management.

Keywords: site index, mangium, height, age, smallholder, equation

AS-24

CHARACTERIZATION AND DETECTION OF FOREST LANDUSE CHANGE IN A SMALL MANGROVE FOREST: THE CASE OF BANACON ISLAND, BOHOL, PHILIPPINES

Dixon T. Gevaña and Sangjun Im
Department of Forest Sciences, College of Agriculture and Life Sciences,
Seoul National University, Korea; dixon@snu.ac.kr

The lack of ample information about forest landuse and landuse change hampers our ability to come up with sustainable forest management plans and programs. Mangrove forest is among the forest ecosystems where geospatial information is often limited. This study was therefore conducted to provide practical techniques in characterizing landuse and detecting landuse changes in a small community-managed mangrove forest using remotely sensed data. Banacon Island in Bohol Province, Philippines was selected as a case for this study. Standard radiometric correction and maximum likelihood classifier were done using two Landsat 5 TM satellite images with a decadal interval, 1993 and 2004. Available on-line global explorer programs such as Google Earth Plus and Bing Map were also used to supplement ground-truth data for better classification. Results of the classification were found accurate using standard error matrix procedure therefore suggesting that landuse changes observed could serve as vital inputs for future landuse planning. Three major forest landuses were identified namely, dense mature stand, dense intermediate stand and sparse mangrove area. Overall, mangrove forest of Banacon Island has improved as seen in the expansion of dense mature and intermediate forest stands. Apparently, large portion (60%) of the sparse mangrove has decreased and eventually developed into dense intermediate plantations. This is reflective of the continuous reforestation being done by local community in the area. However, some portions of dense intermediate stands also showed losses that can be attributed to illegal timber poaching that were reported during those periods. Some themes to improve the current condition of the site were recommended.

Keywords: bakawan, forest conservation, GIS, land use change, local community, remote sensing

AS-25

EFFECT OF GLYPHOSATE ON SURVIVAL, GROWTH AND REPRODUCTION OF *Pontoscolex corethrurus*

Eufemio T. Rasco, Jr.[1], Hanna Mia Monica D. Taya[2], Michael Val G. Lacsamana[2], Richie Eve G. Ragas[2] and Georgianna Kae R. Oguis[2]
[1]Philippine Rice Research Institute, Nueva Ecija, [2]University of the Philippines Mindanao, Davao City; g.kae.oguis@gmail.com

We aimed to examine the assumption that agricultural chemicals are bad for the environment, using a common earthworm species, *Pontoscolex corethrurus*, as indicator. Earthworms help maintain soil health but they are highly sensitive to changes in soil chemical content. The environmental effect of glyphosate, one of the most commonly used herbicides in Philippine agriculture, was evaluated using 4 laboratory experiments. In experiment 1, earthworms were observed in glass containers lined with filter paper irrigated with normal dosage of glyphosate, 10x, 20x, 30x, 40x and 50x the normal. In experiment 2, survival and weight gain of earthworms in soil-filled containers sprayed with 3 mL of the same range of doses of glyphosate, were measured for 2 weeks. The third experiment was an avoidance test where half the Petri dishes were lined with the control and the other half with the normal glyphosate dose. Earthworm positions were recorded for 100 min. Lastly, in reproduction test, soil-filled glass containers were sprayed with varying glyphosate doses (normal up to 16x the normal). On day 28, adult worms were removed and evaluated while cocoons and juveniles were observed for another 28 days. Glyphosate did not significantly show toxic effects to *P. corethrurus* up to the highest dosages in experiments 1, 2 and 4. However, in experiment 3, *P. corethrurus* showed significant avoidance response to normal concentrations of glyphosate (P=0.03). The study shows that the common assumption about the negative environmental effect of glyphosate may not be justified.

Keywords: glyphosate, earthworms, *Pontoscolex corethrurus*, toxicity

AS-26

REACTION OF WILD AND CULTIVATED *Musa* SPECIES TO MAJOR BANANA VIRUS DISEASES

Fe M. Dela Cueva[1], Eric G. Dinglasan[1],
Olivia P. Damasco[1] and Lorna E. Herradura[2]
[1]Institute of Plant Breeding, College of Agriculture, University of the Philippines Los Baños, [2]Davao National Crop Research and Development Center, Bureau of Plant Industry, Davao City; fmdcueva@yahoo.com

Philippine *Musa* germplasm collection at IPB-UPLB and BPI Davao City holds a wide array of wild and cultivated banana cultivars. The germplasm provides wide gene pool as sources of desirable traits for breeding programmes like resistance to pests and diseases. Major banana viruses which include Banana bract mosaic virus (BBrMV), Banana bunchy top virus (BBTV), and Cucumber mosaic virus (CMV), as well as detection of Banana streak virus (BSV) has been observed in the *Musa* germplasm collection. Information on the reaction of these cultivars against these viruses is very little, hence this study. *In vitro* derived plantlets were evaluated for resistance against BBrMV, BBTV, and CMV under greenhouse condition. A total of 57 banana cultivars were evaluated. At 3-7 weeks after insect transmission, symptoms of BBTV appeared as marginal chlorosis and leaf narrowing. Low BBTV incidence (<50%) was recorded on some cultivars ranging from 0-44%. ELISA reading from asymptomatic plants ranged from 0.140 - 0.657, in which some cultivars were detected to be BBTV-positive. This indicates that BBTV is still present even in asymptomatic condition. For CMV, symptoms appeared 3 - 4 weeks after inoculation only in 1 cultivar. ELISA also detected CMV infection on some cultivars, which ranged from 0.143 - 0.940, even in asymptomatic condition. For BBrMV, all plants showed no diagnostic symptoms but ELISA also detected virus infection on some cultivars. ELISA values ranged from 0.140 – 0.913.

Keywords: *Musa* germplasm, ELISA, BBTV, BBrMV, CMV

AS-27

BIOMASS COMPOSITION AND SUGAR CONTENT OF SWEET SORGHUM (*Sorghum bicolor* (L.) Moench) AT DIFFERENT DEVELOPMENTAL STAGES

Dane Mikhael S. Calica, Glory S. Bitanga, Jezzica R. Balagso, Marachel Grace Domingo and Shirley C. Agrupis
Mariano Marcos State University Batac; dane_calica@yahoo.com

Sweet sorghum is a water-use efficient crop that has great potential as feedstock for bioethanol and pulp production. As a bio-based crop, it is important to determine the best growth stage of the plant to harvest the biomass for optimum yield in sugar and structural carbohydrates. This study was conducted to determine the sugar content and biomass constituents of the stalk juice at different developmental stages. Stalks of sweet sorghum v. ICSR 93034 were collected from the MMSU Sweet Sorghum project. Samples were collected from vegetative (before panicle formation), reproductive (during grain formation) and post-reproductive stages (after grain harvest). Fresh juice was extracted to analyze the brix value before they were dried, cut, and ground to 40 mesh. Analyses of the biomass constituents; cellulose, hemicellulose, and lignin, of the extractive-free stalks was carried out following the TAPPI standard procedures. Brix value (°Bx) was lowest at vegetative stage (5), followed by post-reproductive (11.5), then reproductive (14.5). The structural carbohydrates increased with the sweet sorghum plant's growth maturity. The variety under study contains more hemicellulose than cellulose. Cellulose, which contains a long chain glucose sugar, was lowest at vegetative stage, 29.69% while 32.27% was determined in reproductive and post reproductive stalk samples. Hemicellulose, which is a polymer of glucose and pentoses (*e.g.* xylose), was found highest during the vegetative stage, 44.5%, while 39.44% in both the reproductive and post-reproductive stages. Lignin, the complex binding material for the structural sugars, was found to be present in the following order: vegetative < reproductive and post-reproductive.

Keywords: sweet sorghum, structural carbohydrates, bioethanol, pulp, sugar feedstock

AS-28

POTASSIUM AND SODIUM UPTAKE OF CORN (*Zea mays* L.) GROWN ON SALINE SOIL

Jonathan C. Descalsota[1], **Primitivo Jose A. Santos**[1], Pearl B. Sanchez[2], Apolonio M. Ocampo[1] and Pompe C. Sta Cruz[1]
[1]Physiology Division, Crop Science Cluster and [2]Soil and Agro-Ecosystems Division, Agricultural Systems Cluster, College of Agriculture, University of the Philippines Los Baños; jdescalsota@yahoo.com

Corn is considered as a moderately saline sensitive crop and there is a shifting interest to corn farming due to its high value and demand. However, in some areas identified to have saline soil, corn remains as one of the famous crop and one of the most practical way to minimize the adverse effect of this stress to corn is to grow tolerant varieties. A field experiment was conducted to evaluate the potassium and sodium uptake of three corn varieties grown on saline soil amended with additional potassium. The experiment was laid out in randomized complete block design with four replications and three varieties were used. Salinity severely affected the performance of the three corn varieties. IPB Composite 3, which was screened to be drought tolerant, showed better performance compared with the other varieties. Potassium uptake of IPB Composite 3 was also significantly higher compare to the other varieties while on the other hand sodium uptake of this variety was significantly lower. Na:K ratio of IPB Composite 3 was relatively lower compared to other varieties indicative of its inherent characteristics to be saline-tolerant.

Keywords: corn, potassium, sodium, uptake, salinity

AS-29

A PRE-HARVEST 1-METHYLCYCLOPROPENE (1-MCP) AQUEOUS SPRAY FORMULATION TO DELAY RIPENING OF MANGO (*Mangifera indica* L. cv. 'Carabao')

Katherine Ann T. Castillo-Israel[1], Elda B. Esguerra[2], Florinia E. Merca[3], Edralina P. Serrano[2], Veronica C. Sabularse[3]
[1]Food Science Cluster, College of Agriculture, [2]Crop Science Cluster, College of Agriculture, and [3]Institute of Chemistry, College of Arts and Sciences, University of the Philippines Los Baños; kattcastillo@yahoo.com

A pre-harvest 1-methylcyclopropene (1-MCP) aqueous spray was applied to mangoes to determine whether it could effectively control ethylene responses. Mango produces two ethylene peaks, the first of which occurs at about 10 days before harvest maturity. 1-MCP at 0, 10, 20 and 30 ppm was sprayed to mangoes at 90, 100 and 110 days after flower induction (DAFI). Fruits were harvested at 117 DAFI, stored at 12.5°C and ripening parameters were monitored. CO_2 production peak was delayed for 7d in the 1-MCP treatments at 100 DAFI with 10 ppm having the lowest CO_2 production. Ethylene production was lower for 10ppm 1-MCP treatment at 100DAFI compared with the control. Significantly higher firmness, delayed peel color development, decline in visual quality and slower disease development was also observed with this treatment. 1-MCP was found to be effective as a pre-harvest spray when applied at 100 DAFI. At this stage, sufficient ethylene receptors are already present in tissues but the upsurge in ethylene production pre-harvest has not yet occurred. 1-MCP was proven effective because it was able to bind to the ethylene receptors which are mostly unbound to ethylene. The 1-MCP concentration of 10ppm was enough to saturate the receptors and further increase in concentration would not elicit a more favorable response. A pre-harvest aqueous spray formulation of 10 ppm 1-MCP applied at 100 DAFI was proven effective to delay the ripening of mango. This is the first study, to the best of our knowledge, on a pre-harvest 1-MCP aqueous spray application on 'Carabao' mango.

Keywords: 1-methylcyclopropene, 'Carabao' mango, pre-harvest spray, delayed ripening, aqueous spray

AS-30

MODIFIED ATMOSPHERE PACKAGING (MAP) TECHNOLOGY FOR THE EXTENSION OF MANGO (*Mangifera indica* L.) FRUIT FRESHNESS

Rachel F. Rocafort, Abigail S. Rustia, and Jocelyn M. Sales
Food Development Center, National Food Authority, FTI Complex, Taguig City
info@fdc.net.ph, joyce23_dms@yahoo.com

The market of Philippine mangoes (*Mangifera indica* L.) is limited due to its short shelf life in which the fruit ripens in five to eight days after harvest at ambient condition. Modified atmosphere packaging (MAP) technology is known to supplement temperature and relative humidity control to maintain the quality and prolong the shelf life of fresh fruits. This study aims to increase the shelf life of mangoes using MAP technology. Mangoes obtained from various parts of the country were pre-treated with fungicide with active ingredient, azoxystrobin, and vapor heat treatment (VHT) prior to storage in MAP at various conditions including: a) low temperature storage at 10°C and 15°C, b) use of local and imported MAP plastic films in storing mangoes at 10°C, and c) packaging MAP mangoes in different packing sizes. Stored mangoes in MAP were evaluated for physical and sensory qualities and shelf life was determined. Results showed that the shelf life of MAP mangoes pre-treated with fungicide and VHT could be extended up to 30 days by storing MAP fruits using 30 CE plastic film of the Korea Food Research Institute (KFRI) as modified atmosphere packaging material, bulk packing at 4 boxes of 5 kg fruits to a box, and storage at 10°C. At the maximum shelf life of 30 days, MAP mangoes did not shrivel, ripened to yellow peel color index of 5 to 6, had slight to moderate mango odor and flavor, and had no internal breakdown. MAP is a promising technology that could extend the mango fruit freshness and allows export of fruits to distant markets therefore increasing the share of exports of Philippine mangoes globally.

Keywords: MAP, mango, shelf life, bulk packing, MAP film

AS-31

DISEASE CONTROL METHODS FOR MANGOES UNDER MODIFIED ATMOSPHERE PACKAGING (MAP)

Abigail S. Rustia, Rachel F. Rocafort, Jocelyn M. Sales
Food Development Center, National Food Authority, FTI Complex, Taguig City
info@fdc.net.ph, joyce23_dms@yahoo.com

Disease is one of the major forms of deterioration in mangoes after harvest. Mangoes prior to storage in Modified Atmosphere Packaging (MAP) should be treated with effective disease control to prevent decay due to anthracnose and stem-end rot. This study aims to evaluate the physical and chemical methods to control diseases in Philippine mangoes cv. Carabao held under MAP at 10°C and 30°C. Green mature mangoes were treated for disease control by dipping in fungicides – Benomyl and Amistar®; chlorine; and hot water using low temperature, long time (LTLT) and high temperature, short time (HTST). Pre-treated mangoes were wrapped in either 30 CE or 20 CE MAP plastic films made of zeolite-coated low density polyethylene and stored at 10°C, at ambient conditions, and at 30°C for 18 and 10 days, respectively. The film was removed after the specified storage period, and mangoes from 10°C were transferred to 25°C in normal air to ripen. Control samples were not wrapped in the film but stored and ripened under similar ambient conditions. Effectiveness of disease control is in the following order: Amistar®> HTST> LTLT> Benomyl> Chlorine. Benomyl enhanced peel discoloration and is banned for use. In general, development of yellow peel color, shriveling, internal breakdown, and sensory characteristics were not affected by all disease control measures used regardless of storage conditions. Amistar®, however, resulted in the highest disease control >90% in mangoes stored under MAP at 10°C and 30°C. Although Amistar® provided the best disease control, this is currently registered as a pre-harvest and not yet as postharvest fungicide for mangoes. Further investigation on disease control measures suitable for prolonged storage of mangoes in MAP is recommended to exploit new markets for the export of Philippine mangoes.

Keywords: disease control, mangoes, MAP, decay, postharvest treatment

AS-32

FERTILIZERS AND ORGANIC RESIDUE EFFECTS ON THE DYNAMICS OF CO_2 AND N_2O IN SATURATED AND UNSATURATED SOILS

Kei Takizawa[1], Wilfredo A. Dumale, Jr.[2], Taku Nishimura[3] and Tsuyoshi Miyazaki[3]

[1]Hokkaido University, Japan, [2]Department of Plant Science, Nueva Vizcaya State University, and [3]Department of Biological and Environmental Engineering, The University of Tokyo, Japan; dumalewajr@yahoo.com

Carbon dioxide (CO_2) and nitrous oxide (N_2O) are two of the most potent greenhouse gases produced in managed agricultural ecosystems. In an 80-day constant temperature laboratory incubation experiment, we determined the CO_2 and N_2O dynamics in the following: Treatment 1 (T1): Unfertilized (control); Treatment 2 (T2): 100 mg $(NH_4)_2SO_4$-N kg^{-1} soil; Treatment 3 (T3): 100 mg paddy residue-N kg^{-1} soil; and Treatment 4 (T4): 100 mg $(NH_4)_2SO_4$-N +100 mg paddy residue-N kg^{-1} soil. CO_2 emission in both saturated and unsaturated conditions peaked in the early stage of incubation and in a declining pattern. The application of NH_4-N seemed to decrease CO2 emission both in saturated and unsaturated conditions. CO_2 emission in T2 was even lower in the unfertilized treatment (control). N_2O flux peaked in T3 and T4 two days after flooding in the saturated condition and three to four days after flooding in T1 and T2 but at a much lower concentration. N_2O flux was almost nil under unsaturated conditions. Residue and nitrogen application did affect N_2O flux only at the early stage of flooding and had no influence at all under unsaturated conditions. Nitrogen application can decrease CO_2 emission with and without residue application and nitrogen fertilization is a good strategy to decrease CO_2 emission from decomposing organic residues in agricultural fields.

Keywords: carbon dioxide, nitrous oxide, residues, saturated soil, unsaturated soil

AS-33

EXPLAINING THE PERSISTENCE OF NINE WEED SPECIES IN A PLANTATION AGRICULTURE ENVIRONMENT

Georgianna Kae R. Oguis[1], Eufemio T. Rasco, Jr.[2], and Ed Levi C. Camarillo[1]
[1]University of the Philippines Mindanao, Davao City; g.kae.oguis@gmail.com
[2]Philippine Rice Research Institute, Nueva Ecija

Seed longevity and germination pattern of 9 weed species, *Ageratum conyzoides, Bidens pilosa, Cleome rutidosperma, Acalypha indica, Drymaria cordata, Eleusine indica, Cyperus brevifolius, Paspalum conjugatum* and *Cynodon dactylon,* in a banana plantation in Davao City were studied to explain their population dynamics in a long term weed control experiment using paraquat and manual weeding. Dry seeds were exposed to high temperature (day/night temperature of 33ºC / 28ºC and $2.9x10^4$ lux) and high relative humidity (95%) in an improvised accelerated aging chamber. Initial germination percentage was taken for freshly collected seeds of each species. Every week, for 3 months, samples of seeds from each species were obtained from the chamber and were germinated in Petri dishes lined with cotton and daily irrigated with distilled water. There were 3 replicates with 50 seeds per replicate. Germination was done in the laboratory with a day temperature range of 26ºC to 30ºC and a night temperature range of 24ºC to 28ºC. Germination percentage of all species except *A. indica, E. indica* and *P. conjugatum* significantly fluctuated ($P<0.05$) in the course of the experiment. Percentage germination of *C. rutidosperma* and *D. cordata* seeds steadily decreased through time, consistent with the pattern observed in seeds that do not have dormancy and easily eradicated. On the other hand, germination of *A. conyzoides, B. pilosa, A. indica, C. brevifolius* and *C. dactylon* was spread out and showed no marked decline with length of storage. Percent germination of *A. conyzoides, B. pilosa, E. indica* and *P. conjugatum* increased during storage. These patterns are associated with persistent weeds. They constitute a mechanism for long-term survival of these species under fluctuating soil moisture conditions.

Keywords: seed longevity, weeds, banana plantation, seed dormancy, seed germination

AS-34

ERADICATION OF WILD DAISY (*Wedelia trilobata* (L.) Hitche) USING DIFFERENT LEVELS OF HERBICIDE

Jason Pumatong, Richmund Palma and Nely Omboy
Institute of Agriculture, Misamis Oriental State College of Agriculture and Technology, Claveria, Misamis Oriental; richmundp@yahoo.com

Wild daisy was considered one of the top 100 most invasive species in the world and also a problem in many farms in Misamis Oriental. The study was conducted to determine the effective level of glyphosate (C3H8NO5P) to control the growth of *Wedelia trilobata* (L.) A.S. Hitche (Wild daisy). Also, determine its effect on growth and biomass under field condition. The experiment was laid out following a randomized complete block design with four replications and treatments: 1) No herbicides (control); 2) Recommended dosage (160 ml/16 liters); 3) Twice below the recommended dosage (80 ml/16 liters); 4) Twice above the recommended dosage (320 ml/16 liters). At the end of the experiment, growth characteristics such as coloration, % biomass, length of stolon and period of recovery were documented. The result showed that wild daisy was significantly affected by the herbicide treatment of 320 ml/ 16 liters. The length of stolons was reduced by 48.7 cm. Similarly, the amount of biomass produced was significantly different compared to the control. All other treatments were not significant to each other. The effects to the leaves were assessed based on the color. Plots treated with 360 ml/ 16 liters showed yellowing after 2 days and were eradicated while plots treated with 80 ml/ 16 liters and 160 ml/ 16 liters exhibited yellowing after four days and showed regrowth. Control of wild daisy invasion on farmland, open – grassland, forestland and gardens can be effectively implemented by using treatment 320 ml/ 16 liters.

Keywords: wedelia, herbicides, glyphosate, biomass, stolons, growth

BIOLOGICAL SCIENCES

BS-01

POPULATION ASSESSMENT OF BUTTERFLY HOST PLANTS IN SELECTED SITES NEAR MT. BANAHAW DE LUCBAN, LUCBAN, QUEZON, PHILIPPINES

Mary Ann R. Agudilla
Southern Luzon State University, Lucban; maryannagudilla@yahoo.com

This study investigates the population of butterfly host plants thriving in Mt. Banahaw de Lucban Botanical Garden and the College of Agriculture campus in Lucban Quezon, primarily as a prerequisite for the conservation of endemic butterfly fauna and its host plants through butterfly farming. Quadrat method of sampling techniques was utilized in the study. Ten quadrats of 20m x 20m were established in Mt. Banahaw Botanical Garden and ten 10m x 50m quadrats in the College of Agriculture. Results revealed 36 species of host plants belonging to 21 families thriving in the Botanical Garden and 39 species belonging to 21 families comprised the host plant population on campus. Family Fabaceae had the highest representation with 4 species followed by Annonaceae, Euphorbiaceae and Rutaceae with 3 species each. Majority of the host plants in the study sites were not randomly distributed and had low density and frequency values ranging from 0.00003 to 0.0008/m^2 mostly represented by 1-3 individuals. Percent abundance ranged from 0.0789 to 0.2368%. Most plant species were associated with 2 or more species of butterflies for nectar feeding and/or as hosts of butterfly larva while some butterflies depended on one species of plant as its larval host. The results reflect the rarity of host plants in the study sites suggesting the inability to support the food requirements for a butterfly breeding project, perhaps even the wild population of butterflies. It is recommended that a nursery for host plants be established in both sites, an enhancement planting of endemic host plants be implemented and similar study of the same be conducted in the other areas of Mt. Banahaw.

Keywords: butterfly farming, population assessment, host plants

BS-02

FLORISTIC COMPOSITION AND PHYSIOGNOMY OF MANGROVE FOREST IN PAGBILAO, QUEZON, PHILIPPINES

Amalia E. Almazol[1], Cleofas R. Cervancia[2], Inocencio E. Buot, Jr.[2], William SM. Gruezo[2] and Nelson M. Pampolina[3]
[1]Department of Forestry and Environmental Science, College of Agriculture
Southern Luzon State University, Quezon; mall_almazol@yahoo.com
[2]College of Arts and Sciences and [3]College of Forestry and Natural Resources
University of the Philippines Los Baños

The species composition and physiognomy of the mangrove forest in Pagbilao, Quezon Province were studied. Vegetation analysis was done within a 20 x 20 m-quadrat established in each of the three zones (landward, middleward and seaward) of the mangrove forest. A total of 37 species were identified in all zones comprising 744 individuals belonging to 28 genera and 18 families. Using Shannon Index of diversity (H'), the landward zone had the highest diversity (H' =2.70) followed by the seaward zone (H' =2.56). The least diverse was the middleward zone (H' = 1.47). There was a similar trend in the proportion of various tree heights and diameters in the seaward, middleward and landward zones. The density of small trees was higher than those of the large ones. In terms of diameter at breast height (dbh) classes, there are 237 individuals belonging to 3-30 cm, no individual belonging to 31-40 cm and 2 individuals with 41 cm and above. The height classes of 2.5 m have 177 individuals, 61 individuals belonging to 6-15 m and only one individual with height class of 16 m and above. The Importance Value (I.V). of the species varied within each zone. In the order of decreasing I.V., *Avicennia marina* > *Aegiceras floridum* > *Sonneratia alba* in the seaward zone. In the middleward zone, *Avicennia officinalis* > *Ceriops decandra* > *Scyphiphora hydrophyllacea*. At the landward zone, *Xylocarpus granatum* > *A. officinalis* > *Rhizophora mucronata* > *A. marina* var. *rumphiana*. The current floristic composition of Pagbilao mangrove indicates that this ecosystem is still diverse.

Keywords: mangrove, floristic composition, physiognomy, species composition, importance value

BS-03

SPECIES DIVERSITY OF LIZARDS ALONG ELEVATIONAL BANDS OF MT. HILONG-HILONG, DIWATA RANGE, AGUSAN DEL NORTE

Jacqueline R. Carrillo and Emmanuel Pacheco Leaño
Department of Biology, College of Arts & Sciences, Central Mindanao University, Bukidnon, leano_emmanuel@yahoo.com

This study aimed to determine species diversity of lizards along elevational bands of Mt. Hilong-hilong, Agusan del Norte. Specially, it aimed to: compare the diversity of lizards along the elevational bands of Mt. Hilong-hilong, describe lizard species, determine the distribution of lizards along elevational bands and assess the status of lizards of Mt. Hilong-hilong. Only the adult forms of lizards were considered in this study. Sampling and collection methods used were transect, opportunistic and random collection techniques, refuge examination and pitfall traps along the seven elevational bands established in mossy (1,500-1,900 masl) and montane forest (1,200-1,500 masl). Alpha Index of Diversity was highest on fifth (1,600-1,700 masl) elevational band and lowest on the rest of the elevational bands. *Sphenomorphus mindanensis* was the only species that was aggregated. *S. coxi coxi* is the most dominant species. *S. coxi coxi* is the most abundant of the 7 species collected since it can be found in most of the elevational bands (second, fourth. fifth, sixth and seventh elevational bands). Results revealed 2 families with 1 genus, *Luperosaurus* which the species remains to be identified, 7 species and 25 individuals. Every species differs slightly with their SVL, tail length and weight which suggest that every species has its distinctive feature. Elevational bands 1,700-1,800 masl and 1,800-1,900 masl had higher similarity indices on lizard species composition compared to other elevational bands. For the ecological status, Philippine endemic species were *S. decepiens* and *S. cf. jagori* and the Mindanao faunal region endemic were *S. mindanensis, S. coxi coxi, S. cf. diwata* and *S. cf. abdictus abdictus*.

Keywords: species diversity, lizards, elevational bands, Mt. Hilong-hilong, Diwata Range

BS-04

BIODIVERSITY ASSESSMENT OF MT. BANAHAW DE DOLORES

Cecilia N. Gascon, Ronald C. Garcia, Francisco N. Beltran, Wilfredo C. Faller and Mary Ann R. Agudilla
Department of Forestry and Environmental Science,
College of Agriculture, Southern Luzon State University Lucban
forcuala_garcia@yahoo.com

A study was conducted to assess the diversity of biological communities in Mt. Banahaw de Dolores, Sitio Kinabuhayan, Sta. Lucia, Dolores, Quezon from 700masl to its peak at 2155masl. The area was characterized by identifying the forest trees and wildlife, their species richness and diversity, and dominance. This study is the first biodiversity assessment conducted in the site after a 5-year moratorium on visitation. The forest tree and wildlife inventory including insect collection were conducted and analyzed using Shannon-Weiner, Evenness and Dominance Indices. Result revealed a total of 455 trees representing 92 species and 37 families. For wildlife, a total of 30 species of birds representing 16 families, 5 species of bats, 3 species of amphibians and 2 reptiles were recorded. There were a total of 285 insects identified representing more than 104 families and 17 orders. High values for Shannon-Weiner index (H), and Evenness index (e) and low values of dominance (C) index indicated even distribution of individuals among the species and high species variation and diversity.

Keywords: Mt. Banahaw de Dolores, biodiversity, Mt. Banahaw, species richness, Shannon-Weiner index

BS-05

SPECIES COMPOSITION AND VEGETATION ANALYSIS OF MANGROVE FORESTS ALONG BUTUAN BAY, PHILIPPINES

Jess H. Jumawan
Biology Department, CARAGA State University, Butuan City
jehoju78@yahoo.com

Mangrove forests along Butuan Bay, Philippines have deep cultural significance to the Butuanons for a thousand years. Habitat destruction has continued to threaten the existence of remaining mangroves. There was no reported inventory of mangrove loss in the area. This study attempts to determine the species composition of mangroves in the four coastal barangays along Butuan Bay. Vegetation analysis was also conducted using sampling plots in the study sites. A total of 16 sampling plots with an area of 100 m^2 were non-randomly established. Within the main plots were 3 smaller 1m x 1m regeneration plots distributed equally for the counting of saplings and seedlings. There were a total of 28 species of mangroves belonging to 11 different families recorded. The highest number of species was observed in Abilan with 27 species while Pagatpatan had the lowest with 9 species. Vegetation analysis showed that *Avicennia rumphiana* has the highest density, frequency, dominance and importance value (IV). The species *A. rumphiana*, *Rhizophora mucronata* and *R. stylosa* have the highest regeneration of saplings and seedlings. The data generated from the study could be used as baseline information for mangrove conservation.

Keywords: density, frequency, dominance, importance value, Butuanons

BS-06

DIVERSITY OF BATS IN THE MONTANE FOREST OF MT. HILONG-HILONG, DIWATA RANGE, AGUSAN DEL NORTE

Emmanuel Pacheco Leaño and Joanne Ruth Paano Joven
Department of Biology, College of Arts & Sciences, Central Mindanao University, Bukidnon; leano_emmanuel@yahoo.com

The study describes the diversity of bats in the montane forest of Mt. Hilong-hilong, Diwata Range, Agusan del Norte. Specifically, it aimed to: a) compare the species diversity of bats captured in three net heights, b) determine species richness of bats, c) assess the conservation and ecological status of bats; and d) describe the different species of bats sampled in the montane forest of Mt. Hilong-hilong. The sampling was done on October 22-29, 2006 within the montane forest of Mt. Hilong-hilong, Diwata Range, Agusan del Norte. This study used netting and harp trapping techniques for capturing bat species. Mist nets were set in three net heights: the low net (0-4 high), medium net (4-8 high) and high net (8-12 high). Mist nets were established for the determination of species diversity and harp traps were established to increase the species richness. The study revealed the presence of 137 individual of bats belonging to three (3) families (Pteropodidae, Vespertillionidae and Rhinolophidae) at the total of twelve (12) species. Species diversity of bats was found highest in low net (2.197) as compared to high net (1.792) and medium net traps. Four (4) of the captured bats were Philippine endemic (*Ptenochirus jagori*, *Haplonycteris fischeri*, *Hipposideros obscures*, *Rhinolophus inops*, and *R. virgo*) and one (1) was Mindanao endemic (*P. minor*), some were nearly threatened (*Hipposideros obscures* and *R. virgo*), of least concern (*Kerivoula pellucida* and *K. hardwickii*) and vulnerable (*P. jagori*, *P. minor*, *H. fischeri*, and *Rousetus amplexicaudatus*). Local status showed that most Megachiropteran species were common and Microchiropteran species were rare. Morphometry and diagnostic characters were used to identify the species of bats. Furthermore, the study shows that most species of bats have low flying activity (0-4 m high) above the ground.

Keywords: Diversity, bats, montane forest, Mt. Hilong-hilong, Diwata Range

BS-07

HABITAT DETERMINANTS OF PHILIPPINE-ENDEMIC AND MINDANAO-ENDEMIC BIRD COMMUNITIES ON CANTICOL AND MT. HILONG-HILONG, PHILIPPINES

Sherryl L. Paz[1,2], Dusit Ngoprasert[3], Olga M. Nuneza[1], Neil Aldrin D. Mallari[4] and George A. Gale[3]

[1]Department of Biological Sciences, Mindanao State University-Iligan Institute of Technology; sheter29@yahoo.com, [2]Department of Biology, Caraga State University, Butuan City, [3]Conservation Ecology Program, King Mongkut's University of Technology, Thailand, [4]Flora and Fauna International, Cavite

The study focused on the richness, abundance, diversity and habitat use of Philippine-endemic and Mindanao-endemic birds of two mountains in Agusan del Norte – Canticol, Tubay and Mt. Hilong-hilong, RTR from September to November, 2008. Birds were surveyed using eight-minute fixed-radius point counts. Habitat variables estimated included vegetation structure, elevation, slope and the degree of anthropogenic disturbance. Non-linear regression analysis was used to determine the habitat variables that influenced the richness and abundance of endemics in the two sites. Canticol had lower mean density of large and medium trees and higher degree of anthropogenic disturbance than Mt. Hilong-hilong. There were 32 Philippine-endemic birds (five threatened) and three Mindanao-endemics (one threatened) on Canticol while there were 40 Philippine-endemics (eight threatened) and five Mindanao-endemics (three threatened) on Mt. Hilong-hilong. The diversity of endemics was significantly higher on Mt. Hilong-hilong (H'=2.31). Vegetation structure and elevation had greatest influence on the endemic bird communities in the two sites. The study suggests that the two sites need conservation attention to prevent forest loss and endangerment of the threatened endemics. Equally important, adequate regeneration of the disturbed sites in the region must also be prioritized as part of a long-term management strategy.

Keywords: anthropogenic disturbance, Philippine-endemics, Mindanao-endemics, birds, diversity

BS-08

AQUATIC INSECTS' DIVERSITY AT TAYTAY FALLS IN BARANGAY TAYTAY, MAJAYJAY, LAGUNA: INDICATOR OF WATER QUALITY

Kristian Rodrigo A. Yara and Mary Ann R. Agudilla
Southern Luzon State University, Lucban, Quezon
maryannagudilla@yahoo.com

The aquatic insects thriving at Taytay Falls were identified and classified accordingly to its Orders and Families. Assessment of the presence of indicator species was done to determine the water quality of the falls based on the tolerance value and scale of aquatic insects to pollution adopted from Bouchard, 2004. Descriptive method of research was used in the study. Two sampling sites were established using GPS. Three sampling methods of collection were utilized namely; D-net and surber sampler for larvae and naiads and light traps for the adults. Collected insects were brought to the Museum of Natural History for identification. Insect diversity was analyzed using Shannon-Weaver Diversity Index. Findings revealed 22 species of aquatic insects belonging to 19 families distributed in seven Orders were found thriving in the falls. Family Philopotamidae got the highest number of individuals for both sites. Upstreams has the higher number of intolerant species to pollution compared to the downstreams. The presence of species from Orders Plecoptera, Ephemeroptera, Trichoptera and Coleoptera from both sites reflect that the water in Taytay Falls is still in good quality since these indicator species require high dissolved oxygen level in order to survive. The diversity index was high with a value of 3.09.

Keywords: indicator species, d-net, surber sampler, diversity index

BS-09

NICKEL TOLERANCE OF THREE ISOLATES OF ECTOMYCORRHIZAL FUNGUS *Pisolithus* INOCULATED ONTO *Eucalyptus urophylla* S.T. Blake SEEDLINGS

Nelly S. Aggangan
National Institute of Molecular Biology and Biotechnology
University of the Philippines Los Baños; nelly_aggangan@yahoo.com

Nickel is one of the toxic heavy metals common in soils of ultramafic origin in the Philippines, which is seriously affecting plantation establishment and tree growth. Ectomycorrhizal fungi such as *Pisolithus* are found worldwide, and are known to have tolerance to heavy metals. Three isolates of *Pisolithus* collected under eucalypts growing in Western Australia, Philippines and in a mining residue in New Caledonia, were compared for their ability to increase the growth of *Eucalyptus urophylla* seedlings in the presence of nickel (Ni) in pots in a glasshouse. Seedlings, aseptically infected with mycorrhizal fungi and uninoculated, were transplanted into pots containing 3 kg steam-pasteurized yellow sand amended with five rates (0, 6, 12, 24 and 48 mg Ni kg-1 soil, coded as Ni-0, Ni-6, Ni-12, Ni-24 and Ni-48, respectively) of Ni (as NiCl2). A few days after transplanting, all seedlings subjected to Ni rates greater than Ni-12 died. After 12 weeks, uninoculated Ni-6 and Ni-12 seedlings had reduced root growth and exhibited severe toxicity symptoms (chlorosis on young leaves and shoot tips). Ni-12 reduced the length of roots colonized by *Pisolithus*. However, *Pisolithus* infected seedlings grew better at Ni-6 and Ni-12 than the uninoculated counterpart. Inorganic plant analyses revealed that inoculation increased plant growth through improved P uptake but did not prevent Ni uptake. Ni toxicity, however, was minimized by dilution due to an increase in plant biomass. Inoculation partially overcame depression of Fe uptake to the shoot at Ni-6 but not at Ni-12. In conclusion, the three isolates of *Pisolithus* differed in their tolerance to Ni and that the New Caledonian isolate from a Ni mine site was the best and may have greater potential to improve the growth and survival of *E. urophylla* seedlings in ultramafic soils in the Philippines.

Keywords: ectomycorrhizas, *Eucalyptus urophylla*, heavy metals, nickel, ultramafic

BS-10

DETERMINING THE EFFICIENCY OF *Talinum paniculatum* (Jacq) Wild AS A PHYTOREMEDIATOR AND ITS MORPHO-ANATOMICAL RESPONSES TO IRON IN LATERITIC SOILS

Vivian S. Tolentino and Jill Mary J. Bautista
Department of Biology, School of Science and Engineering, Ateneo de Manila University, vtolentino@ateneo.edu

Mining sites in the Philippines may pose possible deleterious effects to society both in the economic and health sector due to water and soil contamination, thus decontamination of polluted soil and water is necessary. This study aims to evaluate the effectiveness of *Talinum paniculatum*, commonly called "Jewels of Opar", as a phytoremediator for Fe in lateritic soil from Brooks Point, Palawan. This study will also establish its leaf anatomy and its morpho-anatomical effects on the leaves using different histological techniques for tissue processing, and determine the uptake of Fe in leaf through plant tissue analysis. Data gathered was statistically tested using repeated Analysis of Variance (ANOVA). Five soil treatments (garden soil, 25%, 50%, 75% and 100% lateritic soil) with *T. paniculatum* cuttings were set up. For morphological responses, leaf color was approximately at 3 (medium green), with the use of the leaf color chart, which indicated neither deficiency nor over-dosage of Fe. The number of leaves and nodes, plant height, and leaf surface area were relatively high (13 leaves, 9 nodes, 107 mm in height and 279.7 mm leaf surface area) in 75% lateritic soil. . The leaf anatomy is of the "Kranz" type, and it exhibited the typical anatomy of the leaf, which implies normal metabolism and chlorophyll functioning due to Fe. Uptake of Fe in the leaves showed that amounts of Fe in garden soil are 2555 ppm, 2338 ppm for 25% lateritic soils, 1485ppm for 50% lateritic soils, 3720 ppm for 75% lateritic soils, and 4232ppm for 100% lateritic soils. These signify higher amounts of Fe in the leaves grown in 75% and 100% lateritic soil. This study will add to the baseline information in anatomy and its potential use as phytoremediator and as guide to consumers since the leaves are edible in certain parts of the world.

Keywords: iron, *Talinum paniculatum*, lateritic soils, morpho-anatomy, phytoremediation, Kranz leaf anatomy

BS-11

GROWTH PERFORMANCE AND PHYTOREMEDIATION POTENTIAL OF *Pongamia pinnata* (L.) Pierre, *Samanea saman* (Jacq.) Merr. AND *Vitex parviflora* Juss IN COPPER-CONTAMINATED SOILS AMENDED WITH ZEOLITE AND VAM

Adrian M. Tulod[1], Arturo SA. Castillo[2],
Wilfredo M. Carandang[2] and Nelson M. Pampolina[2]
[1]College of Forestry and Environmental Science,
Central Mindanao University, Bukidnon; adrian2003ph@yahoo.com
[2]College of Forestry and Natural Resources, UP Los Baños

A pot experiment was conducted to investigate the growth performance and phytoremediation potential of *Pongamia pinnata*, *Samanea saman*, and *Vitex parviflora* in a Cu contaminated soil obtained from an abandoned mined out area amended with VA mycorrhiza and zeolite. Best growth response among the species varies in the following order: *P. pinnata* > *S. saman* > *V. parviflora*. Addition of zeolite and VAM were not significant to enhance height, diameter and biomass production of the three species indicating their practical applicability in reclaiming copper contaminated soils. The exposure, however, causes retardation of root growth as large proportion of the total biomass yield was observed in the shoots. Even so, root to shoot ratio values are generally within the ideal ratio of healthy or quality seedlings. Beneficial effects of zeolites were observed in the uptake of soil Cu but vary with species. The phytoremediation benefits from VAM are not yet clear because of the very low root infection observed in the study. Interestingly, despite the very low percent Cu uptake, both *V. parviflora* and *S. saman* have the ability to transport Cu at an average of 37.0 and 78.25 µg g-1 dry wt, respectively, from roots to shoots beyond the toxicity threshold (20-30 µg g-1 dry wt) indicating their high level of tolerance to Cu toxicity. All the three species limited high amounts of Cu translocation within the roots; hence, are highly suited for phytostabilization or for delimiting areas with Cu contamination.

Keywords: vesicular arbuscular mycorrhiza, zeolite, bioremediation, heavy metals

BS-12

BIOREMEDIATION PERFORMANCE OF *Arachis pintoi* (MANI -MANI) UNDER GREENHOUSE CONDITION

Cheryl Joy T. Villanueva and Flordeliz R. Estira
Biology Department, College of Arts and Sciences
Mariano Marcos State University Batac
flordeliz_estira@yahoo.com

Phytoremediation is the use of plant to mitigate environmental problems like soil contamination. This is less expensive, less-disruptive to the environment and one of the most effective methods in soil remediation because it has the potential to treat sites with more than one type of pollutant. The study aimed to evaluate the bioremediation performance of *Arachis pintoi* under greenhouse condition. This study was initiated by obtaining soil from the Laoag sanitary landfill and subjected to Cd, Cu, Pb and Zn analysis. Using three (3) types of soil media namely: landfill soil without amendment(LSw/oA), landfill soil with amendment (LSw/A) and garden soil (GS), performance of the plant was observed in terms of % survival, growth responses and biomass production. Results showed that *A. pintoi* survived in any of the soil media. However, its growth and biomass production were better in the sanitary landfill soil with amendment with greater number of leaves and branches(19.32 and 5.17), greater size (Sd=2.51mm, Rd=1.95mm, Rl=12.11cm, H=23.93cm) and greater total biomass (57.77g).While, its growth and biomass production in LSw/oA (Sd=2.31mm, Rd=1.28mm, Rl=7.87cm, H=18.47cm, biomass=42.22g) was as good as in GS Sd=2.46mm, Rd=1.27mm, Rl=9.55cm, H=20.40cm, biomass=46.57). After 60 days, plant tissues were analyzed for metal uptake by AAS. Results showed that absorption is more efficient in the landfill soil with amendment than in landfill soil without amendment. Bioaccumulation Coefficient (BAC) analysis in the plant tissues showed that metal accumulation is most efficient in the roots, followed by the stems and least in the leaves. Based from the BAC values determined, *A. pintoi* is capable of metal accumulation and is evaluated to be a moderate accumulator of Cd, Pb, Zn and Cu.

Keywords: Phytoremediation, heavy metal accumulation, Bioaccumulation Coefficient, *Arachis pintoi*

BS-13

BIOREMEDIATION POTENTIAL OF BACTERIAL ISOLATES FROM THE LAOAG CITY SANITARY LANDFILL

Princess Kimberly F. Dumlao and Flordeliz R. Estira
Biology Department, College of Arts and Sciences, Mariano Marcos State University Batac; flordeliz_estira@yahoo.com

Bioremediation addresses the use of microorganisms to remove ground soil contaminants that remain in place during the clean up. The challenge has been to enhance the activity of these microorganisms and develop a means to bring the contaminant into direct contact with the organisms to achieve optimal bioremediation. The study aimed to isolate and characterize bacteria from the Laoag City Sanitary Landfill and evaluate their potential to bioremediate lead-contaminated soil. In conducting the study, four (4) treatments (100, 120, 140 and 160 ppm) were made with different concentrations of lead nitrate to determine the potential of bacterial isolates in cleaning up lead. Based from their morphological characteristics and gram staining affinity, there were four (4) bacteria isolated from the sanitary landfill soil namely Isolates A, B, C and D. Isolate A is a gram positive, undulate, smooth , irregular, umbonate and filiform rod. Both B and C were undulate, smooth , irregular, umbonate rod bacteria but B was gram positive while C was gram negative. Isolate D was circular, convex, entire, smooth, effuse gram positive coccus. All the isolates were able to survive (100%) and grow in culture media containing 45 ppm-160 ppm lead nitrate. Comparatively however, Isolate D exhibited the narrowest tolerance having the least mean number of colonies of 10 CFUs when grown in media containing 160 ppm lead while Isolates A, B and C had 56.6, 33.3 and 16.6 CFUs respectively. These indicate that all the bacterial isolates from the sanitary landfill soil have the potential to bioremediate lead-contaminated soil with Isolate A exhibiting the greatest potential as lead accumulator.

Keywords: bioremediation, lead accumulation, lead tolerance, bacteria, sanitary landfill

BS-14

CYTOLOGIC AND MITOGENIC EFFECT OF TOPICAL MINOXIDIL ON THE SKIN OF *Mus musculus*

Doreen D. Domingo[1] and **Majal Rani O. Espiritu**[2]
[1]Mariano Marcos State University Batac; dr_dhee_dee@yahoo.com
[2]Saint Louis University, Baguio City

Mice and humans share the same gene for growing and shedding hair. But when it is faulty, hair doesn't grow back normally and over time people go bald, to varying degrees. Hence, topical application of minoxidil had guaranteed many users for hair growth without necessarily looking at the effect it may contribute to the skin. To evaluate the effect of minoxidil on the (skin) epidermal cells of white mice, cytologic and mitogenic characteristics were considered. Findings revealed that skin epidermal cells' width and length in the MTM-minoxidil treated mice {male: $\bar{x}$ = 3.85 µm (w); 3.95µm (l) / female: $\bar{x}$ = 4.14 µm (w); 4.02 µm (l)} were comparable in size with the MUM- minoxidil untreated mice, {male: $\bar{x}$ = 4.45 µm (w); 4.66µm (l) / female: $\bar{x}$ = 4.90 µm (w); 4.77 µm (l)}.However, the size of the epidermal cell nucleus in the MTM (male: $\bar{x}$ = 2.32 µm; female: $\bar{x}$ =2.38 µm) were smaller compared to the MUM (male: $\bar{x}$ = 2.86 µm; female: $\bar{x}$ = 2.65 µm). Considering the hair follicles in the skin of MTM(male), the hair follicles significantly showed higher values in width ($\bar{x}$ =23.67 µm) and length ($\bar{x}$ = 87.17 µm) as compared to the control (width $\bar{x}$ =6.85 µm and length $\bar{x}$ = 15.17 µm). Moreover, increase in hair diameter (male: $\bar{x}$ = 6.16 µm; female: $\bar{x}$ = 5.04 µm) was also observed in the MTM. As regards mitotic index, MTM obtained lesser values (male: $\bar{x}$ = 0.44; female: $\bar{x}$ = 0.52) as compared to MUM, (male: $\bar{x}$ = 0.61; female: $\bar{x}$ = 0.79). Indeed, topical minoxidil had explicitly shown cytologic and mitogenic impact on skin (epidermal) cells of female and male mice.

Keywords: cytologic, mitogenic, minoxidil, skin, white mice

BS-15

HISTOCHEMICAL STUDY ON *Hibiscus rosa-sinensis* L. (GUMAMELA) FLOWER AND THE EFFECT OF ITS EXTRACT ON WHITE MICE FETUS

Metchie T. Dunay, Reggie Yadao-dela Cruz and Heidi C. Porquis
Department of Biology, College of Arts and Sciences, Central Mindanao University, Bukidnon, reggiecmu@yahoo.com

Hibiscus rosa-sinensis L. (gumamela) has been valued for its medicinal uses. There are however reports of it being abortifacient. This study determined the presence of phytochemicals in the flower and evaluated the effect of gumamela flower extract on the morphological development of white mice fetus. The following were the treatments replicated five times in a Completely Randomized Design (CRD): T1 (2g/ml aqueous extract); T2 (1g/ml aqueous extract); Negative control (distilled water); Positive control (5.5mg/ml tetracycline). The treatments were administered to pregnant mice orally at 0.2 ml for two weeks. Results of histochemical tests revealed the presence of alkaloids, arbutin, tartaric acid, fats and oils in the epidermis, vascular bundle and cortex of the petals of gumamela flower. Morphological examination of the fetuses showed no abnormalities except for the significantly smaller body weight in T2 (0.36 g) and T1 (0.50 g) compared to the negative control (1.26 g). The fetuses of the treated pregnant mice also had smaller body length of 1.6 cm compared to the negative control with 2.2 cm. The computed implantation index was highest in the negative control (8.8) and least in T1(5.8). It is concluded that the gumamela petal extract has a potential detrimental effect on the fetus of white mice.

Keywords: *Hibiscus rosa-sinensis* L., gumamela, white mice, pregnancy, histochemical test

BS-16

CELLULAR PHONE RADIATION EFFECTS ON THE FETUS OF WHITE MICE

Baby Jean B. Tabalbag, Reggie Yadao-dela Cruz,
Lorelei A. Samaniego and Heidi C. Porquis
Department of Biology, College of Arts and Sciences,
Central Mindanao University, Bukidnon, reggiecmu@yahoo.com

Cellular phones are considered indispensable by man nowadays. The side effect of its use however remains to be seen. This study aimed to determine whether cellular phones have effects on the development of white mice. Eighteen pregnant white mice were divided into three groups subjected to the following treatments: T_0 - control/unexposed to cellphone radiation; T_1 - 18 hours exposure/day for 10 days; T_2 – 18 hours exposure/ day for 20 days. After 20 days, all treatment mice were sacrificed by cervical dislocation and the fetuses examined. Body weight, body length and morphology of each fetus were determined. Implantation and gestation indices were also computed. Data were analysed using Kruskal-Wallis Test. Results showed that the fetuses of exposed pregnant mice had significantly ($K= 15.00$, $P = 0.0006$) lesser body weight than the control. T_0 had an average body weight of 1.15g while T_1 and T_2 had 0.51g and 0.36g respectively. They had significantly ($K= 14.44$, $P = 0.0007$) shorter body length than the control. T_0 had an average body length of 2.22 cm while T_1 and T_2 had 1.48 cm and 1.39 cm, respectively. Morphological examination of the fetuses revealed no difference in terms of the number of eye slits, ears, legs and digits. The treated mice however appeared to have less developed organs than the control. The treated mice also had slightly lower implantation indices. It is concluded that cellular phone radiation at Specific Absorption Rate (SAR) of 1. 24 W/kg caused growth retardation in white mice fetus.

Keywords: cellular phone, radiation, white mice, pregnancy, growth retardation

BS-17

TERATOGENIC EFFECT OF *Datura metel* LEAF AQUEOUS EXTRACT ON THE EMBRYO OF *Danio rerio*

Suzzeth M. Untalan
Natural Sciences Department, College of Arts and Sciences
Manila Central University, Caloocan City; suzzeth_untalan@yahoo.com

Gross morphological observation was done on the embryos of *Danio rerio* (zebrafish) treated with leaf aqueous extract of *Datura metel* (talampunay or talong-punai). Since talampunay has been known for its medicinal importance as well as its narcotics effect, its teratogenic effect was evaluated using zebrafish embryo. The embryos were subjected to leaf decoction with a ratio of 1 gram of leaves to 1 ml of water. Treatments were 0.01%, 0.05%, 0.1%, 0.5%, 1%, 5%, 10% and a negative control. The experiment was done in two replicates with ten embryos per treatment. After five days of observing and examining the gross morphology and development, it was found out that it greatly affected the development of the embryos as the concentration increases by delaying its maturity by 75% or even kill the embryos (all embryos at the 10% concentration). Thus, *D. metel*, especially the leaves, is a potential teratogen. This study may be useful in evaluating potential teratogens as well as the development of new therapeutic drugs safe for pregnancy.

Keywords: teratogen, teratogenicity, talampunay, *Datura metel*, zebrafish embryos

BS-18

ASSESSMENT OF RESILIENCY OF INTERTIDAL MANGROVE COMMUNITIES TO NUTRIENT FLUXES AND CLIMATE CHANGE

Teri S. Del Rosario[1], Aida P. Conanan[1],
Benelita R. Sucgang[2] and Raymond J. Sucgang[2]
[1]Regional Science High School for Region VI, and [2]R.J. Sucgang Center
for Research in the Natural Sciences, Aklan; cesarsed2002@yahoo.com

This study investigated the effects of the different factors such as variations in the amount of sunlight, ambient temperature, soil and water nutrients (sodium, potassium, and phosphorus), rainfall, and tidal events which potentially affect productivity and resiliency in intertidal mangrove communities. The following study sites were selected: Site 1: intertidal zone affected by nutrient discharges of proximate agricultural activities and hardly rinsed by tidal waterlogging; Site 2: primeval/pristine intertidal community recurrently rinsed by tidal inundation; Site 3: intertidal zone receiving nutrient loads from residential communities but instantaneously dispatching nutrients in recurrent tidal flooding. The study evidently indicated that variability in light (100 to 5,000 fc), temperature (25-32°C), and relative humidity (30-50%) caused very minute effects in chlorophyll production in *Avicennia marina* mangroves. The mangroves' productivity, growth and development (estimated from O_2 production ~ ranged from 16.5 to 36.3 µ moles/l/hr) turned out to be resilient to the effects of humidity, temperature, and light. Rainfall events caused potassium surges in certain areas. Increase in the amount of rainfall did not upsurge soil nitrate and phosphorus concentrations in almost all of the sites. Likewise, fluctuations and outpouring of potassium and nitrate ions did not emerge to be the limiting or supplementing factor in the primary productivity of the mangrove community. The lone variable that established significant effects on chlorophyll production/photosynthetic activity was the soil phosphorus concentration. Seasonal reserve storage of phosphorus by mangroves during phosphorus outpouring in the rainy season has been established to intensify resiliency of the intertidal community by ensuring availability of phosphorus throughout episodes of phosphorus depletion during tidal waterlogging.

Keywords: intertidal zone, resiliency, nutrient fluxes, *Avicennia marina*, mangroves

BS-19

ECOLOGICAL ASSESSMENT OF MANGROVE COASTAL AREAS OF MULANAY, QUEZON, PHILIPPINES

Sherwin C. Abantao[1], Orlex B. Yllano[1], Theodore Clyde Apacible[1], Ma. Lourdes Orijola[2], Gerry C. Mediavillo[3], Sanny P. Cortez[3], Linar T. Pereda[3] and Joselito A. Ojeda[3]
[1]Center for Graduate Studies, Adventist University of the Philippines, Cavite; sherabantao@yahoo.com, obyupd@yahoo.com; [2]Department of Science and Technology and [3]Department of Tourism, Mulanay, Quezon

Mangroves are productive coastal ecosystems threatened worldwide. Rehabilitation of these mangroves is a priority of Mulanay municipality. Since there is no baseline information available to guide land managers and policy makers in implementing proper rehabilitation initiatives, this research aims to assess the species diversity, population density, species importance value, degree and type of impact and physico-chemical properties of the mangrove areas in Mulanay. Results revealed eleven species of mangroves belonging to five families. Dominant species is *Avicennia marina* (0.28). Three species from Patabog have higher importance value (IV), *Ceriops decandra* (1.97), *Rhizopora apiculata* (1.80), and *A. marina* (1.48). Six coastal barangays were disturbed by anthropogenic activities. Two showing rather high impact, one showing moderate impact. Soil analysis revealed that eight sites have 0.01- 0.02% nitrogen, 0.4 – 6 ppm phosphorus. Soil potassium ranges from 0.9-3.4 ppm and electrical conductivity from 2.92-11.15 mmhos/cm, respectively on all barangays. Sta. Rosa had the highest organic carbon (0.42 %)/organic matter (0.72 %). Ibabang Yuni had the lowest (0.11 %)/ (0.19 %). Sagongon and Butanyog had the highest pH (8.6), Patabog had the lowest (7.8). Coastal water monitoring showed that July had the highest temperature ranging from 29.9 - 32.3°C while January had the lowest (25.3 – 28.5°C). These results provide the information Mulanay needs on proper rehabilitation of mangroves. Currently, local government units adhere to the serious implementation of environmental laws for proper protection and conservation of mangroves.

Keywords: mangroves, diversity, conservation, rehabilitation, ecological assessment

BS-20

VEGETATION AND LAND-USE OF MAK-BAN GEOTHERMAL AREA, PHILIPPINES

Emmanuel R.G. Abraham[1], Susana M. Maligalig[2]
and Amelita C. Luna[3]
[1]Consultant, [2]HES Specialist and Environmentalist, CHEVRON
[3]University Researcher, Office of the Coordinator for Research,
Extension and Linkages (OCREL), College of Forestry and Natural Resources,
University of the Philippines Los Baños; luna_amelita@yahoo.com

CHEVRON Geothermal Philippines, Inc. (CGPHI) and Aboitiz Power Renewable Inc. (APRI) are operating within the areas that are supporting multiple uses other than geothermal generation. Within their areas of operations are perennial crop-based agricultural areas, forest reserve, resorts, industrial and residential areas. One important aspect of generating geothermal power is taking care of watershed areas that are essential in protecting and maintaining healthy water recharge system and undertaking active conservation and rehabilitation efforts. The objectives of the study were to ground validate the cover areas identified as potential critical areas such as headwaters, riparian areas, areas with existing high canopy density and areas with biodiversity conservation potential and measure forest canopy density, list forest or perennial crop cover and assess land management practices. A total of 26 sample plots were established and measured within the project site. A greater proportion (from 67% to 91%) of the ecological influence areas are covered with vegetation canopies ranging from low to high density. The vegetation cover and land use in the area include intact natural forests (mossy forest, lowland dipterocarp forest), secondary forests, coconut plantations, fruit orchards, banana plantations, as well as grassland areas. All sub-watershed areas are more than 60% vegetation cover. Low vegetation density and built-up areas are concentrated on the lowland areas, which are privately owned. Overall, the lowland areas are dominantly coconut-based farms that are either multi-story or mono-perennial.

Keywords: critical areas, land-use, headwaters, perennial crop-based agricultural areas, riparian areas

BS-21

ECOLOGICAL STATUS OF CAMATIAN RIVER IN LUCBAN, QUEZON: A TRIBUTARY TO LAGUNA DE BAY

Maria Luisa A. Enal, Ma. Joeylynn V. Magallanes, Ann Joy P. Quindoza, Shiela A. Babia, Jacquilyn A. Bañal, Florence C. Maranan, Fidesmarie A. Villenas and Wilma L. Comia
Southern Luzon State University Lucban; airamlane@yahoo.com

Lucban, Quezon has seven rivers that drain to Laguna de Bay; Camatian River is one of them. The increasing population in the vicinity makes it and other tributaries exposed to rising environmental impacts due to domestic and agricultural wastes. This study was conducted to assess the ecological health of Camatian River which is hope to serve as an awakening call to the people of the consequent total impairment of this resource and public health problems. Epilithic algae were collected from three sampling stations from June to November 2008 and were analyzed for species abundance and diversity. Water samples were analyzed for physico-chemical parameters and fecal coliform. Biological indices were also determined. Results showed high levels of fecal coliform bacteria (1.4×10^7 MPN/100 ml sample), total dissolved solids (291 µS/cm), NO_3-N (1.63mg/L) and dissolved PO_4-(0.98 mg/L) but low level of dissolved oxygen (4.46 mg/L). Microscopic analysis revealed that of the 32 algal species in Camatian River, seven were moderately to highly pollution tolerant with *Nitzchia palea* as the most dominant. For biological indices, it has high algal pollution index (16-28) and low Shannon diversity index (1.404-2.349). Parameters imply that Camatian River is moderately to heavily polluted. The quality of water falls under Class D according to National Standards and threatens the remaining aquatic organisms present. Data obtained were presented to the Local Government Unit as baseline information for the development of a comprehensive rehabilitation, conservation and monitoring program for Camatian River.

Keywords: ecological assessment, Lucban, Quezon, epilithic algae, water quality, algal pollution index

BS-22

ENVIRONMENTAL CONDITIONS INFLUENCING DAYTIME ABUNDANCE OF MESOZOOPLANKTON AND ICHTHYOPLANKTON IN MARINE RESERVES IN ILIGAN BAY, NORTHERN MINDANAO, PHILIPPINES

Ephrime B. Metillo, Stephanie P. Faith Ravelo,
Jan Alfred P. Duyaguit, Leomir S. Diaz
Department of Biological Sciences, Mindanao State University-
Iligan Institute of Technology; ephrime.metillo@g.msuiit.edu.ph

Coral reef associated zooplankton provide nourishment to larvae and juveniles of resident fish and invertebrate species. Eggs, larvae and juveniles of many reef species of prime ecological and economic importance recruit in the zooplankton. The clean waters of marine reserves are assumed to contain nutritious zooplankton, but the ecology of reef zooplankton in marine reserves is rarely studied. This study utilised multivariate redundancy analysis in order to discern possible relationship between selected environmental conditions and zooplankton abundance in five established marine reserves in Iligan Bay. Daytime quantitative sampling of zooplankton and environmental variables were conducted in marine reserves located in Initao, Dalipuga, Buruun, Kauswagan and Bacolod. We found statistically significant relationships in all five reserves, and evaluation of the importance of various environmental conditions using a Monte Carlo permutation yielded significant values for chlorophyll *a*, depth, pH, time and tide. For instance, peaks in abundance of fish eggs and fish prey copepods coincided with high chlorophyll *a* values, deeper depths, rising tides, and sampling times close to sunset (1700H). However, this was not explicitly shown by peaks in fish larvae abundance as unstudied variables like predation and hydrodynamics may be most important explanatory variables. In conclusion, this study demonstrates the usefulness of multivariate analysis in ascertaining environmental variables that influence peaks of abundance of mesozooplankton and fish eggs and larvae which are important indicators of the role and status of marine reserves.

Keywords: marine reserves, Iligan Bay, ichthyoplankton, ecology, zooplankton

BS-23

ASSESSMENT OF MANGROVES IN ENCLARO, BINALBAGAN, NEGROS OCCIDENTAL

Heide G. Taleon, Daisy G. Cari-an and Rosebella L. Malo
Department of Fisheries, Carlos Hilado Memorial State College
Binalbagan, Negros Occidental; cariandaisy@yahoo.com

This study was a descriptive survey on the assessment of mangroves conducted to identify the mangrove structures in the coastal areas of Barangay Enclaro. There were four sampling sites namely: Sitio Serena, SitioVietnam Rose, Sitio Alo and Sitio Tap-ok. The mangroves were assessed in terms of species, diversity, abundance, density and stages of life cycle. The quadrat method and the transect plots were used to perform floristic inventory of mangrove stands. There were 10, 4, 6 and 6 species of mangroves in Serena, Vietnam Rose, Alo and Tap-ok sites, respectively. *Rhizophora mucronata* comprised 55.22% of the total stands in Serena and *Avicennia marina* which covered 72.21% in Vietnam Rose, 81.19% in Alo and 40% in Tap-ok. Serena had the most diverse mangrove species. *A. marina* was the most abundant and dominant mangrove species which covered 66.47% of the total population. The mangroves in Vietnam Rose had the highest density of 15.94 mangroves/m^2. The stages of mangroves' life cycle were 50.67% seedlings, saplings comprised 25.20% and mature mangroves composed 24.13% of the total population. Sitio Alo had the least mangrove stand and the results of this study would serve as baseline information for the local government units for mangroves and coastal ecosystems' conservation, management and development.

Keywords: ecological mangroves assessment, species, abundance, density, diversity stages of life cycle

BS-24

POLLUTERS AND WATER QUALITY OF CEBU CITY RIVERS

Pedro P. Cuizon, Cecilio S. Baga and Bonifacio S. Villanueva
Cebu Technological University, Cebu City; csbaga@yahoo.com

The study was conducted to determine the water quality of the Palma river in Cebu City and the main causes of the river's severe water pollution. Laboratory technique and Contingent Valuation Method (CVM) were used in this study, with the Barangay officials and purok leaders as trained respondents. The findings revealed that the waters of the river had opaque to black color emitting bad odor; a pH value of 7.4; Dissolved Oxygen at zero (0); BOD at 150 mg/L; TSS at 27 mg/L; temperature at 29°C. Soil of the river bed is black. Waste disposal practices of riverbank residents (95%) and industries and commercial establishments (5%) within the runoff area were the causes of pollution of river water. The major source of waste water discharges that directly drains into the river were residential, commercial, and industrial effluence. Sickness occurrence per year per were fever (22% of the households); cough and colds (27%); allergies (9%); asthma (8%). Respondents were not aware (80%) on what a waste treatment facility is. Respondents were willing to pay an amount of PhP50.00 a month as charge per household for wastewater treatment fee based on the volume of water consumption gauged on Metropolitan Cebu Water District meter system. Policy for the tariff system shall be necessary.

Keywords: pollutants, environment, contingent valuation method

BS-25

ASSESSING WATER QUALITY AND LARVAL MOSQUITO ABUNDANCE IN CALOOCAN CITY, PHILIPPINES

Glenn L. Sia Su
Biology Department, University of the Philippines Manila
siasug@gmail.com

This study aims to examine the relation of the water quality parameters of the breeding habitats of mosquitoes from randomly selected communities of Caloocan City, Philippines to the abundance of the larval mosquitoes inhabiting these breeding habitats. Water samples obtained from the breeding habitats were assessed for dissolved oxygen, pH, conductance, and salinity. Mosquito larva surveys were conducted in all breeding habitats. The 4th instar mosquito larvae obtained were identified at the genera level. The relationship between the abiotic variables (dissolved oxygen, pH, conductance, and salinity) and the abundance of mosquito larvae was investigated through a regression analysis. Results showed that there are three common genera of mosquito larvae surveyed in all the breeding habitats: *Aedes sp*., *Anopheles sp.*, and *Culex sp.* Among the three genera, *Aedes* was the most common genus among the larval mosquitoes identified. All water samples obtained from the breeding habitats were within the water quality standards. Results of the multiple regression analysis suggest that dissolved oxygen is the best predictor variable associated with the abundance of mosquito larvae (Y = -37.92 + 8.00 [DO], r^2 = 0.145, $P < 0.05$). The dissolved oxygen in the waters plays an important role in the abundance of larval mosquitoes in breeding habitats.

Keywords: mosquito larva, water quality, abundance, dissolved oxygen

BS-26

ULTRASTRUCTURAL PREDATORY ACTIVITY OF *Arthrobotrys oligospora* ON PARASITIC JUVENILE STAGES OF CITRUS NEMATODE, *Tylenchus semipenetrans*

Gina Leah A. Dizon, Jonar I. Yago and Liberty G. Torres
Nueva Vizcaya State University; gdizon@yahoo.com

This experiment tried to harness nematode trapping fungi as biological control agent against the causal organism of citrus decline, *Tylenchus semipenetrans*. *Arthrobotrys oligospora* was taxonomically characterized and they belong to a group of nematode-trapping fungi, which possessed specialized structures in the form of rings, which are extensions of the mycelium to capture, kill and digest nematodes. Initial population density (IPD) was recorded and population build up started on the month of February and reach the peak in the month of May and eventually declined in August. The time of effective parasitism was noted between 4 to 8 days after inoculation. *T. semipenetrans* starts to capture 24 hours after inoculation. Ultramicroscopic study revealed that the presence of ring-nets, adhesive conidia and hyphae are the structures for predaceous ability of *A. oligospora* against *T. semipenetrans*. *In vitro* and *in vivo* study proved that there was a significant reduction of juvenile stage of *T. semipenetrans* when a nematode-trapping fungus was used.

Keywords: predatory activity, *Arthrobotrys oligospora*, *Tylenchus semipenetrans*, parasitic juvenile stage

BS-27

STATUS OF BUTTERFLIES IN DINAGAT, PHILIPPINES

Alma B. Mohagan and Dave P. Mohagan
Department of Biology, Central Mindanao University, Bukidnon
almohagan@gmail.com

Information on the status of butterflies in the three habitat types of Dinagat is herewith provided. Belt transect, light and malaise traps and time constraint samplings were employed in the three mountains namely: Mt. Paragua, Mt. Redondo and Mt. Kimbinliw. Data revealed 102 species of butterflies. Of these, 72 or 71% were endemic: ten rare Philippine endemic, 18 common Philippine endemic, 1 very rare Philippine endemic, 3 rare Mindanao endemic, 6 common endemic and 2 rare Dinagat Island endemic. Three of the species are new record to the Philippines, 4 new record to Mindanao namely: *Cephrenes ocalle chrysozona*, *Hyarotis iadera*, *Tagiades gana elegans* and *Taractrocera luzonensis luzonensis*, 58 new record to Dinagat and 28 recorded species in Dinagat islands in the previous study. The 102 species with 71% endemism and the presence of newly recorded and possible new species to science are noteworthy for conservation. Fifty percent of the species found in each habitat are disconcordant and most of the endemics were found in the forest habitats. These simply suggest that forests are important in sustaining the lives of the endemic butterflies in the area.

Keywords: diversity, butterflies, Dinagat Islands

BS-28

MYCOCHEMICAL ANALYSIS, NUTRITIONAL CHARACTERIZATION AND TOXICITY OF *Lentinus tigrinus*, A PHILIPPINE EDIBLE MUSHROOM

Rich Milton R. Dulay[1], Sofronio P. Kalaw[1], Renato G. Reyes[1], Esperanza C. Cabrera[2], Noel F. Alfonso[2] and Fumio Eguchi[3]
[1]Center for Tropical Mushroom Research and Development, Central Luzon State University, Nueva Ecija; richmiltondulay@yahoo.com
[2]Department of Biology, College of Science, De La Salle University Manila
[3]Takasaki University of Health and Welfare, Gunma, Japan

Lentinus tigrinus is a wood-rotting fungus that is usually found growing on fallen logs during the onset and middle part of the rainy season where moisture is abundant. This mushroom has a great potential for cultivation. Its relative, *Lentinula edodes* was introduced in the country due to its aroma and applicability for gourmet purposes. Though most preferred, cultivation of *L. edodes* in the country is being delimited due primarily to its semi-temperate requirement for growth. One of the best alternatives is to search a nutritious local counterpart. In this study, we determined the proximate nutritional and mycochemical contents of fruiting bodies of *L. tigrinus* harvested in the formulation of rice straw-sawdust based substrate. The lyophilized extract of *L. tigrinus* was tested in female ICR mice following the single dose toxicity test by oral gavage for its biosafety. Both air-dried pileus and stipe of *L. tigrinus* hold promising nutritional contents. The pileus had higher amount of crude protein (25.90%), crude fat (2.12%), ash (7.41%) and moisture (12.20%), while the stipe had higher amount of carbohydrates (43.02%) and crude fiber (24.74). Moreover, flavonoid was the only chemical constituent detected in the hot water extract. Acute single oral toxicity test in mice confirmed that *L. tigrinus* is toxicologically safe. Altogether, *L. tigrinus* is an addition to the newly recorded safe, edible and nutritious mushroom of the Philippines

Keywords: *Lentinus tigrinus*, mycochemical, nutritive, toxicity, edibility

BS-29

IDENTIFICATION AND CHARACTERIZATION OF THE CHALCONE SYNTHASE GENE (CHS) IN *Curcuma longa* L. AND *Curcuma zedoaria* Rosc. RHIZOMES

Vivian A. Panes, Emilio Serafin Adriano,
Mennold Archee P. Redota and Neil H. Tan Gana
Department of Biology, School of Science and Engineering,
Ateneo De Manila University, vpanes7@yahoo.com, vpanes@ateneo.edu

Chalcone synthase catalyzes the production of a number of secondary metabolites in *Curcuma longa* L. and *C. zedoaria* Rosc. The objective of this research is to identify the chalcone synthase gene which encodes for Chalcone synthase enzyme. Gene specific primers for chalcone synthase (CHS) gene were designed using the software VectorNTI. The sense primer has the sequence 5'–CAAGGACCTGGCGGAGAACA-3' and the antisense primer 5'-CGCTTCCTCACCTCGTCCAT-3'. Both primers have 20 base pairs with an optimum melting temperature of 57°C. Genomic DNA of *C. longa* L. and *C. zedoaria* Rosc. were extracted. PCR amplification settings were optimized. Different DNA template dilutions of 1:20, 1:50 and 1:100 were used. At 60°C melting temperature (denaturation1:00; annealing 1:00; elongation 2:00), there were no distinct PCR products that were produced. In the second PCR trial, 61°C was used as the melting temperature (denaturation 0:30; annealing 0:30; elongation 1:00). Faint bands were observed at the 1:100 dilutions for both *C. longa* L. and *C. zedoaria* Rosc. The 1:100 dilution was subjected to $MgCl_2$ gradient concentration. Different concentrations of $MgCl_2$ (0.5 mM, 1.00mM, 2.00 mM and 2.5 mM) were used. Distinct bands emerged in the agarose gel after electrophoresis at the 2.00 mM and 2.5 mM $MgCl_2$ for *C. longa* L. and 2.00 mM $MgCl_2$ for *C. zedoaria* Rosc. The primers designed were able to amplify the chalcone synthase gene (CHS) gene in *C. longa* L. and *C. zedoaria* Rosc. at the optimum PCR profile and the optimized concentration of MgCl2 in the second PCR trial. Hence, the chalcone synthase gene for *C. longa* and *C. zedoaria* was identified using a gene specific primer.

Keywords: Chalcone synthase gene, Zingiberaceae, *Curcuma*, *C. longa*, *C. zedoaria*

BS-30

MOLECULAR SEQUENCE CHARACTERIZATION OF THE GLYCOLYTIC REGULATORY ENZYME, PHOSPHOFRUCTOKINASE IN *Cocos nucifera* L.

Reggie Yadao-dela Cruz
Central Mindanao University, Bukidnon; reggiecmu@yahoo.com

Normal coconut and mutant *makapuno* endosperms profoundly differ in their carbon metabolism. In an attempt to explore the makapuno phenomenon, the most important regulatory enzyme of glycolysis, phosphofructokinase (PFK), was cloned and characterized. cDNA from isolated total RNA was used as a template during PCR with the designed primers. The cloned *cnpfk* partial sequence is composed of 1230 bp and found most similar to a bamboo *Phyllostachys edulis* cDNA clone (FP093159.1) with 80% maximum identity (= 1070 bits; E=0.0) upon BLASTn analysis. It has 79% maximum identity (E=0.0) to sequences of *Vitis vinifera*, *Oryza sativa*, *Ricinus communis*, *Sorghum bicolor* and *Zea mays*. The 1230-bp sequence designated as *cnpfk* is 59.6% of the 2067-bp *P. edulis* cDNA clone and 62% of the 1988-bp sequence of the *R. communis* phosphofructokinase (XM_002514143.1). It codes for a 410-amino acid protein sequence with conserved domains characteristic of the PFK superfamily. The translated protein has several active sites, binding sites for fructose-1,6-biphosphate, binding sites for ADP/pyrophosphate binding, allosteric effector sites and a dimerization interface. BLASTP analysis of the translated protein revealed its highest homology (736 bits; E=0.0) to *R. communis* phosphofructokinase. High homology was also seen with similar sequences from *V. vinifera* (733 bits; E= 0.0); *Arabidopsis thaliana* (733 bits; E= 0.0); *O. sativa* (723 bits; E= 0.0) and *Z. mays* (715 bits ; E= 0.0). BLAST analyses of five other genes involved in carbon metabolism from previous studies - enolase, glyceraldehyde-3-phosphate dehydrogenase(GAPD), pyruvate kinase, beta -ketoacyl carrier protein synthase I (KASI) and pyruvate decarboxylase - were carried out. Results pointed to *R. communis* as another oil-storing plant whose data can be used as basis for further studies on coconut molecular genetics and physiology and most especially in exploring the molecular basis of the makapuno phenomenon.

BS-31

PRELIMINARY ESTIMATION OF GENETIC VARIATION THROUGH ISOZYME ANALYSIS IN FRESHWATER SARDINES, *Sardinella tawilis* (Herre), FROM TWO DIFFERENT SITES NEAR TAAL LAKE: LEMERY AND TALISAY, BATANGAS

Joan Christine O. Adajar, Rosalina N. Tandang,
Ma. Cecilia S. Reamillo and Ma. Carmina C. Manuel
Genetics and Molecular Biology Division, Institute of Biological Sciences,
University of the Philippines Los Baños; jcoadajar@yahoo.com

Genetic variation in freshwater sardines, *Sardinella tawilis* (Herre), from two sites near Taal Lake: Lemery and Talisay, was determined through isozyme analysis using four enzyme systems: acid phosphatase (ACP), alkaline phosphatase (ALP), esterase (EST), and malic enzyme (ME). The eye, heart, and muscle tissues were collected. Results revealed four presumptive loci in both populations (ACP-1, ALP-1, EST-1, ME-1). An interpopulation variation was noted between the eye and muscle tissues of the two populations in terms of EST-1. The degree of genetic variability within each population was determined by calculating the proportion of polymorphic loci (P), average number of alleles (A), and average heterozygosity (H). The genetic variation between organs and between populations was assessed through the estimates of genetic identity (IN), genetic distance (D), and genotypic similarity (IH). Among the organs, the heart showed the highest genetic variability based on the P (0.75), A (1.75), and H (0.369-0.371) values in both populations. Isozyme variation in the organs could be attributed to the differences in their physiological functions. The computed IN, D, and IH showed the same trend in the two populations, wherein the eye tissues had greater relatedness with muscle tissues. The two populations when compared revealed the same values for P (0.75) and A (1.75). However, the average heterozygosity was slightly higher in the Talisay population (H=0.291) than the Lemery population (H=0.249). The computed values for IN (0.929), D (0.074), and IH (0.869) implied high relatedness between the two populations showing that the geographical distance between Lemery and Talisay is not enough to produce significant isozyme variation based on the enzyme systems used.

Keywords: *Sardinella tawilis*, isozymes, starch-gel electrophoresis, genetic variation, isozyme polymorphism

BS-32

EVALUATION OF THE IMMUNOMODULATORY ACTIVITY OF *Macaranga mappa* (EUPHORBIACEAE) ETHANOL EXTRACTS IN BALB/C MICE

Mellissa C. Alcantara and Elena S. Catap
Institute of Biology, College of Science,
University of the Philippines Diliman; elenacatap@yahoo.com

Plant bioactive products have been used as medicine for as long as man's history, from being a cure to the common cold to being chemopreventive agents. This study focuses on the immunomodulatory activity of the ethanolic extract of *Macaranga mappa*, in immunosuppressed Balb/C mice. Thirty-six mice were divided into three groups, and treatments were orally administered through gavage for seven (7) days. The negative control group was treated with phosphate-buffered saline (PBS), while the positive control group was treated with cyclophosphamide (CP), an immunosuppressant. The mice in the plant extract group (M + CP) were gavaged with CP at days 1, 4 and 7 at one hour post-administration of the plant extract, which was done daily at 50 mg/kgBW. Lymphocyte proliferation, reactive oxygen species (ROS) production, and plasma lysozyme levels were measured at day 8 of the experiment. Cell proliferation was significantly higher in the CP + M group compared with the positive control group (with LPS, p=0.003; ConA, p=0.000). However, the addition of the mitogens, lipopolysaccharide and concanavalin A, specific for B and T lymphocytes, respectively, had minimal effects in cell proliferation. ROS production was likewise highest in the plant extract group (CP + M, 0.57 nmol O_2-/2.5 x 10^5 cells/30 min) but the difference was not statistically significant. The plasma lysozyme level in the plant extract group was only comparable to that of the positive control group. This suggests that ROS production is the preferred pathway for bacterial killing instead of cell lysis via lysozyme, and further indicates the antimicrobial activity of the plant extract. Overall, the results show that M. mappa could be an effective microbicidal agent, and has potential immunostimulatory actions, but further screening of the plant's bioactive products are required to validate these effects.

Keywords: *Macaranga mappa*, immunomodulation, Balb/C mice, antioxidant, cyclophosphamide

BS-33

THE EFFECTS OF *Tabernaemontana pandacaqui* POIR. LEAF EXTRACT ON SOME NONSPECIFIC IMMUNE RESPONSE OF CYCLOPHOSPHAMIDE-TREATED BALB/C MICE

Charmaine R. Peredas and **Elena S. Catap**
Institute of Biology, College of Science
University of the Philippines Diliman; elenacatap@yahoo.com

The immunomodulatory effects of *Tabernaemontana pandacaqui* POIR. ethanolic leaf extract were determined in immunosuppressed Balb/C mice using nonspecific immune assays. Thirty-six (36) mice were grouped into: (1) negative control mice, given with sterile phosphate-buffered saline, 50 mL/kgBW; (2) positive control mice, injected with cyclophosphamide as immunosuppressant, 30 mg/kgBW, at days 1, 4, and 7 of the treatment period; and (3) plant-extract treated mice, orally-gavaged (5 mg/kgBW) daily for 7 days, and injected with cyclophosphamide one hour after the extract administration at days 1, 4 and 7 of the treatment period. Production of reactive oxygen species (ROS) or superoxide anion, proliferation of T and B lymphocytes and plasma lysozyme level were determined in the three groups of mice. Results showed that the plant extract-treated mice exhibited the lowest ROS production ($^{-}$0.1181 nmol O_2-/2 x 10^5 cells/30 min) after 30 min incubation of macrophages. This suggests that the leaf extract inhibited this response which could indicate its potential as antioxidant. The plant extract-treated mice had the least percentage of cell proliferation with the addition of either lipopolysaccharides (LPS, 80% < control) and concanavalin A (ConA, 60% < control). The mitogens failed to stimulate the proliferation of T and B lymphocytes, which means that the plant extract has a potential anti-inflammatory and anti-cell proliferation. For the lysozyme activity assay, the plant extract had higher activity that the cyclophosphamide-treated mice but it was not significantly different. In general, the leaf extracts of *T. pandacaqui* had immunosuppressive effects on Balb/C, which were consistent with reported studies on the genus *Tabernaemontana*. It is recommended that further studies be undertaken to determine effective dose and modulatory effects of the plant by using other immune response assays.

Keywords: *Tabernaemontana pandacaqui*, immunomodulation, Balb/C mice, immunosuppresion, cyclophosphamide

BS-34

DIFFERENT LEVELS OF CONFINEMENT STRESS: ITS EFFECT TO THE IMMUNE SYSTEM OF *Mus musculus*

Doreen D. Domingo[1], and Asuncion C. Saguid[2]
[1]Mariano Marcos State University Batac; dr_dhee_dee@yahoo.com
[2]Saint Louis University, Baguio City

Stress response occurs in an animal if it perceives an external condition (stressor) that threatens to compromise its well being. This involves: (1) release of cathecolamines, associated with sympathetic stimulation causing physiological response called the fight-or-flight response; and (2) release of glucocorticoids, giving suppressive effects on the immune system specifically the white blood cell count. To demonstrate how different levels of confinement stress can affect the immune system of white mice, differential white blood cell (WBC) count was performed considering with (experimental) and without (control) application of confinement stress to male and female mice using different PVC pipes with different chamber diameters: 2.0 in.,1.75 in, 1.5 in, and 1.25 in. As a result, lymphocytes decrease in number (male: $\bar{x}$ = 38.00, 35.00, 33.50, 25.00, female: $\bar{x}$ = 45.50, 44.00, 33.50, 29.50) as the diameter of the confinement chambers decrease (from 2.0 in, 1.75 in, 1.5 in, 1.25 in). High magnitude of stress is shown in the smallest diameter (1.25 in) of confinement chamber. Ironically, the number of neutrophils increases (male: $\bar{x}$ = 17.00, 23.50, 32.50, 40.00, female: $\bar{x}$ = 17.50, 21.50, 32.50, 39.50) as the diameter of the chambers decreases. Hence, as lymphocytes decrease, the neutrophil count increases in both male and female mice. The effect of the different levels of confinement chambers between male and female mice was comparable. Hence, confinement stress has a role impact on the immune system as demonstrated in the differential WBC of white mice.

Keywords: confinement, differential WBC, stress, white mice, neutrophil, lymphocyte

BS-35

MICROBIAL ENUMERATION AND DETECTION OF *Staphylococcus aureus* FROM THE SELECTED DRIED FISHERY PRODUCTS

Corazon P. Macachor
Cebu Technological University, Cebu City
cora_macachor@yahoo.com

Taboan Market in Cebu City, Philippines is the most famous source of dried *danggit, pusit* and *mangsi* which serve as *pasalubong* for local and foreign tourists in Cebu City. The Cebu Technological University researchers visited the dried processing firms located near the coastal areas of Cebu City and Talisay City, Cebu. The study revealed that the processors were not aware of good manufacturing practices for fish drying. Samples of the top three best seller dried products at Taboan Market were analyzed as to bacterial and fungal total plate count with the detection of *Staphyloccoccus aureus*, in colony forming unit, using 3M-Petrifilm and pour plate method. The pH and water activity levels of the products were determined. The dried *danggit, pusit* and *mangsi* had bacterial total plate count of 1.0×10^4 cfu/g, 2.5×10^4 cfu/g and 5.0×10^4 cfu/g, respectively; mold count of 2.3×10^1 cfu/g, 2.0×10^1 cfu/g, and 1.5×10^1 cfu/g. The *S. aureus* count of 30, 50 and 100 cfu/g sample for dried *danggit*, *pusit* and *mangsi*, were within the acceptable standards of Bureau of Food and Drug Administration. The pH level of dried fish samples was within 6.1 to 6.5, while the water activity of the dried products is 0.98 based on Lupin's water activity (Aw) mathematical calculation. Continuing studies on packaging and good manufacturing practices of dried fish products will be conducted to ensure microbial reduction.

Keywords: microbiology, dried products, water activity, *danggit*, *pusit mangsi*

BS-36

MOLECULAR DIVERSITY OF RUMEN METHANOGENS IN CARABAO AND CATTLE IN RESPONSE TO DIETARY TANNIN

Gondelina A. Radovan
College of Agriculture, Southern Luzon State University Lucban
gar_328@yahoo.com.ph

The molecular diversity of rumen methanogens in domesticated carabao and cattle fed tannin – containing banana leaves or supplemented with commercial tannin extract was assessed using polymerase chain reaction – denaturing gradient gel electrophoresis (PCR-DGGE). Primer set 0357 F- GC and 0691 R was used to amplify the methanogenic archaeal community of the rumen. A total of 26 DNA fragments were excised from DGGE gels and their nucleotide sequences were successfully determined. PCR-DGGE band profile and nucleotide sequence analysis revealed that domesticated carabao harbors fewer methanogens compared to cattle. Methanogen resembling *Methanobrevibacter sp.* YE288 is the predominant methanogen in carabao while *Methanobrevibacter thaueri* strain CW and *Methanobrevibacter millerae* strain ZA-10 are the predominant ones in cattle. Feeding of tannin–containing banana leaves remarkably altered the methanogen composition of both carabao and cattle more than commercial tannin extract supplementation in the diet.

Keywords: methanogens, cattle, tannin, banana leaves

BS-37

APPLICATION OF *Salmonella* DAS™ KIT FOR RAPID MONITORING OF *Salmonella spp.* IN COMPOSTS AND OTHER ENVIRONMENTAL SAMPLES

Teresita J. Ramirez, Jennifer D. Saguibo, Susan A. Sedano, Arsenia B. Sapin, Armi R. Creencia, Christine B. Brown, Nik Shawn C. Tabao and Noel H. Tan Gana
National Institute of Molecular Biology and Biotechnology (BIOTECH), University of the Philippines Los Baños; ramirez.tj@gmail.com

The suitability of organic composts as soil conditioners and fertilizers in agriculture should be evaluated in terms of hygienic status and microbial quality prior to their application to avoid potential hazards to consumers. This study was conducted to test the applicability of the PCR-based *Salmonella* DAS™ kit developed at BIOTECH in monitoring *Salmonella* in various compost samples. Samples that include manure composts, water, and soil samples were artificially-spiked with *Salmonella typhimurium* BIOTECH 1826, and evaluated using the DAS™ kit and the conventional culture plating method. The established protocol that involved two enrichment stages of 20h+3h previously applied for foods and feeds was applied to manure and environmental samples. Collaborative study with Philippine National Collection of Microorganisms yielded 97.3% agreement between the two methods used. To further improve the agreement value, the protocol was modified by extending the second enrichment stage from 3h to 6h which resulted to 100% agreement value. Therefore, the PCR-based Salmonella DAS™ kit could be used in monitoring *Salmonella* in manure composts and other environmental samples by employing the modified 20h+6h two-stage enrichment protocol. This PCR-based detection kit is more effective, more sensitive and more rapid with fewer manipulations for 28h compared with the culture plating that takes 5-7 days to complete.

Keywords: composts, manure, PCR-based, *Salmonella* DAS™ kit, *Salmonella typhimurium*

BS-38

USE OF *Salmonella* DAS™ KIT FOR DETECTION OF *Salmonella spp.* IN SWABS OF CONTACT SURFACES

Arsenia B. Sapin, Teresita J. Ramirez,
Jennifer D. Saguibo and Susan A. Sedano
National Institute of Molecular Biology and Biotechnology (BIOTECH),
University of the Philippines Los Baños; ramirez.tj@gmail.com

Pathogenic bacteria, like *Salmonella*, should be routinely monitored in contact surfaces of food production plants, establishments and laboratories to ensure hygienic status and microbial quality of products for consumers. This study was conducted to test the applicability of the PCR-based *Salmonella* DAS™ kit developed at BIOTECH in monitoring *Salmonella* on contact surfaces of equipment, utensils, work place and workers' hands. Collaboration with Lipa Quality Control Center (LQCC) and Peter Paul Corporation was conducted to validate the *Salmonella* DAS™ kit. *Salmonella* monitoring was subjected to two detection protocols- the *Salmonella* DAS™ kit protocol and the culture method using Bismuth Sulfite Agar. Results showed that the protocol of *Salmonella* DAS™ kit recommended and validated for foods and feeds can be used to monitor *Salmonella* in swabs of contact surfaces. In 58 samples analyzed, a relatively high 89.65% agreement between the two methods was obtained. However, more contact surfaces samples of different food processing establishments/ companies have to be tested to further improve method agreement.

Keywords: contact surface, percent agreement, PCR-based, *Salmonella*, *Salmonella* DAS™ kit

BS-39

MOLECULAR DETECTION AND PHYLOTYPING ANALYSIS OF *Ralstonia solanacearum* ISOLATED FROM WHITE POTATO AND REDUCTION OF ITS POPULATION BY BIOFUMIGATION

Danah Jean A. Concepcion[1], Mark Angelo O. Balendres[2], Fe M. Dela Cueva[2], Michelle J. Vergara[2], Edna Y. Ardales[3], Valeriana P. Justo[3], Nandita Pathania[4] and Peter Trevorrow[4]

[1]Graduate School [2]Institute of Plant Breeding and [3]Crop Protection Cluster, University of the Philippines Los Baños; fmdcuevayahoo.com

[4]DEEDI, South Johnstone Queensland, Australia

Ralstonia solanacearum strains infecting *Solanum tuberosum* (white potato) in the Philippines were analyzed for genetic variation at the level of phylotype and pathogenicity on tomato or potato. Isolates were confirmed *R. solanacearum* by polymerase chain reaction using the 759/760 primer pair specific to *R. solanacearum* which generated a 280 bp diagnostic fragment. Phylotype analysis divided the isolates into two phylotypes, phylotype I and phylotype II, that corresponds to two genetic groups based on the ITS region. Variation in phylotypes was associated with elevation of the geographic origin of the isolates. Phylotype II which contains the race 3 potato pathogen and isolated primarily from America, was observed among the isolates collected from the highlands in Benguet and one site in Bukidnon while phlotype I, which includes all strains isolated primarily from Asia, was mainly observed among the isolates collected from Bukidnon, Davao del Sur and one site in Benguet with a low elevation. This is the first report of the presence of *R. solanacearum* phylotype II identified from white potato in the Philippines and strains belonging to phylotype I that are pathogenic to potato. Moreover, management of *R. solanacearum* was also explored using radish and sunflower plant under greenhouse condition to determine its effect on population as well as the subsequent reduction in tomato wilting incidence and severity. Bacterial populations in sunflower- and radish-treated soil were significantly lower than the untreated soil one (1) month after incorporation. Likewise, there was a significant reduction in disease incidence and severity of wilting in plants treated with radish (34.50-40.50%) and sunflower (10-40%) relative to the control (75%). The results revealed suppression of the bacterium in the soil that consequently lowered the disease incidence.

Keywords: *Ralstonia solanacearum*, white potato, phylotypes, polymerase chain reaction, biofumigation

BS-40

PERITHECIAL AND ASCOSPORES DEVELOPMENT OF *Haematonectria haematococca* CAUSES TWIG BLIGHT DISEASE OF CITRUS IN THE PHILIPPINES

Jomar L. Dulnuan[1], Jonar I. Yago[1], Danuwat Peng-ont[2] and Sunchai Aroonrungrote[2]
[1]Nueva Vizcaya State University, Nueva Vizcaya; jlugay@yahoo.com
[2]Institute of Product Quality and Standardization, Maejo University, Thailand

This is the first report of a teleomorph stage of *Fusarium solani* that infect citrus in the Philippines. *Haematonectria haematoccoca* isolated from twigs of citrus plants with twig blight disease proved to be the ascoma stage of *F. solani*. A single ascospores culture produced sporodochia with masses of brown macroconidia and microconidia. Ascospores were didymospore with thallic conidiogenesis, bitunicate, septated hyphae and germinated bipolarly. The ascoma was orange in color containing asci and ascospores. The asci were bitunicate operculate and the the ascal apex is extremely thick and pierced by a narrow canal. The asci vary in shape from cylindric to spherical. Each ascus contains four 2-celled hyaline spores. Ascoma was produced 22 days after inoculation and conidia with few paraphyses were seen on the ostiole portion at 25 days after inoculation. Matured conidia were released from the ascoma at 27 days after inoculation and started to disperse for the next cycle of infection.

Keywords: perithecia, ascospores, *Haematonectria haematoccoca*, twig blight disease, teleomorph

BS-41

MORPHOGENESIS OF *Lentinus sajor-caju* Fr.

Karen Kae Santos, Rich Milton R. Dulay,
Sofronio P. Kalaw and Renato G. Reyes
Center for Tropical Mushroom Research and Development
Department of Biological Sciences, College of Arts and Sciences,
Central Luzon State University, Nueva Ecija; spk31162@yahoo.com

Lentinus sajor-caju is commonly known as white rot fungus and one of the wood decaying fungi that usually grows in clusters on fallen logs during the onset and middle part of rainy season. It is tough with a well developed central stalk or stipe with whitish to grey fan shaped mushroom and become brown and curled when it is totally matured. The CLSU Mushroom Center has domesticated this species of mushroom from the wild. With the desire to develop production technology for the commercial cultivation, we studied the morphogenesis of this mushroom on different indigenous culture media and physical factors. Corn grit decoction recorded the highest spore germination with a mean of 76.66% while sweet sorghum decoction had the lowest spore germination with a mean of 46.66% after 10 hours. Among the physical factors evaluated pH 8.0, air condition temperature (23˚C) and total light recorded the highest spore germination. The basidiospores have unusual type of germination. The spore coat was retained which ultimately become part of the hypha and later grew and developed to a fully grown basidiocarp. The process of spore germination of *L. sajor-caju* consisted of five major stages, namely: liberation of the basidiospores from the basidiocarp; swelling of the basidiospore (after 7 hours); elongation of the hypha (after 10 hours); septation of the hypha (after 16 hours) and; branching of the monokaryotic primary mycelia (after 20 hours).

Keywords: *Lentinus sajor-caju*, morphogenesis, indigenous culture media, basidiospores, physical factors

BS-42

GENE SILENCING OF VP9: A NOVEL NONSTRUCTURAL PROTEIN FROM WHITE SPOT SYNDROME VIRUS AND ITS ROLE IN SHRIMP-VIRUS INTERACTION

Rod Russel R. Alenton and Mary Beth B. Maningas
College of Science, Research Center for the Natural Sciences
University of Santo Tomas; russel.alenton@gmail.com

White Spot Syndrome Virus (WSSV) remains the most widespread and devastating infectious agent that hit the shrimp aquaculture industry worldwide. To date, there are no available cost-effective remedies yet for WSSV infection. Hence, functional studies on genes critical for viral infection, is essential in elucidating shrimp-virus interaction. Here we report, a newly identified WSSV gene, VP9, a non-structural protein predicted to have possible involvement in viral transcription. This study utilized gene knock-down technology through RNA Interference, to elucidate the function of VP9 in shrimp-virus interaction. Three set-up using twenty-two (22) *Macrobrachium rosenbergii daqueti* shrimps were prepared for treatment of dsRNA-VP9, dsRNA-GFP, and Phosphate Buffer Saline (PBS). Each shrimp was challenged with WSSV and survival rate was recorded. Three (3) shrimps were sampled on day 0, 1, 3, and 7 post-infection for gene expression analysis by RT-PCR. The VP9- and GFP-dsRNA injected shrimps showed a significant survival rate at 60 and 50 percent survival, respectively, compared to that of the PBS injected shrimp. Silencing of specific WSSV genes was observed as early as day 1 post infection, which further corroborates our challenge test data. Results showed that VP9 is critical in WSSV infectivity to the shrimp host. Therefore, silencing of VP9 might pave the way in preventing WSSV infection in shrimp.

Keywords: Gene silencing, double-stranded RNA interference, white spot syndrome virus

BS-43

A pCAMBIA EXPRESSION VECTOR CONTAINING THE BUNCHY TOP VIRUS NUCLEAR SHUTTLE PROTEIN (NSP) GENE

Mary Ann Robelle L. Polido and Vermando M. Aquino
Plant Molecular Biology and Plant Virology Laboratory
National Institute of Molecular Biology and Biotechnology
College of Science, University of the Philippines Diliman
vmaquino@mbb.upd.edu.ph

The nuclear shuttle protein (NSP) in the nanoviruses is responsible for the transfer of the viral genomic DNA from the nucleus, where replication occurs, to the cell periphery. NSP is an important component of the virus life cycle and works together with the movement protein which facilitates transport of virus particles from cell to cell. The study aims to isolate, clone and elucidate this viral component. The Banana bunchy top virus nuclear shuttle protein gene (BBTV DNA-N) was isolated, subcloned for propagation in bacteria and cloned into a plant expression vector. PCR amplification was used to isolate BBTV DNA-N using total genomic DNA from BBTV infected abaca leaves as template and BBTV6F_*Bgl*II/ BBTV6R_*Bst*EII primer pair. The 479 bp PCR product was cloned into pGEM® T-easy vector and transformed into *E. coli* DH5α cells. Positive bacterial colonies with the 479 bp product via PCR colony screen was selected for plasmid extraction and sequencing. Sequencing analysis revealed 99% nucleotide similarity to BBTV DNA-6 or DNA-N. After restriction endonuclease digestion with *Bgl*II and *Bst*EII, the released insert BBTV DNA-N and the cut plant expression vector, pCAMBIA 1302 was ligated and subsequently transformed in *E. coli* DH5α cells. Using the plant vector specific primers CaMV35SF and NosTerR, positive colonies showed a 643 bp PCR product. The pCAMBIA BBTV DNA-N construct was then extracted and sequenced. Sequence analysis showed 99% nucleotide similarity to BBTV DNA-6 or DNA-N.

Keywords: abaca, banana bunchy top virus (BBTV), cloning, nuclear shuttle protein gene (DNA-N), nuclear shuttle protein (NSP), pCAMBIA

BS-44

A pCAMBIA EXPRESSION VECTOR CONTAINING THE BUNCHY TOP VIRUS MOVEMENT PROTEIN (MP) GENE

Fides Angeli DLC. Zaulda, Jasca Gayle G. Española
and Vermando M. Aquino
Plant Molecular Biology and Plant Virology Laboratory
National Institute of Molecular Biology and Biotechnology
College of Science, University of the Philippines Diliman
vmaquino@mbb.upd.edu.ph

Among nanoviruses such as the bunchy top viruses of both abaca and banana, the movement protein facilitates the transfer and movement of viral genome or particles from cell to cell. The protein is restricted to the cell periphery and increases the size-exclusion limit of the plasmodesmata. Exogenous expression of such protein in abaca may control virus infection and disease through pathogen-derived resistance (PDR). In this study, the movement protein (MP) gene of the Banana bunchy top virus (BBTV) is cloned into a plant expression vector. Primers specific for the MP gene were designed and appended with restriction endonuclease sites. PCR amplification of genomic DNA from BBTV-infected abaca plants from Bicol yielded an approximately 380bp product. The amplified product was subsequently cloned in pCR2.1®-TOPO® vector and was shown to have 95% sequence identity to the BBTV MP gene. The pCR2.1®-TOPO®-MP construct was digested with *Bgl*II and *Bst*EII and yielded the 380bp digest of interest. This was ligated with pCAMBIA 1302 treated with the same restriction endonucleases. The pCAMBIA 1302-MP construct was transformed into DH5α *E. coli* for selection and propagation. PCR amplification using pCAMBIA 1302-specific primers yielded an approximately 600bp product for three clones MP4, MP5 and MP10. Plasmids extracted from these clones all contained a 350bp region with 99% sequence identity to the BBTV MP gene.

Keywords: abaca, banana bunchy top virus (BBTV), movement protein (MP), molecular cloning, vector construction, pCAMBIA 1302

BS-45

ISOLATION AND IDENTIFICATION OF CDNA ENCODING A MIDGUT TRYPSIN-LIKE ENZYME IN THE CIGARETTE BEETLE *Lasioderma serricorne* Fabricius (COLEOPTERA: ANOBIIDAE)

Angelo A. dela Fuente and Vermando M. Aquino
Plant Molecular Biology and Plant Virology Laboratory
National Institute of Molecular Biology and Biotechnology
College of Science, University of the Philippines Diliman
vmaquino@mbb.upd.edu.ph

The use of enzyme inhibitors either from direct processing of natural sources or from transgenic crops has become promising in the biological control of stored product pests. This strategy however requires knowledge of the target enzymes because of their diversity and relative activities in different species of pest arthropods providing a range of specific responses that may influence the success or failure of the control strategy. The current study aims to explore a digestive trypsin-like enzyme in the gut of the cigarette beetle *Lasioderma serricorne*, an important emerging pest of agricultural commodities. The study involves isolation of mRNA from the insect gut, complementary DNA (cDNA) synthesis, isolation of the target enzyme cDNA using CODEHOP-PCR technique. Total RNA was isolated from the midgut dissected from the fourth instar larvae of *L. serricorne*. Reverse transcription-polymerase chain reaction (RT-PCR) was conducted to convert mRNA into cDNAs. The cDNAs were subjected to cDNA-ends amplification using CODEHOP-PCR and designed degenerate primers based on the conserved sequence of homologous protein sequences of the target enzyme. A 3'-end DNA fragment of ~828 bp was generated and cloned in p-GEM-T easy vector and sequenced. The result suggests that *L. serricorne* may have a single digestive trypsin-like enzyme relatively ideal for biological control.

Keywords: midgut trypsin-like enzyme, *Lasioderma serricorne*, mRNA, cDNA, cDNA synthesis, reverse-transcription-polymerase chain reaction (RT-PCR), cDNA-ends amplification, CODEHOP-PCR

BS-46

GEOGRAPHIC VARIATION IN VEGETATIVE AND FLOWER MORPHOMETRY AMONG POPULATIONS OF *Lilium philippinense* Baker (LILIACEAE), AN ENDEMIC SPECIES IN THE PHILIPPINES

Teodora D. Balangcod[1], Virginia C. Cuevas[2] and Kryssa D. Balangcod[1]
[1]University of the Philippines Baguio; tdbalangcod@yahoo.com
[2]University of the Philippines Los Baños

Lilium philippinense is an endemic species with a narrow geographic distribution along the southwestern part of the Cordillera Central Range, Luzon, Philippines. Recently, its population is decreasing due to over collection and habitat loss. This study aims to establish if the populations of this species represents a single population. Morphometric analyses of vegetative and floral characteristics were studied in 23 populations of *L. philippinense*. Morphometric features of the vegetative and floral organs were measured from five plants that were randomly collected from each of the 23 populations. Correlation analysis reveals that most morphometric traits are correlated among the 23 populations. This is supported by principal component analysis suggesting that there is morphometric association among the populations. Elevation significantly correlates with corolla diameter. Using analysis of variance with post hoc tests on the four clusters showed that the populations significantly differ only in corolla diameter and leaf length. Generally, statistical analyses suggest that the 23 *L. philippinense* populations are closely associated with each other and probably represent a single population. The variation in leaf width and corolla diameter can be considered as a start of differentiation among the populations possibly implying selection on these two traits.

Keywords: Cordillera Central Range, geographic variation, morphometry, Luzon, Philippines, *Lilium philippinense*

BS-47

MANDIBULAR SHAPE VARIATION IN THE ANTS *Diacamma rugosum* AND *Pheidologeton diversus philippinus*

Muhmin Michael E. Manting, Eugene Vernon V. Tañedo, Jr., Mark Anthony J. Torres and Cesar G. Demayo
Department of Biological Sciences, College of Science and Mathematics, Mindanao State University-Iligan Institute of Technology
torres.markanthony@gmail.com; cgdemayo@gmail.com

This study was conducted to determine mandibular shape variation in two species of ants that vary in their life history and social adaptation patterns These includes the ant *Diacamma rugosom* which still retains the primitive faculties as solitary hunter and the ant Pheidologeton diversus which lives in a caste system complete with a queen and various types of workers. The specimens used in this study were collected from Initao National Park, Initao, Misamis Oriental and stored in 70% ethyl alcohol solution. Body size measurements of each worker were taken. The mandibles of the ants were dissected from 150 randomly selected worker ants and photographed prior to Geometric Morphometric analyses. A total of 100 points were digitized from images of the mandibles using TpsDig ver. 2.12. The X and Y coordinates of the outline points were saved in Matlab format and were subjected to Relative Warp Analysis to remove non-shape components. Results showed that size-dependent shape variation was observable only in the eusocial ant *P. diversus* and not in the solitary species *D. rugosom*. Plots of the effective principal components for *P. diversus* showed that forty-seven percent of the shape variation could be attributed to allometry and that minor workers have slender sharp mandibles while the major workers and soldiers have thicker and more robust club. Pearson correlation values for shape variables against body size in *D. rugosom* ranged only from r=0.006 to 0.197. These results show that age- and size- related changes in the shapes of the mandible may accompany task partitioning in ants and may be important in studying the evolution of sociogenesis in ants.

Keywords: eusocial ants, *Diacamma rugosom*, *Pheidologeton diversus*, solitary ant, mandible

BS-48

FOLIAR ANATOMY OF JADE VINE, *Strongylodon macrobotrys* A. Gray (FABACEAE): IMPLICATIONS OF GROUND AND VASCULAR TISSUE ORGANIZATION TO GROWTH AND DEVELOPMENT

Jan Lorie M. Robil and Vivian S. Tolentino
Department of Biology, School of Science and Engineering
Ateneo De Manila University; janlorie_29@yahoo.com

Foliar anatomy of threatened tropical vine *Strongylodon macrobotrys* was investigated, focusing on its stem, petiole and leaflets. Leaves and stems of the vine were collected from Lucban, Quezon. Tissue sections of stems and leaves were processed and their structures were observed under light microscope. Findings reveal that ground and vascular tissue characteristics have implications to the growth and development of the vine. The stem has thin uniseriate epidermis, compact mesophyll and wide pith, with large isodiametric cells. The vascular cylinder is very distinct, with well developed xylem tissue. Firm xylem tissue in young stem of *S. macrobotrys* is of great mechanical advantage for its twinning habit since the vine is lacking of other support structures. Transverse sections of *S. macrobotrys* petiole revealed one distinct ridge vascular bundle which runs from the medial to the distal region of the petiole before reaching the attachment of the first two leaflets. It is suggested that this vasculation pattern has anatomical implications to the plant's trifoliar leaf development. Leaves are dorsi-ventral with collateral midvein. Four to eight layers of large isodiametric to polyhedral transition parenchyma cells are sandwiched between the palisade and spongy parenchyma which houses most of the lateral veins. The ground tissue organization of the leaves that can be related to the plant's physiology (*i.e.* metabolism and water storage) is uncommon in the family. It is concluded that the foliar anatomy of *S. macrobotrys* generally conforms to the anatomy of other plants under Fabaceae. Several anatomical features of the vine have implications to its growth and development, reflecting morphological adaptations, particularly for mechanical support.

Keywords: Fabaceae, foliar anatomy, included vascular bundle, transition parenchyma, *Strongylodon macrobotrys*

BS-49

COMPOSITIONAL ANALYSIS OF BANANA STALKS DEGRADED BY *Pleurotus ostreatus* UNDER SOLID STATE FERMENTATION

Ma. Concepcion Birginias and Shirley C. Agrupis
Mariano Marcos State University Batac; mcbbirginias@yahoo.com

Fungal bioprocessing of lignocellulosic biomass is an important agent responsible for the environmental carbon circulation. Higher fungi like basidiomycetes (*e.g. Pleurotus ostreatus*) have unique oxidative systems which together with ligninolytic enzymes are responsible to decompose cellulose, hemicellulose, and lignin to lower molecule components. Hence, an environment-friendly pre-treatment process for lignocellulose residues. Biodegraded products from the biomass can be refined to bioethanol and other biobased materials like fiber and biochemicals. Banana stalk was inoculated with *P. ostreatus* under solid state fermentation (SSF) at ambient conditions for 45 days. Dried banana stalks ground to 40 mesh was wetted at 6:1 water to biomass ratio. The biodegradation activity of the fungi was compared in substrates with or without sugar additive. Sugar composition was determined by HPLC, Acid soluble (ASL) by UV Spectrophotometer, and acid insoluble lignin (AIL) by gravimetric method, following standard protocols. *P. ostreatus* grew progressively in the substrates with time until the whitish hyphae covered the whole biomass in 45 days. Addition of sugar in the biomass did not show a distinct advantage over the substrate with no sugar in terms of growth and activity of the fungi. Dry solid yields were increased by 9% from the original weight due to fungal hyphae biomass. ASL and AIL were significantly decreased by about 50% compared to the original lignin of the material (11.55%). The ash content of the fungal-treated biomass was higher (0.9039-1.75%) than the untreated sample (0.6217%). Glucose (33.75-34.17 %) and Xylose (20.67-22.30 %) contents of the fungal-treated samples were lower compared to the control at 44.37% and 30.67 % glucose and xylose contents, respectively. Mannose sugar (4.89-5.45%) was comparable with the untreated biomass. Sugar composition of the washings of the fungal-treated banana stalks should be analyzed to account the sugar released from the biomass during the biodegradation process.

Keywords: Bioprocessing, bioethanol, ligninolytic enzyme, SSF, biodegrdation

BS-50

LAWN CULTURE OF *Schizophyllum commune* Fr. ON SELECTED TROPICAL FRUIT SUBSTRATES

Liezel F. de La Cruz, **Renato G. Reyes** and Sofronio P. Kalaw
Center for Tropical Mushroom Research and Development, Department of Biological Sciences, College of Arts and Sciences, Central Luzon State University, Science City of Munoz, Nueva Ecija; spk31162@yahoo.com

Schizophyllum commune Fr. is a wild edible mushroom that usually grows in decomposing logs during rainy season. This mushroom is known to produce an extracellular polysaccharide called schizophyllan which has been proven to have several pharmaceutical properties. Mycelial production of this mushroom is coupled with the production of schizophyllan. In our desire to produce the mycelia and schizophyllan we evaluated the mycelial performance of three strains of *S. commune* on coconut water and selected tropical fruit extract such as pineapple, watermelon, tomato, papaya and mango juice in lawn culture. Lawn culture is a technique in which the growth of mycelia is on the surface of the medium which leads to the formation of mycelial mat in lawn form. Regardless of fruit extract used, wild strain 1 recorded the shortest number of days to total mycelial ramification with a mean of 7 days, while ATCC 38548 strain had the longest number of days with a mean of 13 days. No significant differences in mycelial weight, volume loss of the fruit extract, final pH and total soluble solids (TSS) were noted. Among the different fruit extracts evaluated, watermelon extract produced the heaviest mycelial weight (67.58 mg), highest final pH (7.85) and the highest TSS loss (3.83 % Brix). Moreover, statistical analysis revealed that the volume loss of the fruit extract was comparable with each other.

Keywords: *Schizophyllum commune*, broth culture, tropical fruits, schizophyllan, mycelia

BS-51

CAROTENOID CONTENT OF CANISTEL OR TIESA (*Pouteria campachiana* (HB.K) Baehni)

Elmira P. Capistrano and Ma. Leonora dL. Francisco
Department of Food Science and Nutrition, College of Home Economics, University of the Philippines, Diliman; mdfrancisco@up.edu.ph

Extraction and isolation of carotenoids from biological sources is of current interest to researchers. Canistel is an underutilized crop that is rich in carotenoids. This study was done to investigate the carotenoid content of canistel at various maturity stages. Different maturity stages of canistel were obtained based on peel color. Samples were immediately analyzed for firmness, flesh color, soluble solids and pH. Total carotenoid concentration was estimated by comparing the sample absorbance to a standard curve of β-carotene at 476 nm. Firmness decreased from 1.33 to 178mm as the canistel increased in maturity. Firmness of overripe canistel decreased almost three times compared to the ripe canistel. No significant differences ($P>0.05$) were observed between immature and half-mature canistel. Lightness (L*) of the sample were not significantly different ($P>0.05$) for the first three stages of maturity (L* 57 to 60). Significant ($P<0.05$) change was observed when the fruit became overripe (L* 53). The redness (a*) of the sample on the other hand increased as the fruit reached senescence (a* 7 to 14) while the yellowness (b*) had its maximum value (b* 61) during the ripe stage. Soluble solids increased as the fruit develops while no significant difference ($P>0.05$) in pH was observed across all samples. Carotenoid concentration was at its maximum during the immature stage and decreased as the fruit reached senescence (180 to 54 ppm). Carotenoids partially identified were a mixture of hydrocarbons and xanthophylls. Ten carotenoids were identified based on spectral maxima that include neoxanthin, violaxanthin, α-carotene, ε-carotene, neurosporene, lutein, α-zeacarotene, cis-luteoxanthin, β-zeacarotene and β-carotene-5,6,5',6'-diepoxide. Increased utilization of canistel as natural source of carotenoids should be explored as possible substitute for synthetic food colorants to meet consumer's desire for natural carotenoids.

Keywords: Canistel, carotenoids, maturity, firmness, color

BS-52

PEDICULICIDAL ACTIVITY OF A SHAMPOO FORMULATED FROM THE CRUDE ETHANOLIC EXTRACT OF *Tinospora rumphii* Boerl (MENISPERMACEAE) STEMS

Tracy V. Mamaril[1], **Joanne Katherine T. Manlusoc**[1], Amabelle Lou C. Marcelo[1], Mark Christian C. Mendoza[1], Maria Vicroria D. Naga[1], Justin W. Ng Sinco[1], Tanya Angela P. Perez[2] and Agnes L. Castillo[1]
1UST Faculty of Pharmacy, 2Dept of Dermatology, UST Hospital
agnes_412@yahoo.com

This study involves the formulation of a pediculicidal shampoo from the *Tinospora rumphii* Boerl ethanolic extract using compatible excipients and the determination of its activity using Permethrin (Kwell) as positive control. Stems of the plant *T. rumphii* Boerl was percolated with 80% ethanol and was formulated together with a base to determine its pediculocidal effect. No apparent irritation was noted after 72 hours of application on rabbits. *In vitro* study was also conducted to determine its lice-killing activity. Preliminary clinical studies were also employed to five (5) respondents to test for the possibility of hypersensitivity and to further test its effectivity on human subjects. Single-Factor ANOVA showed a significant difference between the mean killing time of the adult lice using the *Tinospora* shampoo, Permethrin and the shampoo base ($p<0.001$). Human patch test result in thirty (30) subjects showed no significant irritation with the *Tinospora* shampoo. ANOVA for Repeated Measures showed no significant interaction effect between the treatment used and the duration it was applied – amount of adult lice ($p = 0.077$), nits ($p=0.580$) and pruritus (0.519). Also, there was no significant difference on the number of adult lice ($p=0.233$) and nits (0.580) killed but a significant difference in pruritus ($p<0.001$) in regards to the treatment. However, in regards to the duration of treatment, there was no significant difference on the decrease of the number of adult lice ($p<0.001$) and pruritus ($p=0.071$) but a significant difference on the nits killed ($0=0.02$). Therefore, the shampoo formulated with the crude ethanolic extract from *T. rumphii* has equal efficacy as that of the commercially available positive control (Permethrin).

Keywords: *Tinospora*, pediculocide, excipients, formulation, permethrin

BS-53

A 10% CREAM PREPARATION FROM THE CRUDE ETHANOLIC EXTRACT OF THE DRIED SEEDS OF TONKIN (*Ipomoea muricata*): FORMULATION AND ITS QUALITY CONTROL

Mary Rose S. Angeles[1], Jessica Rei N. Camina[1], Agatha Christie T. Castillo[1], Romielhyne Z. Diaz[1], Nico S. Murillo[1], Liana Aira V. Quibael[1] and **Sandra C. Sy**[1,2]
[1]Faculty of Pharmacy, and [2]Research Clusters for the Natural Sciences and Applied Sciences, University of Santo Tomas; sandracsy@yahoo.com

Ipomoea muricata (L.) Jacq. (Convolvulaceae) has been proven to possess antimicrobial activity against *Staphylococcus aureus*. The study aimed to formulate a topical cream from the dried seeds of the plant. The crude ethanolic extract was subjected to drug-excipient compatibility testing using a ratio of 1:1 and stored at 40°C for four weeks. The excipients that are compatible with the crude ethanolic extract were used in the formulation of cream. *S. aureus* was tested for its susceptibility against the formulated cream preparations using Disk Diffusion Method. The formulated cream that produced the biggest zone of inhibition was chosen to be the best formulation and was also subjected to quality control tests. The quality control tests include the organoleptic characteristics, pH, and viscosity and antimicrobial activity. The extract was found to be compatible with acacia, glycerin, sodium lauryl sulfate, methyl paraben, propylene glycol, stearyl alcohol, white petrolatum and not compatible with benzalkonium chloride and yellow soft paraffin. The excipients were used in the formulation of three cream preparations. Using t-test at $p<0.05$, formulation 3, which is a creamy white, tamarind-like odor cream with a pH of 6.45, viscosity of 57,000 cp and zone of inhibition of 23.5 mm, exhibited the best antimicrobial activity Based on ANOVA, there is no significant difference in the quality control parameters of two batches of Formulation 3. The cream should be stored at a temperature not exceeding 40°C because changes in pH, viscosity and antimicrobial activity are temperature dependent. The antimicrobial activity of the formulated cream is comparable to the commercially available Fucidin cream. The cream of *I. muricata* can be manufactured in large scale so as to provide the nation with another source of antibacterial drug.

Keywords: *Ipomoea muricata*, tonkin, cream, quality control, formulation

BS-54

PHYTOCHEMICAL STUDIES ON TWO PHILIPPINE ENDEMIC RUBIACEAE SPECIES - *Gardenia merrelli* AND *Villaria odorata*

Mario A. Tan[1,2], Christian Nicolo Ll. Concepcion[2], Raychel Ann P. Villacorta[2] and Grecebio Jonathan Alejandro[1,2]
[1]Research Center for the Natural and Applied Sciences and
[2]College of Science, University of Santo Tomas; mat0468@yahoo.com

The family Rubiaceae is the fourth largest flora which is distributed worldwide. Phytochemical studies on Rubiaceae species have elaborated the presence of various classes of natural products with interesting biological activities. In our interest of identifying biologically-active secondary metabolites from the endemic Philippine Rubiaceae plants, this research aims to isolate, purify and elucidate the exudates from the leaves of *Gardenia merrelli* and *Villaria odorata*. The crude extracts of the two plant species obtained from the air-dried leaves were subjected respectively to polarity partitioning. The obtained semi-polar $CHCl_3$ sub-extracts were further purified by several chromatographic techniques (TLC, gravity column chromatography, vacuum liquid chromatography). From the leaves of *G. merrelli*, three ^{1}H-NMR pure compounds (GmD-1, GmD-2, GmD-3) were isolated. GmD-1 was identified as *p*-hydroxybenzaldehyde based on ^{1}H- and ^{13}C-NMR and in comparison with the literature. Structure analyses of GmD-2 and GmD-3 is currently in progress. The leaves of *V. odorata* yielded six ^{1}H-NMR pure compounds, namely, Vo-1 to Vo-6. Vo-1 was identified as vomifoliol by extensive 1D and 2D NMR and MS analyses and comparison with the literature. The biological evaluation of the pure compounds is underway. The structure elucidation of compounds Vo-2 to Vo-6 is currently in progress. This study represents the first phytochemical work on the endemic species *G. merrelli* and *V. odorata*. Moreover, this is the first isolation of vomifoliol from the genus *Villaria* and the first isolation of *p*-hydroxybenzaldehyde from the genus *Gardenia*.

Keywords: Rubiaceae, *Gardenia*, *Villaria*, Vomifoliol, p-hydroxybenzaldehyde

BS-55

EVALUATION OF POLYETHYLENIMINE/ CARRAGEENAN MULTI-LAYER FOR ANTIBACTERIAL ACTIVITY OF PATHOGENIC BACTERIA

Annabelle V. Briones[1], Toshinori Sato[2] and Urcila G. Bigol[1]
[1]Industrial Technology Development Institute, Department of Science and Technology; avbriones2003@yahoo.com
[2]Department of Biosciences and Informatics, Keio University, Japan

The purpose of this study is to investigate the antibacterial activity of multi-layer of polyethylenimine (PEI) and carrageenan (κ, ι, λ) for potential use as coating on biomaterial surface. The multi-layer of PEI/carrageenan was formed using the layer-by-layer assembly absorption technique and was monitored by atomic force microscopy (AFM) and biomolecular interaction analysis. All samples were prepared in phosphate buffer solution and applied to mica disk alternately. The micrographs showed the formation of bi-layer of polyethylenimine and carrageenan (κ, ι, λ) as observed in the change of height of the layer and surface morphology. The bimolecular binding of carrageenan with polyethylenimine was also investigated using a biosensor. The sensorgram showed that PEI interacted molecularly with carrageenan. Results were: 1,916.08 pg/nm^2 for κ*appa* type; 1,844.1 pg/nm^2 for ι*ota* type and 6,074.24 pg/nm^2 for *lambda* type. The multi-layer showed antibacterial activity against *Enterobacter cloaceae*, *Staphylococcus aureus* and enterococcal strains (*Enterococcus faecalis* (EF) 29212 and 29505).

Keywords: carrageenan, polyethylenimine, atomic force microscopy, antibacterial, multi-layer

BS-56

ABIOTIC STRESSES TO ENHANCE BIOACTIVE POTENTIAL OF PEANUT KERNELS

Jocelyn D. Masiglat-Sales[1] and Anna V. A. Resurreccion[2]
[1]Food Development Center, National Food Authority, FTI Complex, Taguig City; joyce23_dms@yahoo.com; [2]Department of Food Science and Technology, The University of Georgia, USA

Polyphenolic compounds, including resveratrol, were recognized for their antioxidant properties, great abundance in our diet, and prevention of various diseases associated with oxidative stress such as cancer, cardiovascular and neurodegenerative diseases. Peanuts contain resveratrol in amounts next to red wines and grapes, among food sources. Abiotic stresses increased the levels of polyphenols in certain plants. This study aims to apply abiotic stresses such as wounding, exposure to ultraviolet light (UV), ultrasound (US), and combined US-UV to enhance the bioactive potential of peanuts. Raw peanuts were washed, sanitized, imbibed, sliced to about 7 mm, exposed to UV, US, and combined US-UV, and incubated at 25°C for 24-48 hours. Results showed that slicing increased resveratrol by 19-fold from 0.02 microgram (mcg)/g in controls to 0.37 mcg/g in sliced peanuts. UV increased resveratrol of sliced peanuts by 9-fold or 3.3 mcg/g whereas US resulted in 17-fold increase or 6.35 mcg/g indicating that US is more effective than UV in enhancing resveratrol synthesis. Chopped peanuts after exposing to US achieved lower resveratrol of 2.88 mcg/g whereas whole US-treated peanuts had the lowest at 0.99 mcg/g indicating that moderate wounding of peanuts by slicing is necessary for enhanced resveratrol synthesis. Exposure of US-treated sliced peanuts to UV further increased resveratrol to 7.1 mcg/g. Wounding, UV, US, and combined US-UV also increased total phenolics, antioxidant capacities expressed as trolox equivalent antioxidant capacity (TEAC) and oxygen radical absorbance capacity (ORAC), and other beneficial phenolic compounds including piceid, and coumaric, caffeic, and ferulic acids. Application of abiotic stresses in peanuts increased its bioactive potential which can provide health benefits to consumers and value-added products to food manufacturers.

Keywords: Peanuts, abiotic stress, wounding, UV light, ultrasound, resveratrol, polyphenolic compounds, antioxidants

BS-57

CORRELATION OF FRUIT VARIABLES TO THE PHYSICO-CHEMICAL AND BIOCHEMICAL ATTRIBUTES OF THE COCONUT (*Cocos nucifera* L.) LIQUID ENDOSPERM

Chester C. Deocaris[1] and Dina B. Masa[2]
[1]University of the Philippines Manila, [2]Philippine Coconut Authority;
chdeocaris@yahoo.com, dina_masa04@yahoo.com

A correlation study was conducted to show the relationships of the variables concerning the coconut fruit and its liquid endosperm. Variables in this study were: fruit maturity; longitudinal and transverse circumferences; gross weight and; weight of the liquid endosperm. Fruit maturities were estimated by counting the number of inflorescence starting from sampled bunch up to the bunch with fertilized pistilate flowers. This count is multiplied by 21 or 31 days, the established flowering rates of dwarf and tall coconuts respectively. Electrolytes (K^{+1}, Na^{+1}, Ca^{+2}, Mg^{+2} and Cl^{-1}), glucose, protein, pH, specific gravity, and soluble solids were the physico-chemical and biochemical attributes measured. Aromatic Dwarf (AROD), Catigan Dwarf (CATD) and Laguna Tall (LAGT) varieties were included in the study. Fruit maturity showed positive correlations (Pearson's coefficient) with sodium content (0.49-0.84) and pH (0.37-0.80). The weight of the fruit (0.44-0.88) also had positive correlations to fruit transverse circumference. Potassium levels of coconut water increase with maturity for AROD (0.407) and LAGT (0.430). The reverse is observed with CATD (-0.639). The differences in the correlations of the three varieties suggest the biochemical "uniqueness" and significance of each variety in new beverage formulation. This could also suggest physiological and nutritional differences of the trees in general.

Keywords: heatmap, correlation, coconut water, electrolyte, biochemical profiles

BS-58

INFLORESCENCE AND LEAF MORPHOLOGY OF SOME WILD GINGERS (ZINGIBERACEAE) RECORDED FROM EASTERN MINDANAO, PHILIPPINES

Florfe M. Acma[1], William Sm. Gruezo[2], Inocencio E. Buot, Jr.[2], Teresita U. Dalisay[3] and Leonardo M. Florece[4]
[1]Department of Biology, College of Arts and Sciences, Central Mindanao University, Bukidnon; flmacma@yahoo.com.ph, [2]Institute of Biological Sciences, College of Arts and Sciences, [3]Crop Protection Cluster, College of Agriculture, and [4]School of Environmental Science and Management, University of the Philippines Los Baños

The family Zingiberaceae is the largest family of the Order Zingiberales and is composed of important ornamental as well as medicinal species which are utilized by the local people. However, the family is poorly taxonomically known. The inflorescences and leaves of some gingers were studied morphologically. Further, leaf epidermal features were described using clearing technique to expose the anatomical details. These were supplemented with botanical field studies to Mt. Hamiguitan, Davao Oriental, Bislig Experimental Forest, Surigao del Sur and Hinatuan logged-over forest, Surigao del Sur. Herbarium studies to UPLB Herbarium, Philippine National Herbarium and Singapore Botanical Gardens Herbarium were done to identify the species using herbarium materials and the protologues. Results of the study showed the presence of *Amomum microchiela* (Ridl.) Merr., *A. muricarpum* Elm., *Etlingera dalican* (Elm.) Poulsen, *E. philippinensis* (Ridl.) R.M. Smith, *Geocharis fusiformis* (Ridl.) R.M. Smith and *Hornstedtia conoidea* Ridl. The important characters which were diagnostic in the identification of the species were the texture and size of floral bracts, characteristic of the labellum and calyx and shape of the inflorescence. The shape, texture and length of ligule, length of petiole of leaves were also useful in the delineation of species. Results of this study support the taxonomic transfer of these Philippine species from genus *Amomum* to the present generic placements.

Keywords: Zingiberaceae, inflorescence, *Amomum*, *Etlingera*, *Hornstedtia*, bracts, labellum

BS-59

A NOVEL ENDEMIC PHILIPPINE SPECIES OF *Bikkia* Reinw. (RUBIACEAE) INFERRED FROM MULTIPLE DNA SEQUENCING DATA, WITH IMPLICATION ON ITS CONSERVATION STATUS AND BIOLOGICAL ACTIVITIES

Grecebio Jonathan D. Alejandro[1,2], Lorenzo Angelo R. Santos[1], Hao Wei C. Hsu[1], Michelle Samantha S. Mejillano[1], Propa Joy R. Santor[1] and Ericson M. Paragas[2]
[1]Department of Biological Sciences, College of Science, [2]Research Center for the Natural & Applied Sciences, University of Santo Tomas
gdalejandro@mnl.ust.edu.ph

Based on molecular data, the genus *Bikkia* Reinw. (coffee family) was formerly subdivided into two groups with contrasting habitat and corolla shape. Subsequently, one group was transferred to a genus of its own the *Thiollierea* (inland forest) leaving the *Bikkia* (coastal species) with 10 species worldwide. In the Philippines, only one *Bikkia* species (*B. philippinensis*) is known found in the coastal areas of Siargao Island. Recent observation of herbarium specimens at Central Mindanao University revealed a diverging *Bikkia* species collected in the inland forest of Mt. Redondo, Dinagat Island. This raises questions on the identity of this *Bikkia* as well as its contradicting habitat. Comparative evaluation was conducted using morphology and molecular data from nuclear rDNA (ITS region) and cpDNA (rps16 & trnL-F regions). Genomic DNA from two isolates of *B. philippinensis* and four isolates of *Bikkia sp.* (Mt. Redondo) was sequenced and analyzed. Eighteen sequences of Philippine *Bikkia* from the three molecular markers are newly generated in this study. Surprisingly, the separate and combined parsimonious trees showed that the inland forest *Bikkia sp.* is nested within the purely coastal species of *Bikkia* (BS=90%) but did not group with the *B. philippinensis*. This molecular result is supported by morphology as they differ mainly in the size and shape of calyces and fruits. Therefore, we proposed a new species of Philippine *Bikkia* (*B. redondoensis*). *B. redondoensis* is critically endangered due to its restricted distribution and < 250 mature individual population size. The first phytochemical screening of this new species inluding the Microplate Alamar Blue Assay is here reported.

Keywords: *Bikkia*, conservation, cpDNA, nrDNA, Philippine endemic

BS-60

FOUR NEW SPECIES OF *Nepenthes* IN TWO MOUNTAIN ECOSYSTEMS IN SOUTHERN PHILIPPINES

Victor B. Amoroso and Fulgent P. Coritico
Central Mindanao University, Bukidnon; amorosovic@yahoo.com

Plants of *Nepenthes* are carnivorous which form specialized pitcher leaves that attract, capture, kill and digest insects and other small animals. Thus far, 23 species were reported in the Philippines, of which 23 are endemic to the country. A survey conducted in Mt. Kiamo, Kibalabag, Bukidnon and Mt. Hamiguitan, Davao Oriental revealed four species of *Nepenthes* new to science. With these 4 new species, the Philippines will now have 27 species of *Nepenthes* making the Philippines third with the greatest number of species worldwide. The new species of *Nepenthes* include: *N. ceciliae*, *N. pulchra*, *N. micramphora* and *N. hamiguitanensis*. *N. ceciliae* and *N. pulchra* are presently known only from Mount Kiamo where these grow terrestrially on ultramafic soils at altitudes from 1300–1800m. On the otherhand *N. hamiguitanensis* and *N. micramphora* were found in Mount Hamiguitan in southern Mindanao, where these occur from approximately 1000–1635 m altitude. Of the four new species, *N. micramphora* and *N. hamiguitanensis* are critically endangered while *N. pulchra* and *N. ceciliae* are endangered and vulnerable status, respectively.

Keywords: Pitcher plants, threatened, Mt. Kiamo, Mt. Hamiguitan, Mindanao

BS-61

CONTRIBUTING TO THE PHILIPPINES' BIODIVERSITY: ESTABLISHMENT OF TWO PHILIPPINE RUBIACEAE GENERA BASED ON PLASTID AND NUCLEAR DNA INCLUDING THEIR CONSERVATION STATUS

Axel H. Arriola[1,3] and Grecebio Jonathan D. Alejandro[2,3]
[1]Department of Biological Sciences, College of Arts and Sciences, University of the East, Manila; arriolaaxel@yahoo.com,
[2]College of Science and Research Center for Natural & Applied Sciences, and
[3]The Graduate School, University of Santo Tomas

The Philippine Vanguerieae is represented only by two genera: *Canthium* (20 spp.) and *Psydrax* (monotypic). Recent molecular and morphological treatments of the tribe showed that most of its representatives do not form a monophyletic assemblage. For instance, *Canthium* was restricted to plants having supraaxillary spines. This raises questions on the position of the Philippine *Canthium* as members are without spines. In this first molecular study of two Philippine *Canthium* (*C. monstrosum* and *C. ramosii*), trnL-F and ITS regions were sequenced, assembled and aligned manually using Se-Al v2.0 and subsequently analyzed using MrBayes 3.1.2. Interestingly, the majority-rule consensus tree revealed that the two Philippine species were nested in two different clades with high support; *C. monstrosum* within the *Keetia* clade (PP= 0.98) while *C. ramosii* grouped with the *Pyrostria* clade (PP= 1.00). Therefore, we proposed two new combinations, the *Keetia monstrosa* (A.Rich.) Arriola & Alejandro and *Pyrostria ramosii* (Merr.) Arriola & Alejandro. This study establishes for the first time the two genera (*Keetia* and *Pyrostria*) in the Philippines. The IUCN Red List declared that conservation status of *Keetia* and *Pyrostria* were from vulnerable to critically endangered. Hence, sustainable conservation is urged which requires further studies on its reproductive biology, biogeography, and economic importance.

Keywords: *Canthium*, ITS (nrDNA), *Keetia*, Philippine endemic, *Pyrostria*, trnL-F (cpDNA)

BS-62

MOLECULAR DETECTION AND CLASSIFICATION OF A NEW *Theileria* SPECIES IN THE PHILIPPINES

Lawrence P. Belotindos[1], Jonathan V. Lazaro[1],
Marvin A. Villanueva[2] and Claro N. Mingala[2]
[1]College of Veterinary Science and Medicine, Central Luzon State University
[2]Animal Health Unit, Philippine Carabao Center, Nueva Ecija
cnmingala@hotmail.com

Theileriosis is a tick–borne disease of domestic and wild animals that cause devastating economic loss in livestock all over the world. Theileriosis is not yet documented in the Philippines as compared to babesiosis and anaplasmosis which are considered major tick-borne diseases that infect livestock in the country and contribute major losses to the livestock industry. The study was aimed to detect *Theileria sp.* at genus level in blood samples of cattle using polymerase chain reaction (PCR) assay. Specifically, it determined the phylogenetic relationship of *Theileria* species affecting cattle in the Philippines to other *Theileria* species registered in the GenBank. A total of 292 blood samples of cattle that were previously collected from Laguna (147 samples), Pangasinan (40 samples), Cebu (77 samples), and Bohol (28 samples) were used. *Theileria sp.* was detected in 43/292 from the cattle blood samples using PCR assay targeting the major piroplasm surface protein (MPSP) gene. DNA sequence showed high similarity (90-99%) among the reported *Theileria sp.* isolates in the GenBank and the Philippine *Theileria* isolates. Phylogenetic tree construction using nucleotide sequence classified the Philippine *Theileria* isolate as benign. However, nucleotide polymorphism was observed in the new isolate based on nucleotide sequence alignment. It revealed that the new isolate can be a new species of *Theileria* that also possessed nucleotides similar to virulent strain of *Theileria* species. The findings suggest that there is high possibility of mutation events turning this new species into a virulent strain.

Keywords: *Theileria sp.*, Cattle, PCR, MPSP, Philippines

BS-63

WHY NEW HATS ARE BETTER: TWO NEW ENDEMIC SPECIES OF PHILIPPINE *Gynochthodes* Blume AND MOLECULAR SUPPORT ON THE RE-CLASSIFICATION OF *Morinda elliptifolia* Quisumb. & Merr. (MORINDEAE-RUBIACEAE)

Jayson G. Chavez[1], Joshua Johnedel P. Salvacion[2], Gerson C. Contreras[2], Wei Yi D.C. Hung[2], Fernan Macrin C. Ramos[2], Diana Grace B. Ysaac[2] and Grecebio Jonathan D. Alejandro[2,3]
[1]Department of Biological Sciences, Institute of Arts and Sciences, Far Eastern University, Manila; jayson.chavez@gmail.com,
[2]College of Science and [3]Research Cluster for the Natural and Applied Sciences, University of Santo Tomas

Recent phylogenetic works on the systematics of Morindeae (Rubiaceae) have proposed new generic delimitations of the tribe and the adoption of a narrow circumscription of the nutriceutical genus *Morinda* known as "noni". The proposed transfer of all lianescent *Morinda* species including the Philippine endemic *M. elliptifolia* to its conglomerate *Gynochthodes* have raised the question whether this taxonomic amendment is supported by molecular dataset. To address this, samples of *M. elliptifolia* and two *Gynochthodes* cf. specimens were collected in the island of Palawan. A total of 53 trnT-F (cpDNA) sequences was utilized for cladistic analysis. Bayesian inference (BI) of the plastidial data supports the generic transfer of *M. elliptifolia* to *Gynochthodes* proposed by Razafimandimbison & Bremer with strong posterior probabilities (PP=1.00). *Gynochthodes* is united by marginal hairs along stipules and bracts; axillary, racemose or cymose inflorescences with white and shortly pedunculate flowers; recurved calyx tubes; and corollas with long hairs within the tubes and on the adaxial side of the lobes. Furthermore, the two sampled *Gynochthodes* cf. nestled on the basal polytomy of *Gynochthodes* subclade proving their generic affinity (PP=1.00). Comparisons between the Malesian *Gynochthodes* and these specimens have shed light to the proposal of two new endemic *Gynochthodes* species. In relation to these taxonomic breakthroughs; implications on Philippine biodiversity, and the industrial and medicinal applications of *Gynochthodes* are presented.

Keywords: biodiversity, cpDNA, *Gynochthodes*, *Morinda*, Philippines

BS-64

TAXONOMIC AND ECOLOGICAL STUDY OF MICROALGAE IN LAKE BUHI, CAMARINES SUR

Erwin P. Elazegui
College of Science, Technological University of the Philippines Manila
ngsepe@yahoo.com

A plankton study of Lake Buhi, Camarines Sur was conducted for classification and identification purposes. Three stations were established and were based on the presence and distribution of sinarapan (*Mistichthys luzonensis*), the world's smallest fish that can only be found in the lake. Plankton collection was done vertically and collected water samples were placed in a container preserved with 5% formalin. Plankton species were analyzed using the Sedgewick Rafter Counting Chamber and a binocular microscope. Photographs were also taken for verification. The study obtained 4 divisions of microalgae that include Cyanophyta, Chlorophyta, Chrysophyta and Euglenophyta. There are 11 Orders of phytoplanktons observed: Centrales, Chlorococcales, Chroococcales, Charales, Cladophorales, Dinophyceae, Eulenales, Oscillatoriales, Pennales, Tetraporales, Zygnematales . Eighteen families, 20 genera and 24 species of phytoplanktons were also noted. *Synedra acus*, *Synechocystis aquatilis* and *Synedra tabulata* were the three most abundant species. It belongs to Family Fragilariaceae and Family Chroococcaceae. Physico-chemical parameters such as temperature, pH, and turbidity were recorded and correlated with the number of planktons counted .

Keywords: Lake Buhi, Phytoplanktons, Sinarapan, Taxonomic

BS-65

TAXONOMY OF THE GENUS *Sargassum* (SARGASSACEAE, PHAEOPHYTA) FROM CAMOTES ISLAND, CEBU

Wilfred John E. Santiañez and Gavino C. Trono, Jr.
Marine Science Institute, University of the Philippines Diliman
wjesantianez@gmail.com

The taxonomy of the genus *Sargassum* in the country is poorly known and studied owing largely to its complex and highly variable morphology. In fact, the most recent treatment on the genus *Sargassum* in the country was done by Trono (1992) more than a decade ago. We attempt herein to add to the body of knowledge on the taxonomy and distribution of the genus by examining *Sargassum* specimens collected from Camotes Island, Cebu. Morphological characteristics of fertile specimens, primarily the nature of holdfast, shape and nature of branches, vesicles, leaves, and nature and form of receptacles, were studied. Specimens were identified, whenever possible, to species level using the key by Trono (1992). Three species were recognized, namely, *S. polycystum* C.A. Agardh, *S. siliquosum* J. Agardh and *S. paniculatum* J. Agardh.

Keywords: *Sargassum*, seaweeds, taxonomy, Cebu, Philippines

BS-66

GENETIC IDENTIFICATION OF SELECTED LACTIC ACID BACTERIA AND STRUCTURAL GENE ELUCIDATION OF THEIR BACTERIOCINS

Francisco B. Elegado[1], Maria Teresa M. Perez[1],
Takeshi Zendo[2] and Kenji Sonomoto[2]
[1]National Institute of Molecular Biology and Biotechnology (BIOTECH), University of the Philippines Los Baños; fbelegado@hotmail.com
[2]Department of Bioscience and Biotechnology, Faculty of Agriculture Graduate School, Kyushu University, Japan

In our continuing search for probiotic microorganisms that produce bioactive compounds, we have isolated nine (9) bacteriocinogenic lactic acid bacteria from various sources in the Philippines. Their identities and bacteriocin genes were elucidated through 16S rRNA gene and bacteriocin gene sequencing, respectively, followed by NCBI-BLAST homology search. Four (4) isolates were identified as *Pediococcus acidilactici*, three (3) *Lactobacillus plantarum*, one (1) *Enterococcus durans* and one (1) *Enterococcus faecium*. PCR-based screening using primers for the structural genes of Pediocin AcH or PA-1; Plantaricins A, 423 and NC8 and Enterocins A and B were done. All four *P. acidilactici* isolates were positive for the Pediocin gene while only one *L. plantarum* was positive for the Plantaricin A gene. The bacteriocins generated were at least 98% homologous to the nearest nucleotide sequence of similar bacteriocin in the NCBI-BLAST database. The culture supernatants of *P. acidilactici* 3G8 and 3G3, assayed against standard indicator strains, showed strong antilisterial activities.

Keywords: lactic acid bacteria, 16S rRNA sequencing, bacteriocin, *Pediococcus acidilactici*, *Lactobacillus plantarum*, *Enterococcus durans*, *Enterococcus faecium*

BS-67

GENOMIC SEQUENCE IDENTITY OF *Haematonectria haematococca* CAUSING TWIG BLIGHT DISEASE OF CITRUS IN THE PHILIPPINES

Jonar I. Yago[1] and Kuang-Ren Chung[2]
[1]Nueva Vizcaya State University; jyago2002@yahoo.com
[2]University of Florida, USA

The nucleotide sequence of phytopathogenic fungus *Haematonectria haematoccoca* was identified using the internal transcribed spacer region of the ribosomal RNA gene (rDNA-ITS). The cultured fungus produced 1-celled microconidia and multiple, canoe-shaped macroconidia highly resembling *Fusarium spp*. The inoculated plants kept in a screenhouse started showing the initial twig dieback symptoms in all inoculated branches at 37 days post inoculation (dpi). The appearance of pink perithecia of *H. haematoccoca* was observed at 45 dpi, similar to those observed in the field. No symptoms were observed on branches treated with water only. *H. haematoccoca* was re-isolated from the symptomatic twigs and displayed similar characteristics as the original strain. There were about 710 bases were identified and sequence analysis of the 5.8S and partial 18S internal transcribed spacers of rDNA amplified with ITS1 and ITS4 primers was deposited at National Center for Biotechnology Information (NCBI) and coded as GenBank Accession No. HQ696788.1 displayed a strong similarity to Fusarium solani (Mart.) Sacc. (Teleomorph: *Haematonectria haematoccoca*). This is the first identification and confirmation of *H. haematoccoca* causing citrus twig blight in the Philippines.

Keywords: genomic sequence, teleomorph, *Haematonevtria haematococca*, *Fusarium solani*, twig blight disease

BS-68

IDENTIFICATION OF *Chryseobacterium indologenes* FROM SALT USING THE ANALYTICAL PROFILE INDEX API 20E

Prima Fe R. Franco, Cecille Gaoat and Rowena Acosta
Mariano Marcos State University Batac; primarfranco@gmail.com

Salt is one of the most important seasonings of Filipino cuisines whether eaten as cooked or as raw food. Some of the available salt in the market are produced locally while others are manufactured and packaged carefully. This study is focused on the determination of microbial load of salt sampled from various sources and on the identification of the isolate using API 20E Identification System. The samples were inoculated into sterile Sea Water Complex Medium and incubated overnight at ambient temperature. Results show that only one type of bacterium was able to grow and survive in the medium used. The isolate is a halophile that could tolerate up to 39% salt concentration. It is a Gram negative rod with its colony form as circular, elevation as pulvinate and margin as entire. Its slant growth type is echinulate. The isolate is identified as *Chryseobacterium indologenes* using API 20E. Surprisingly, this is a pathogen associated with Urinary Tract Infection (UTI) as well as non-catheter related bacteremia. It is a very rare pathogen. Results indicate the possibility of salt samples as sources on infection of humans from the food that they eat either cooked or raw with salt as seasoning.

Keywords: API, salt, halophile, *Chryseobacterium*

BS-69

Proteus SPECIES IDENTIFIED USING THE ANALYTICAL PROFILE INDEX API 20E: POTENTIAL BIOLOGICAL CONTROL FROM BORER INFESTING SWEET SORGHUM

Cecille Gaoat, Prima Fe R. Franco,
Samuel S. Franco and Heraldo L. Layaoen
Mariano Marcos State University Batac; primarfranco@gmail.com

Previous studies on sweet sorghum production in the Philippines show that it is affected by insect pests like borer. This insect attacks both the leaves and the stalks of the plant thus causing a decrease in juice yield for ethanol production. It s also observed that some larvae of borer attacking sweet sorghum varieties die prior to pupation even without the application of insecticides. This phenomenon is postulated to be due to bacteria harbored by the larvae in their gut. Bacterial isolates then from the gut of the larvae of the borer were obtained and characterized. They were identified using API 20E. Results show that borer attacking both leave and stalks harbor the same bacteria. They both have *Proteus vulgaris* and *P. mirabilis*. Both isolates are positive in the protease and hemolysin tests indicative of their being pathogens. They employ protease and hemolysin as virulence factors. The characterized and identified flora of the gut of borers must have the potential as biological control of insects attacking sweet sorghum

Keywords: *Proteus*, borer, sweet sorghum, API

BS-70

ACTIVATION OF ENDOGENOUS BANANA STREAK BADNAVIRUS (eBSV) IN *Musa* GENOTYPES UNDER DROUGHT CONDITION

Eric G. Dinglasan[1], Fe M. Dela Cueva[1], Evelyn F. Delfin[1], Antonio C. Laurena[1] and Marina P. Natural[2]
[1]Institute of Plant Breeding and [2]Crop Protection Cluster
College of Agriculture, University of the Philippines Los Baños
eric091884@gmail.com

Banana streak badnavirus (BSV) is the most serious virus threat in *Musa* breeding program and germplasm movement. Viral sequences naturally integrated into the banana genome, called endogenous BSV (eBSV), can be activated into episomal BSV which are infectious and causes the destructive banana leaf streak disease. Factors that triggered activation include tissue-culture. In a changing climate scenario, abiotic stress specifically drought condition continuously affects crop productivity and susceptibility to diseases, hence it is deemed necessary to determine if drought condition in terms of water stress can trigger the activation of eBSV into infectious episomal form. Two treatments were put-up under glasshouse condition: drought imposed (water-stressed) and well-watered (control). Using BSV F1/R2 primers, IC-PCR detected 8 out of 18 banana cultivars with episomal BSV at 3 weeks after drought imposition (WADI). At 3 WADI, BSV incidence per genotype ranged from 5.56 – 33.33%. In addition, episomal BSV was expressed on 'Pelipia' at 8 WADI but not on 3 WADI. Statistical analysis indicated that activation of BSV, as influenced by water stress condition, occurs only in specific *Musa* cultivars, whether they have the A, AB, or B genome. However, under glasshouse condition, drought did not contribute to symptom expression of BSV infection even on episomal BSV-infected plants at 3 and 8 WADI.

Keywords: Banana streak badnavirus, Immunocapture-PCR, *Musa* germplasm, endogenous, episomal

BS-71

STRUCTURAL AND ULTRASTRUCTURAL CHARACTERISTICS OF THE TESTES OF THE INVASIVE SUCKERMOUTH SAILFIN CATFISH *Pterygoplichthys spp.* Gill 1858 (SILURIFORMES: LORICARIIDAE) FROM THE MARIKINA RIVER SYSTEM, PHILIPPINES

Joycelyn Jumawan[1,2] and Annabelle Herrera[2]
[1]Biology Department, CARAGA State University, Butuan City
[2]Institute of Biology, University of the Philippines Diliman,
joycejumawan@gmail.com

The suckermouth sailfin catfish (*Pterygoplichthys pardalis*) is one of the many loricariid species regarded as highly invasive posing serious threat to many freshwater systems worldwide. Although several loricariid features had been described to contribute to its invasive spread potential, studies on its early development has yet to be described. In this study, mature female *P. pardalis* were subjected to spawning induction using human chorionic gonadotropin (HCG) to study the developmental stages from fertilization until yolk resorption. Females subjected to a single exposure by HCG responded positively to treatment (97%) with higher fertilization success (88.33%) compared to the untreated females (20.89%). Nonetheless, HCG-induced fertilized eggs had a low hatching success (48.56%). From the free-living embryos successfully hatched, a high number (90.44%) had survived to become juveniles. Embryonic development in *P. pardalis* was completed 168 h and 30 min after fertilization with total yolk resorption completed on the 8th day post hatching during which the suckermouth gradually shifts from rostral to ventral position to commence the loricariid algae-scraping feeding mode. *P. pardalis* has the propensity to thrive in hardy water and does not undergo true larval metamorphosis between the free swimming embryo and the juvenile stage, hence, a definitive adult phenotype develop directly. These results provide essential information of the early developmental features of this invasive species whose spawning and early developmental strategies were difficult to observe in the field.

Keywords: janitor fish, invasive fish species, loricariids, development

BS-72

ECTOPARASITES OF CAVE-DWELLING BATS IN MARINDUQUE ISLAND, PHILIPPINES

Ace Kevin S. Amarga[1], Phillip A. Alviola[2], Sheryl A. Yap[2], Ireneo Lit, Jr.[2,3] and Rodolfo Verdida, Jr.[4]
[1]Fishbase Information and Research Group, Inc., International Rice Research Institute Compound, Los Baños, Laguna; ace_amarga061@yahoo.com
[2]Museum of Natural History, and [3]Institute of Biological Sciences, University of the Philippines Los Baños, and [4]College of Science, Bicol University, Albay

This paper constitutes the first ectoparasite faunal survey of bats for Marinduque Island, Philippines. From June 1 to 12, 2010, 150 individual bats comprising of eleven species were captured in eleven caves in Marinduque Island. Each bat was sampled for ectoparasitic arthropods, and a total of 587 individuals representing twenty two species and belonging to five families (Argasidae, Spinturnicidae, Nycteribiidae, Streblidae, and Ischnopsyllidae) were collected. A total of twenty five new country host records for ten ectoparasitic arthropods were documented. The degree of the host specificity of the ectoparasitic arthropods on bats in this island ranges from monoxeny (as seen in *Brachytarsina megadermae* which infests *Megaderma spasma*) up to varying extent of oligoxeny (as exhibited by genus *Nycteribia* infesting the genera *Hipposideros*, *Megaderma*, *Rhinolophus* and *Miniopterus*).

Keywords: cave, bats, ectoparasites, Marinduque, Philippines

CHEMICAL, MATHEMATICAL AND PHYSICAL SCIENCES

CMPS-01

MOLECULAR ASSEMBLY AND ELECTROPOLYMERIZATION OF 3,4-ETHYLENEDIOXYTHIOPHENE ON Au(100) SINGLE CRYSTAL ELECTRODE USING IN-SITU ELECTROCHEMICAL SCANNING TUNNELING MICROSCOPY

Jonyl L. Garcia[1], Bernard John V. Tongol[1,2,3], and Shueh-Lin Yau[4]
[1]The Graduate School, [2]Department of Chemistry, [3]Research Center for the Natural and Applied Sciences, University of Santo Tomas, and [4]Department of Chemistry, National Central University, Taiwan; bvtongol@mnl.ust.edu.ph

Electrochemical scanning tunneling microscopy (EC-STM) is a powerful technique that can provide molecular-level information regarding electrode surface processes in-situ in electrolyte solvent under ambient conditions. In this study, the adsorption and electropolymerization of an industrially important conducting polymer precursor, 3,4-ethylenedioxythiophene (EDOT), on Au(100) single crystal was probed using EC-STM. The Au(100) single crystal electrode substrate used for this study was fabricated using the well-known Clavilier's flame melting procedure. Cyclic voltammetry (CV) was used along with EC-STM to characterize the bare, EDOT-modifed, and poly(EDOT)-modified Au(100) single crystal electrode. Time-dependent EC-STM imaging at 0.550 V showed the formation of an EDOT self-assembled monolayer through 2-D surface diffusion. The resulting EDOT molecular assembly on Au(100) single crystal electrode was found to fit in a $4\sqrt{2}\,x3\sqrt{2}$ unit cell. Difference in apparent corrugation between molecular rows was attributed to different angular orientation with respect to the substrate. The electropolymerization of EDOT on Au(100) single crystal electrode was done by potentiostatic and potentiodynamic methods. Both methods suggested a solution-process mechanism for EDOT electropolymerization.

Keywords: conducting polymers, electrochemical scanning tunneling microscopy, cyclic voltammetry, molecular self-assembly, electropolymerization

CMPS-02

PREPARATION AND CHARACTERIZATION OF CARBON-SUPPORTED PTSN ELECTROCATALYSTS FOR ETHANOL OXIDATION: POSSIBLE APPLICATION FOR INKJET INK FORMULATIONS

Bernard John V. Tongol[1,2,3] and Hao Yuhn C. Hsu[1,2]
[1]The Graduate School, [2]Research Center for the Natural and Applied Sciences,
[3]Department of Chemistry, College of Science, University of Santo Tomas
bvtongol@mnl.ust.edu.ph

The study aimed to utilize inkjet printing technique as a possible fabrication method for developing new Pt-based anode systems with enhanced electrocatalytic behavior towards ethanol oxidation, while reducing the cost of preparation. Carbon-supported Pt and PtSn catalysts of different atomic ratios (90:10, 80:20, 70:30, 60:40 and 50:50) were synthesized by using a modified polyol method. X-ray diffraction (XRD) data revealed that the estimated particle sizes of all synthesized catalysts were approximately 2.0-3.0 nm. Cyclic voltammetry (CV) was used to evaluate the catalytic activity of the synthesized catalysts towards ethanol oxidation. CV data showed that $Pt_{80}Sn_{20}$ exhibited the highest activity with current density of 88.192 mA•cm^{-2}. Chronoamperometry (CA) data confirmed that $Pt_{70}Sn_{30}$ was the most stable among the prepared catalysts with long-term poisoning rate of 4.25 x 10^{-3} (% per s), which was 4 times lower thanPt (1.70 x 10^{-2}). The catalyst with the optimum performance was used as the ink pigment of the inkjet ink formulations. It was seen that the addition of dispersant to the formulations affects the stability and catalytic performance of the ink catalysts. The ink formulations are being characterized by its dispersion stability, preservation stability, drying characteristic and clogging tendency.

Keywords: PtSn catalyst, Polyol method, cyclicvoltammetry, Ethanol oxidation, Inkjet printing technique, ink formulation

CMPS-03

PREPARATION AND CHARACTERIZATION OF DYE-SENSITIZED SOLAR CELL BASED ON PT NANOPARTICLES/ POLY(3,4-ETHYLENEDIOXYTHIOPHENE)-POLY(STYRENESULFONATE) ON FLUORINE-DOPED TIN OXIDE AS COUNTER ELECTRODE ELECTROCATALYST

Lei Angeli S. Morenos[1,2], Bernard John V. Tongol[1,2,3] and Koichiro Mitsuke[4]
[1]Graduate School; [2]Research Center for the Natural and Applied Sciences, [3]Department of Chemistry, College of Science, University of Santo Tomas, and [4]Institute for Molecular Science, National Institutes of Natural Sciences, Japan
bvtongol@mnl.ust.edu.ph

Dye-sensitized solar cells (DSSCs) have attracted an increasing interest as an alternative source of energy because of its low cost, easy production, relatively high efficiency, potential transparency and flexibility. In this study, a simple and fast fabrication of DSSC counter electrode was demonstrated based on electrodeposition of Pt nanoparticles on Poly (3,4-ethylenedioxythiophene) poly(styrenesulfonate) (PEDOT:PSS)-modified Fluorine-doped Tin Oxide (FTO) glass substrate. Cyclic Voltammetry (CV) shows that the electrocatalytic activity towards triiodide/ iodide redox reaction of the electrodeposited Pt/PEDOT:PSS on FTO (I_{pc} = -2.07μA/cm^2) is more superior as compared to the spin-coated Pt/ PEDOT:PSS electrocatalyst (I_{pc} = -1.47μA/cm^2). It was also found that the electrocatalytic activity of the Pt particles was enhanced when PEDOT:PSS was used as a support matrix for the Pt particles. Similarly, an increase in the conversion efficiency of DSSC, prepared using Pt nanoparticles-based counter electrodes, was obtained when these nanoparticles were electrochemically deposited on PEDOT:PSS support matrix (6.6%) rather than on bare FTO substrate (6.2%). This efficiency is comparable to the DSSC fabricated using commercial Pt paste (~6.9%) counter electrode. Meanwhile, Field Emission Scanning Electron Microscopy (FESEM) revealed the dispersion and approximate size of Pt particles (~5 nm) on the FTO glass substrate.

Keywords: Dye-sensitized solar cells, counter electrode, platinum nanoparticles, PEDOT:PSS, CV, FESEM

CMPS-04

GOLD NANOPARTICLES IN SILICA SOL-GEL MATRIX: PREPARATION, CHARACTERIZATION, AND APPLICATION

Blessa Bianca C. Estacion[1] and **Alan Rodelle M. Salcedo**[1,2]
[1]Department of Chemistry, College of Science; [2]Research Center for the Natural and Applied Sciences, University of Santo Tomas
alanx3@yahoo.com; blessabianca06@gmail.com

Gold nanoparticles are attracting much attention in the field of analytical chemistry. In recent years, many attempts have been made to successfully immobilize gold nanoparticles for applications in sensors such as electrochemical and optical sensors. In this study, the feasibility of immobilizing gold nanoparticles in glass substrates using sol-gel method were investigated. The organosilanes: methyltrimethoxysilane (MTMOS) and (3-mercaptopropyl)-trimethoxysilane (MPTMS) were used for the preparation of sol-gel. MTMOS sol-gel was prepared using the solvent system EtOH:MTMOS:0.1MHCl (7.5:3.75:1.0,v/v) and for MPTMS sol-gel, the solvent systems 1%MPTMS in toluene and MPTMS:MeOH:0.1M HCl (1:3:3, molar ratio) were utilized. Spin-coating and dipping techniques were also evaluated for the application of the sol-gel onto the glass substrate prior to the immobilization of AuNPs. The immobilized AuNPs were then characterized using UV-Vis spectroscopy. Spectra of the immobilized AuNPs using MTMOS sol-gel showed no absorbance peaks both in dipping and spin-coating methods indicating the unsuccessful immobilization of the AuNPs. Using MPTMS sol-gel, the dipping technique produced an immobilized AuNPs with absorbance peaks at 565nm and 560nm for MPTMS:MeOH:0.1M HCl and 1%MPTMS in toluene solvent systems, respectively. While the spin-coating technique produced an immobilized AuNPs with an absorbance peak of 580nm only for the MPTMS:MeOH:0.1M HCl solvent system. The potential application for metal ion sensing was demonstrated by exposing the immobilized AuNPs to aqueous solutions of Cd2+, Cr3+, Pb2+ and Ni2+. Varying shifts in the absorbance peaks of the immobilized AuNPs were observed after exposure to these metal ions.

Keywords: Gold nanoparticles, Spin-coating method, Methyltrimethoxysilane sol-gel, (3-mercaptopropyl)-trimethoxysilane sol-gel, UV-Vis spectroscopy

CMPS-05

SECONDARY METABOLITES FROM THE LEAVES OF *Psychotria gitingensis* Elmer

Jameson A. Eusebio[1] and Mario A. Tan[1,2]
[1]The Graduate School and [2]Research Center for the Natural and Applied Sciences, University of Santo Tomas
jameson.eusebio@up.edu.ph, jaeusebio06@yahoo.com

Phytochemical studies involving the genus *Psychotria* (Rubiaceae) have been conducted and it has been established that many species under this genus contain interesting chemical constituents, mostly comprised of alkaloid-type metabolites. This research intends to isolate and identify the secondary metabolites from the crude foliar extract of *P. gitingensis* Elmer, a plant species endemic to the Philippines. The crude methanolic extract was subjected to acid-base partitioning which gave the crude base extract. Initial normal phase gravity column chromatography (silica gel 60) of the crude base extract afforded nine major fractions (PgC-A to PgC-I) and PgC-F and PgC-G gave light orange spots in TLC using Dragendorff's reagent, which may be indicative of the presence of alkaloids. Further normal phase gravity column chromatographic purification of PgC-F and PgC-G both led to the isolation of vomifoliol, a sesquiterpenoid whose structure was elucidated based on extensive spectroscopic analyses (1D and 2D NMR, and MS) and comparison with reported literature. Vomifoliol was also tested for its antimicrobial activity using the agar diffusion paper-disc method and it showed moderate activity towards *Klebsiella oxytoca* at 0.5 mg/mL. Structure identification and antibacterial evaluation of the other isolated constituents are in progress. The results of this study present an implication on the chemotaxonomic relationship of *P. gitingensis* with other members of genus *Psychotria*. This study represents the first phytochemical work on Philippine *Psychotria*, particularly on *P. gitingensis*, and the first isolation of vomifoliol from the genus *Psychotria*.

Keywords: *Psychotria gitingensis*, Rubiaceae, secondary metabolites, vomifoliol, Dragendorff's reagent

CMPS-06

CUSTOM SYNTHESIS OF ISOTOPE-LABELLED *Apis meliifera* PHEROMONE

Aida P. Conanan**,** Nicole Marie A. Cortes, Cristel Lyn R. Daguno, Jose Angelo A. Templonuevo and **Raymond J. Sucgang**
R.J. Sucgang Center for Research in the Natural Sciences, Batan, Aklan
cesarsed2002@yahoo.com

The object of this study is to determine the optimum conditions for the synthesis of isotope-labelled isopentyl acetate. Isopentyl acetate is widely used as a raw material in industries, in syntheses, and is utilized as a sex attractant (pheromone) by the bee species, *Apis mellifera*. The isotope labelling of isopentyl acetate will allow tracking of the fate and movement of the isopentyl acetate in the environment, in chemical transformations, and in biological systems. Esterification by alcoholysis of acetic acid was optimized for the preparation of Carbon -14 (^{14}C)-labelled isopentyl acetate from ^{14}C- labelled acetic acid and isoamyl alcohol. The different conditions studied were: (1) The effects of acid catalysis and or reflux on the amount of yield of the product. (2) The effects of acid catalysis and/or reflux on the incorporation and retention of the isotope label on the product. The efficiency of label incorporation and retention was determined through the beta radioactivity of Carbon 14 in each of the synthetic constructs. Determination of the beta radioactivity concentration of ^{14}C in the isopentyl acetate product was done using low level liquid scintillation spectrometry. Each of the synthetic products was mixed with UltimaGold scintillation cocktail in a low potassium glass scintillation vial, and analysed in a low-level Wallac 1414 scintillation counter. The application of catalysis without reflux resulted in the highest yield (35%). The same condition also resulted in the highest abundance of carbon isotope label with 2.40 Bequerels per cubic centimetre, Bq/cc (measurement unit for radioactivity).

Keywords: liquid scintillation, radiolabelling, carbon 14, isotope, isopentyl acetate

CMPS-07

DEVELOPMENT OF LABORATORY METHOD FOR THE SIMULTANEOUS DETERMINATION OF GROSS ALPHA AND GROSS BETA ACTIVITIES IN WATER BY LIQUID SCINTILLATION COUNTING

Raymond J. Sucgang, Preciosa Corazon B. Pabroa,
Norman DS Mendoza and **Soledad S. Castañeda**
Philippine Nuclear Research Institute, Department of Science and Technology; rjsucgang@pnri.dost.gov.ph

The Philippine National Standards for Drinking Water (PNSDW) includes the determination of the radiological quality of drinking water to ensure that water is safe from contamination due to fallout, or suspected sources of radiological impurities . The standard limits are: 0.1 Bq/L for gross alpha counts and 1.0 Bq/L for gross beta counts. A liquid scintillation (LSA) based method that requires smaller sample quantities, less sample preparation time and operator intervention, and produces adequate minimum detection levels for local drinking water guidelines has been developed. It involves the enrichment of the sample 10 times by evaporation and counting for two hours, the alpha and beta emissions simultaneously by pulse shape analysis using the Guardian 1414 liquid scintillation counter. The method overcomes the self-attenuation problems typical of high dissolved solid waters and gas flow proportional counting that was previously used. Additionally, the need to evaporate large volumes of water, quantitatively transfer residues to counting planchets and developing operator skills in producing homogeneous and evenly distributed samples are eliminated. Operator intervention is also minimized during sample preparation and counting. This resulted in the reduction of analysis time to 1/5 and analysis cost to 1/3 from that using the former procedure. The detection limits: 0.03 -0.06 Bq/L for alpha and 0.2-0.5 Bq/L for beta, are sufficiently low for the required regulatory limits. Detection limits of ≤0.05 Bq/L for gross alpha and ≤0.3 Bq/L for gross beta were achieved for a total of two hours counting per sample.

Keywords: radiological testing, water, liquid scintillation, gross alpha, beta

CMPS-08

POTENTIOMETRIC SENSOR FOR MELAMINE USING ELECTROPOLYMERIZED POLYANILINE MEMBRANE

Dasha A. Fernandez[1], Francis G. Biñas[1,2] and Fortunato B. Sevilla III[1,2]
[1]Department of Chemistry, College of Science, [2]Research Center for the Natural and Applied Sciences, University of Santo Tomas; fernandezdasha@gmail.com

A simple, rapid, and inexpensive way of quantifying melamine was devised using a potentiometric sensor based on the molecularly imprinted- polymer (MIP). Polyaniline (PAni) membrane was electrodeposited on a graphite/ epoxy composite electrode using potentiostatic polymerization. Melamine, which served as the template molecule, was extracted from the polymer membrane. Several parameters were optimized such as the applied potential, polymerization time, melamine and aniline molar concentration ratio, conditioning time and pH. The linear range for melamine determination was $1.0x10^{-10}$ - $1.0x10^{-2}$ M in buffered solution with a sensitivity of 0.5380 mV/ decade, linearity of 0.9990 (n= 3) and a limit of detection of $2.5x10^{-15}$ M. The sensor response was found to be repeatable. The morphology of the polymer was probed by scanning electron microscopy (SEM).

Keywords: potentiometry, graphite/ epoxy composite, electropolymerization, polyaniline, molecular imprinting

CMPS-09

EFFECT-DIRECTED ANALYSIS OF POTENTIAL ENDOCRINE DISRUPTORS FROM THE EXTRACTS AND FRACTIONS OF SEDIMENTS FROM LAGUNA LAKE, PHILIPPINES USING THE LYES-ASSAY

Arnold V. Hallare[1,2], Christine Schonlau[1],
Georg Streck[3], Werner Brack[3] and Henner Hollert[1]
[1]University of the Philippines Manila, [2]RWTH Aachen University, Germany,
and [3]Centre for Environmental Research (UFZ), Germany
avhallare@gmail.com

Sediments of aquatic systems serve both as sink and secondary sources of contaminants. Previous studies reported that sediments from Laguna Lake, one of the largest aquatic resources in the Philippines, contain a complex mixture of substances. A large range of these chemicals have shown to act as endocrine-disrupting compounds. The present study, was conducted to further investigate the level of contamination of sediment samples from the lake. The LYES-Assay (Yeast estrogenic screen assay assisted by enzymatic digestion with Lyticase) was performed to screen for estrogenic active fractions in sediment samples from Laguna Lake. Sediment samples from two pre-selected sites within the lake were obtained and subjected to fractionation and effect-directed analysis: Central Bay and East Bay. The sediment samples were extracted using an accelerated solvent extraction method whereas the fractionation of extracts was carried out using the recently-developed automated online multistep fractionation method. Each fraction was tested in seven different dilution steps. Only 5 out of 38 sediment samples showed endocrine activities. In the sediment samples from East Bay four fractions showed a significant endocrine effectiveness at the one fold concentration (fraction 11, 15, 16, 18). The estrogenic activity ranged from 8.43 ± 4.37 ng/L at fraction 18 to 10.79 ± 5.28 ng/L at fraction 15. Only fraction 18 indicated a significant endocrine potential from Central Bay. However, it already showed significant endocrine effectiveness even at the 1/8 fold concentration of 8.80 ± 2.29 ng/L and up to 27.32 ± 18.39 ng/L at the one fold concentration. Overall, the sediment samples did not reveal a very high estrogenic impact when compared with sediments from some European sites. Characterization of fractions exhibiting endocrine activities through further chemical analyses is underway.

Keywords: effect-directed analysis, sediment, endocrine activities, Laguna Lake, LYES assay

CMPS-10

SYNTHESIS OF COBALT BORIDE NANOPARTICLES USING RADIO FREQUENCY THERMAL PLASMA

Lorico DS. Lapitan, Jr.[1,2], Ying Ying Chen[2],
Seesoek Choi[2] and Takayuki Watanabe[2]
[1]Faculty of Engineering, University of Santo Tomas; sanjo_icko@yahoo.com
[2]Tokyo Institute of Technology, Japan

Nanosize cobalt boride particles were synthesized from the vapor phase using a 30 kW – 4 MHz radio frequency (RF) thermal plasma. Cobalt and boron powder mixtures used as precursors in different composition and feed rate were evaporated immediately in the high temperature plasma and cobalt boride nanoparticles were produced through the quenching process. The X-ray diffractometry (XRD) patterns of cobalt boride nanoparticles prepared from the feed powder ratio of 1:2 and 1:3 for Co:B showed peaks that are associated with the Co_2B and CoB crystal phases of cobalt boride. The XRD analysis revealed that increasing the powder feed rate results in a higher mass fraction and a larger crystalline diameter of cobalt boride nanoparticles. The images obtained by field emission scanning electron microscopy (FE-SEM) revealed that cobalt boride nanoparticles have a spherical morphology. The crystallite size of the particles estimated with XRD was found to be 18 - 22 nm.

Keywords: cobalt boride nanoparticles, thermal plasma, x-ray diffraction, scanning electron microscopy

CMPS-11

DEVELOPMENT OF LYOPHILIZED COCONUT WATER FOR ISOTONIC BEVERAGES

Rosalinda C. Torres, Carmelita O. Manalo,
Teresita S. Bonifacio, Evelyn B. Manongsong,
Elvira L. Arrogante, Eduardo A. Lanto and Romulo R. Estrella
Industrial Technology Development Institute
Department of Science and Technology
lindactorres@yahoo.com

Lyophilized coconut water from both young and mature coconuts was developed by ultra low freezing followed by freeze-drying. Lyophilized product with 25% maltodextrin was found to conform with specifications of the commercial product. Likewise, it remained stable up to six months or more after processing as long as it is stored in freezing temperature. Developed product will be used as isotonic beverage or sports drink. Physico-chemical properties of coconut water from young and mature coconuts were characterized and compared. Likewise, microbial evaluation was conducted. Mineral content was further analyzed and compared with sports drink. Results of the analysis showed that mineral contents such as sodium, potassium, calcium, magnesium, iron, copper and phosphorus were found higher in mature coconut water than in young coconut water. There were slight differences in the physico-chemical properties but microbial evaluation showed higher contamination (total plate count and mold & yeast count) in mature coconut water than young coconut water. However, these results including *Pseudomonas* & *Salmonella* counts were found within required limits. Results for *E.coli* and *S. aureus* counts fall slightly below the required limits. Mineral content from both sources was found higher than sports drink in terms of potassium and magnesium content.

Keywords: lyophilized coconut water, isotonic beverages, mineral content, microbial evaluation

CMPS-12

ISOLATION AND STRUCTURE CHARACTERIZATION OF CHEMICAL CONSTITUENTS FROM *Micromelum compressum* WITH *IN VITRO* ANTITUBERCULOSIS ACTIVITY

Warren S. Vidar[1], Allan Patrick G. Macabeo[1], Paul Kohls[2], Mathias Knorn[2], Yuehong Wang[3], Scott G. Franzblau[3], and Ma. Alicia M. Aguinaldo[1]

[1]Research Center for the Natural and Applied Sciences, and The Graduate School, University of Santo Tomas; warrenvidar@yahoo.com

[2]Institut fur Organische Chemie, Universitaet Regensburg, Germany

[3]Institute of Tuberculosis Research, College of Pharmacy University of Illinois at Chicago, USA

This study investigated polymethoxy flavones from the leaves of *Micromelum compressum* with synergistic inhibitory effect against *Mycobacterium tuberculosis* H37Rv. The crude DCM-MeOH extract obtained from the sample exhibited 84% inhibition against *M. tb.* at 128 μg/mL using the colorimetric microplate Alamar blue assay (MABA). It was subjected to acid-base partitioning, followed by partitioning by polarity using petroleum ether, DCM, and water and gave three fractions (McP, McD, and McW). McD was partitioned using vacuum liquid chromatography yielding five fractions where the third showed 96% inhibition against *M. tb.*, while McP showed 92%, at 128 μg/mL. Silica chromatographic purification of McD3 resulted in the isolation of the following: 3,5,7,4'-tetramethoxyflavone (McD3.3), a 1:1 mixture of McD3.3 and 3,5,7,8,4'-pentamethoxyflavone (McD3.5), and a mixture with the pentamethoxyflavone and traces of McD3.3 (McD3.6) The structures were elucidated using HREIMS, 1H-NMR, 13C-NMR, COSY, HSQC and HMBC. MABA showed McD3.3 and McD3.6 to have low inhibition against *M. tb.* Surprisingly, McD3.5, exhibited a good activity with a minimum inhibitory concentration (MIC) of 15.98 μg/mL. The results also uniquely present the synergism of two polymethoxy flavones in enhancing the inhibition of *M. tb.*, making it a potential source of antitubercular constituents.

Keywords: *Micromelum compressum*, polymethoxy flavones, synergistic effect, antitubercular inhibitory activity, antitubercular constituents

CMPS-13

SYNCHRONIZING p TIMEPIECES IN $\Theta(\log_2 p)$ STEPS

Jaderick P. Pabico
Institute of Computer Science
University of the Philippines Los Baños
jppabico@uplb.edu.ph

In response to Department of Science and Technology's (DOST) "Juan Time, On Time" program, which aims to encourage Filipinos to use the Philippine Standard Time, we take it further by providing a log(p) broadcast and reduction protocol for automatic synchronization of p timepieces that are connected through some communication media (*e.g.* Wi-Fi, LAN, *etc.*), where the current Berkeley protocol uses p steps. Given p timepieces displaying different time readings T_1, T_2, ..., T_P, respectively, the purpose of the communication schemes is to :

1. Perform a many-to-one reduction with log(p) steps of T_i, for all i's, to a designated master timepiece p_1, incorporating the time-delay due to reduction propagation r_i to each T_i at the ith reduction step.

2. The master timepiece p_1 performs an average T' of the $T_i + r_i$, and then updates its own time by $T'' = T' + C(T')$, where $C(x)$ is the time cost of performing the mathematical operation x.

3. The master then initiates a log(p)-step one-to-many broadcast of T'', where at the ith step of the broadcast, the time-delay b_i due to broadcast propagation is recorded, and the timepieces involved in the broadcast step updates its own clock by $b_i + T''$.

At the end of the reduction and broadcast, all P timepieces will display the same $b_{\log p} + T''$ time, which can be done in exactly $\Theta(\log p)$.

Keywords: clock synchronization, Berkeley algorithm, broadcast, reduction, $\Theta(\log p)$ steps

CMPS-14

THE HANKEL TRANSFORM OF GENERALIZED BELL NUMBERS

Roberto B. Corcino
Department of Mathematics, College of Natural Sciences and Mathematics
Mindanao State University Marawi; rcorcino@yahoo.com

The generalized Bell numbers, denoted by $G_{n,\beta,r}$, are defined by

$$G_{n,\beta,r} = \sum_{k=0}^{n} S(n,k;\beta,r)$$

where $S(n,k;\beta,r) = \lim_{\alpha\to 0} S(n,k;\alpha,\beta,r)$ with $S(n,k;\alpha,\beta,r)$ are the unified generalization of Stirling numbers by L.C. Hsu and P.J-S. Shuie. The numbers $S(n,k;\beta,r)$ are exactly the *r*-Whitney numbers of the second kind and the same numbers considered by Rucinski and Voight. In this paper, the following recurrence relations for $G_{n,\beta,r}$ are established

1. $G_{n,\beta,r+1} = \sum_{k=0}^{n} \binom{n}{k} G_{k,\beta,r}$,

2. $G_{n,\beta,r} = \sum_{k=0}^{n} (-1)^{n-k} \binom{n}{k} G_{k,\beta,r+1}$.

These recurrence relations are used in obtaining the Hankel transform of the sequence $\left(G_{n,\beta,r}\right)$, which is given by

$$\begin{vmatrix} G_{0,\beta,r} & G_{1,\beta,r} & G_{2,\beta,r} & \cdots & G_{n,\beta,r} \\ G_{1,\beta,r} & G_{2,\beta,r} & G_{3,\beta,r} & \cdots & G_{n+1,\beta,r} \\ \vdots & \vdots & \vdots & \cdots & \vdots \\ G_{n,\beta,r} & G_{n+1,\beta,r} & G_{n+2,\beta,r} & \cdots & G_{2n,\beta,r} \end{vmatrix} = \prod_{k=0}^{n} \beta^k k!$$

Keywords: Generalized Bell numbers, Stirling numbers, Hankel transform, Hankel matrix, *r*-Whitney numbers.

CMPS-15

SOME CONVOLUTION-TYPE IDENTITIES AND CONGRUENCE RELATION OF THE LIMIT OF THE DIFFERENCES OF GENERALIZED FACTORIAL

Roberto B. Corcino[1] and **Miraluna L. Herrera**[2]
[1]Department of Mathematics, Mindanao State University Marawi, [2]Department of Mathematics, Caraga State University Butuan; rcorcino@yahoo.com

The generalized Stirling numbers of the first kind $F_{\alpha,\gamma}(n,k)$ are defined by means of the following limit relation

$$F_{\alpha,\gamma}(n,k)=\lim_{\beta\to 0}\frac{\left[\Delta_t^k(\beta t+\gamma\mid\alpha)_n\right]_{t=0}}{k!\,\beta^k}$$

where are real numbers and n, k are nonnegative integers. The limit, when evaluated completely, gives an explicit formula

$$F_{\alpha,\gamma}(n,k)=\sum_{0\le j_1<j_2<\ldots<j_{n-k}\le n-1}\prod_{q=1}^{n-k}\left(\gamma-j_q\alpha\right)$$

In this paper, we establish the following convolution-type identities

1. $\binom{k}{k_1}F_{\alpha,\gamma}(n,k)=\sum_{m=0}^{n}F_{\alpha_1,\gamma_1}(m,k_1)F_{\alpha_2,\gamma_2}(n-m,k_2)$
   where $k=k_1+k_2$ and $\gamma=\gamma_1+\gamma_2$,
2. $F_{\alpha,\gamma}(n,k)=\sum_{l=0}^{k}F_{\alpha,\gamma}(n_1,l)F_{\alpha,\gamma-n_1\alpha}(n_2,k-l)$ where $n=n_1+n_2$.

Consequently, we obtain the following congruence relation

$$F_{\alpha,\gamma}(p,k)\equiv 0(\mathrm{mod}\,p)$$

where $1<k<p$.

Keywords: convolution-type identity, congruence relation, 0-1 tableau, generalized factorial, Stirling numbers

CMPS-16

SHARPNESS OF THE CRITICAL CONSTANT OF THE IMPROVED RELLICH INEQUALITY

Alnar L. Detalla
Department of Mathematics, Central Mindanao University
Musuan, Bukidnon, al_detalla@yahoo.com

Let Ω be a bounded domain in R^n with $0 \in \Omega$ and $n \geq 3$. For any $1 < p < \frac{n}{2}$, the well-known Rellich inequality

$$\int_\Omega |\Delta u(x)|^p dx \geq \left(\frac{n-2p}{p}\right)^p \left(\frac{p-n}{p}\right)^p \int_\Omega \frac{|u(x)|^p}{|x|^{2p}} dx \qquad (1)$$

holds for any $u \in W_0^{2,p}(\Omega)$. The improvement of inequality (1) gains much attention in the recent years because of its application in Potential and Magnetic Theory. It also allows us to assume $p = \frac{n}{2}$. In this paper, we consider the inequality

$$\int_\Omega |\Delta u(x)|^{\frac{n}{2}} dx \geq \left(\frac{n-2}{\sqrt{n}}\right)^n \int_\Omega \frac{|u(x)|^p}{|x|^{2p}} \left(\log \frac{R}{|x|}\right)^{-\frac{n}{2}} dx + C^* \int_\Omega \frac{|u(x)|^p}{|x|^{2p}} \left(\log \frac{R}{|x|}\right)^{-\frac{n}{2}-1} dx \qquad (2)$$

for any $u \in W_0^{2,\frac{n}{2}}(\Omega)$. This is an improvement of (1) at $p = \frac{n}{2}$. We call this condition, the Critical Case of the improvement. We shall prove the sharpness of the critical constant $\left(\frac{n-2}{\sqrt{n}}\right)^n$ which guarantees further improvement of inequality (2).

Keywords: Rellich Inequality, Critical Constant, Sharp Constant, eigenvalue, Potential Theory.

CMPS-17

ON THE REPRESENTATION OF AB-GENERALIZED LUCAS SEQUENCE BY HESSENBERG MATRICES

Michael B. Frondoza and Mhelmar A. Labendia
Department of Mathematics, MSU-Iligan Institute of Technology
michael.frondoza@g.msuiit.edu.ph

Let n be a positive integer. The Lucas sequence {Ln} has the recurrence relation $L_{n+1} = L_n + L_{n-1}$, where $L_0=2$ and $L_1=1$. A lower Hessenberg matrix $M_n = (a_{ij})$ is an nxn matrix where $a_{jk} = 0$ whenever $k > j+1$ and $a_{j(j+1)} \neq 0$ for some j. In this paper, we introduce the second order linear recurrence relation of the AB-generalized Lucas sequence $\{v_n\}$ and give the relationships between $\{v_n\}$ and Hessenberg permanents and determinants. Moreover, we also give representations of $\{v_{2n}\}$ and $\{v_{2n+1}\}$.

Keywords: Lucas sequence, AB-generalized Lucas sequence, Hessenberg matrix, Hessenberg permanent, Hessenberg determinant

CMPS-18

SUPER-CONTINUITY AND SUPER-CONNECTEDNESS

Mhelmar A. Labendia and Sergio R. Canoy, Jr.
Department of Mathematics, College of Science and Mathematics
MSU-Iligan Institute of Technology; mhelmar.labendia@g.msuiit.edu.ph

This study considered the topological concepts such as super-open, super-closed, super-closure, and super-continuity introduced by Volicko in 1968. Equivalent statements of super-continuity of a function are obtained. Super-connectedness is defined and it is shown that this concept is equivalent to the ordinary concept of connectedness.

The following main results have been generated in this study:

1. Let (X,τ) be a topological space and τ^* be the family consisting of all the super-open subsets of X. Then τ^* is a topology on X.
2. Let $f: X \to Y$ be a function. Then the following statements are equivalent.
   (a) f is super-continuous on X.
   (b) $f^{-1}(F)$ is super-closed for every closed subset F of Y.
   (c) $f^{-1}(B)$ is super-open for every (sub-basic) basic open set B in Y.
   (d) For each $p \in X$ and every open set V in Y containing $f(p)$, there exists an open set O in X such that $p \in O$ and $f(Cl(O)) \subseteq V$.
   (e) $f(Cls(A)) \subseteq Cl(f(A))$ for every subset A of X.
   (f) $Cls(f^{-1}(B)) \subseteq f^{-1}(Cl(B))$ for every subset B of Y.
3. Let (X,τ) be a topological space. Then the following statements are equivalent.
   (a) X is connected.
   (b) X is super-connected.
   (c) The only subsets of X both super-open and super-closed are $\varnothing$ and X.
   (d) No super-continuous function $f: X \to 2$ is surjective, where 2 is the space $Y = \{0,1\}$ with the discrete topology.

Keywords: super-open, super-closed, super-closure, super-continuity, super-connectedness

CMPS-19

ON THE HAMILTONICITY OF PRODUCT GRAPH $G \square S_m$, FOR A GRAPH G OF ORDER n, AND STAR GRAPH S_m, $n \geq m$

Aurea Z. Rosal
Polytechnic University of the Philippines
Sta. Mesa, Manila, azrosal@yahoo.com

The Cartesian product of two Hamiltonian graphs is again Hamiltonian, but the hamiltonicity of the product of two graphs of which one may not be Hamiltonian is generally unknown. This study will provide the necessary and sufficient conditions for the hamiltonicity of the Cartesian product of two graphs when one of the graphs is Hamiltonian. Given two graphs G and H, the cartesian product, G□H (Cartesian product of graph G and graph H) is the graph whose vertex set is V (G)×V (H) and the set $\{(u_1, v_1), (u_2, v_2)\}$ is an edge if and only if exactly one of the following is true.
(i) $u_1 = u_2$ and $\{v_1, v_2\}$ is an edge in H.
(ii) $v_1 = v_2$ and $\{u_1, u_2\}$ is an edge in G.
A star graph S_m, also known as a complete bipartite graph $K_{1,m}$, is a graph whose vertex set consists of the union of two disjoint sets $V_1 = \{c\}$ and $V_2 = \{v_1, v_2, \ldots, v_m\}$, known as partites, such that no two vertices in V_2 are adjacent to each other but all of them are adjacent to c. A hamiltonian graph is a graph that contains a cycle containing all its vertices. Clearly, S_m is not hamiltonian for all $m \geq 1$.

In this paper the following shall be proven:

Let G be a hamiltonian graph , C_n be a cycle graph and K_n be a complete graph, all of orders n, and S_m be a star graph, $m \geq 1$, then

1. $C_n \square S_m$ is hamiltonian if and only if $n \geq 3$
2. $K_n \square S_m$ is hamiltonian if and only if $n \geq 2$
3. $G \square S_m$ is hamiltonian if and only if $n \geq m$.

Keywords: graph, hamiltonian graph, Cartesian product of graph, complete graph, star graph

CMPS-20

DETERMINATION OF THE INTRUDER'S LOCATION IN A GIVEN NETWORK

Sergio R. Canoy, Jr.* and Gina A. Malacas
Department of Mathematics, College of Science and Mathematics
MSU-Iligan Institute of Technology, serge_canoy@yahoo.com

The exact location of an intruder in a given network or graph can be determined using the concept of locating-dominating set in a graph. In this study, the locating-dominating sets in the joins of graphs are characterized in terms of other related concepts and the associated locating-domination numbers are determined. Just like other existing monitoring strategies, the objective in this strategy is to evaluate or determine the minimum number of monitoring devices needed to determine the exact location of a possible intruder in a graph or network. The following main results have been generated in this study:

1. For any connected graph G, $ln(G) \leq \gamma_L(G) \leq \gamma_{SL}(G)$.
2. Let G be a connected graph of order $n \geq 2$. Then $\gamma_L(G) = n - 1$ if and only if $G = K_n$ or $G = K_{n-1}$.
3. Let G and H be connected non-trivial graphs. Then $S \subseteq V(G+H)$ is a locating dominating set in $G+H$ if and only if $S_1 = V(G)\backslash S$ and $S_2 = V(H)\backslash S$ are locating sets in G and H, respectively, where S_1 or S_2 is strictly locating.
4. Let G and H be connected non-trivial graphs. Then $\gamma_L(G+H) = \min\{sln(H) + ln(G), sln(G) + ln(H)\}$.

Keywords: graph, domination, locating, strictly locating, locating domination number

CMPS-21

THE AVERAGE OF THE 10th POWER OF THE L_{10} NORM OVER THE LITTLEWOOD POLYNOMIALS ON THE BOUNDARY OF THE UNIT DISK

Braullo D. Peñalosa[1] and Jocelyn S. Paradero-Vilela[2]
[1]Department of Mathematics, College of Arts and Sciences
Central Mindanao University, Bukidnon; pbraullo@yahoo.com
[2]Department of Mathematics, College of Science and Mathematics
MSU-Iligan Institute of Technology; jocelyn.velila@g.msuiit.edu.ph

Let $\mathsf{L}_n = \left\{ P : P(z) = \sum_{j=0}^{n} a_j z^j, a_j \in \{1,-1\} \right\}$ be the set of all Littlewood polynomials of degree n where $n \geq 0$ an integer. Further, let $\mu_n(m) = \frac{1}{2^{n+1}} \sum_{P \in \mathsf{L}_n} \|P\|_m^m$ be the average of the m^{th} power of the L_m-norms over L_n where $\|P\|_m = \left\{ \frac{1}{2\pi} \int_0^{2\pi} |P(z)|^m \, d\theta \right\}^{1/m}$ is the L_m-norm of P on the unit circle. The formulae for $\mu_n(m)$ for m = 2 , 4, 6 and 8 have been established in the literature by Borwein and Choi in their paper entitled ``The Average Norm of Polynomials of Fixed Height''. In this paper, the exact formulae for $\mu_n(10)$ which is

$$\mu_n(10) = 120n^5 + 150n^4 - 350n^3 + 265n^2 + 281n - 144 - 75n(-1)^n + 145(-1)^n$$

was derived by the authors in an entirely different approach which makes this result new and is the tip of an iceberg that we explore further.

Keywords: Littlewood polynomial, average, -spaces, norm, unit circle

ENGINEERING SCIENCES and TECHNOLOGY

EST-01

PARAMETRIC AND KINETIC STUDIES ON THE TREATABILITY OF DISTILLERY SLOP BY PHOTOCATALYSIS USING PAINT-IMMOBILIZED TITANIUM DIOXIDE

Ramer P. Bautista, Jovita L. Movillon, Marilyn C. del Barrio, John Meynard M. Tengco and Rhebner E. Arocena
College of Engineering and Agro-Industrial Technology,
University of the Philippines Los Baños; ramer.bautista@yahoo.com

Distillery slop is the large amount of wastewater generated which is equivalent to about 12 to 15x of the volume of ethanol produced. It causes serious disposal problem due to its large volume, high organic load, low pH, high temperature, and dark color (if coming from molasses-based distilleries).This study aimed to determine the efficiency of using paint-immobilized titanium dioxide for the photocatalytic reduction of color and chemical oxygen demand (COD). Titanium dioxide is a non-toxic white powder, resistant to photocorrosion, relatively inexpensive and effective in oxidizing organic and inorganic compounds. The synthetic distillery slop (color of 127,200 PCU, 46,600 mg/L COD and pH 4) was tested using three parameters: presence of light, catalyst loading and pH (4, 5, 6, 7 and 8) to determine which conditions will give the maximum degradation of organic and inorganic materials at 20x dilution. Highest color reduction of 33.65% was measured for the catalysis under solar exposure using the optimum catalyst loading of 50 g titanium dioxide mixed with 50 mL both of water and BoysenTM Gloss Latex Paint in Burnt Sienna. Two controls were used: plain paint and glass alone. Results of treatment with titanium dioxide were significant compared to those of the controls based on the analysis of variance. Kinetic parameters were calculated using the differential and integration methods, giving the preferred values of k at first order of reaction to be 3.5394×10^{-4}/min for color reduction; and $k = 9.1497 \times 10^{-4}$/min for COD reduction. Photocatalysis using paint-immobilized titanium dioxide may be used as a primary treatment for decolorization and COD reduction of distillery slop. However, secondary treatment should be performed to make it compliant to the requirements of the Philippine Clean Water Act.

Keywords: distillery slop, titanium dioxide, photocatalysis

EST-02

PARAMETRIC STUDY ON THE GROWTH OF GREEN ALGA *Chlorella vulgaris* Biej. (CHLOROPHYTA) CULTIVATED IN POLYETHYLENE PHOTOBIOREACTORS UNDER OUTDOOR OPERATIONS

Denise Ester O. Santiago[1], Milagrosa M. Goss[2], Rex B. Demafelis[1], June Owen O. Nacorda[2], Jovita L. Movillon[1] and Sammy D.C. Aquino[1]
[1]Chemical Engineering Department, College of Engineering and Agro-Industrial Technology, [2]Institute of Biological Sciences, College of Arts and Sciences, University of the Philippines Los Baños; kyrr_den@yahoo.com

Microscopic alga is rich in oils (30% to 80% by weight in biomass), and can produce more than 30 times the amount of oil (per year per unit area of land) compared to oil seed crops used for biodiesel production. This study determined the growth kinetics (specific growth rate, doubling time, doublings per day and maximum cell concentration) of green algae *Chlorella vulgaris* Beijerinck, in polyethylene photobioreactor in batch and outdoor operation; and identified the effects of variations in the aeration rate, reactor diameter, and culture media. The batch and outdoor cultivation of *C. vulgaris* CV1 strain was done in polyethylene photobioreactors of varying diameters (4.0”D, 6.0”D, 7.0”D), aeration rates (vvm of 0.114, 0.275 and 0.377) and 3 kinds of culture media (fertilizer solution 0.17192 g/L of urea and 0.02073 g/L of NPK; hog manure mixture; BG-11 medium in Stanier et al, 1971). The biomass concentration at stationary phase for aeration settling of 0.275 vvm was 0.3202 g/L and for 0.114 vvm, it was 0.2670 g/L. The growth of *C. vulgaris* was most favorable in photobioreactor with smallest diameter (4.0”), and in the BG-11 in terms of specific growth rate. The highest oil yield (6.962%) was obtained from the reactor with 7.0”D, followed by 4.0”D (4.546%); least was 6.0”D (3.423%)

Keywords: *Chlorella vulgaris* Beijerinck, Chlorophyta, polyethylene photobioreactors

EST-03

PRE-TREATMENT STUDIES OF SWEET SORGHUM NON-GRAIN BIOMASS FOR BIOETHANOL PROCESSING

Shirley C. Agrupis[1] and Praveen Vadlani[2]
[1]Mariano Marcos State University Batac; shirleyagrupis@yahoo.com
[2]Kansas State University, USA

Lignocellulosic biomass like the residual non-food biomass from agricultural sector is a potential alternative feedstock for bioethanol. However, the complex cross linking of cellulose, hemicellulose, and lignin make the biomass recalcitrant to hydrolysis for further processing to bioethanol and other products. Hence, pre-treatment is essential as this converts lignocellulosic biomass from its native form. In this study, combination of thermo-chemical was evaluated. The objective was to establish the most appropriate process for sweet sorghum bagasse, which will serve as basis for optimization for other agricultural residues. The thermo-chemical pretreatments were Soda, Kraft, and Organoslov with predetermined amounts of chemical catalysts. They were carried out at constant temperature (170^{o}C), liquid to biomass ratio (10:1), residence time at treatment temperature (60 min), and cooling down (60mins). Hydrothermal process was performed using the same conditions without chemical catalyst. Fiber yield (%) after pretreatment was in a decreasing order from Organoslov (58.75%)> Kraft (51.25)> Soda (38.28) >Water (25.63%). Sugar yields after acid hydrolysis of the pretreated biomass was highest in Soda (30.22%) and Kraft (29.29%) processes. Organoslov was at 15.37% and hydrothermal at 22.77%, respectively. Sugar degradation was at different extents ranging from 8.29-53%. Also, delignification was effected by the pretreatment protocols and was best observed in Kraft process at 70.72%, Soda at 62.49%; Organoslov at 27%, and hydrothermal at 16.64%. High powered microscopy provided clear degradation of the biomass. Soda and Kraft processes gave the best result while hydrothermal process in combination with biological treatment showed promising result for further investigation

Keywords: Biofuel, lignocellulosic biomass, feedstock, pre-treatment, thermo-chemical

EST-04

LAND COVER CHANGE AND WATER YIELD OF SILANG-SANTA ROSA RIVER SUBWATERSHED, LAGUNA, PHILIPPINES

Kathreena G. Engay[1] and Damasa B. Magcale-Macandog[2]
[1]College of Agriculture, Southern Luzon State University
[2]Institute of Biological Sciences, University of the Philippines Los Baños;
yagne2002@yahoo.com

Patterns of land cover changes in the Silang-Santa Rosa River Subwatershed were documented through conduct of Participatory Rural Appraisal approaches and GIS mapping. 1993 and 2008 Land cover maps were generated from classified satellite images using ArcGIS with four identified cover classes that include perennials and coconut, cultivated or tilled areas, fallow and grassland, and built-up. Land cover patterns in the subwatershed begun from perennials to grassland to built-up, and from farmlands to idle lands then to built-up. A GIS-based water balance model of the subwatershed that predicts water discharge was derived from PCRaster's DISCHARGE MODEL with component parameters including rainfall, evapotranspiration, cover coefficient, and soil field capacity. Results of sensitivity analysis showed that the volume of water discharge changes with varying land cover coefficients. The model can be used to simulate various scenarios of land cover change and its impact to water yield. Simulation results show that increase in built-up areas resulted to increase in water yield implying reduction in groundwater recharge.

Keywords: Silang-Santa Rosa Subwatershed, Participatory Rural Appraisal, land cover change, land cover patterns, water balance model

EST-05

UTILIZING SPECTRAL REFLECTANCE AND VEGETATION INDICES OF *Bougainvilleae spectabilis* IN MONITORING PARTICULATE AIR POLLUTION IN METRO MANILA

Alex S. Olpenda and Enrico C. Paringit
Applied Geodesy and Space Technology, College of Engineering
University of the Philippines, Diliman; alecsolpenda@yahoo.com

This research aims to examine the potential of multispectral remote sensing in assessing particulate air pollution at a wider scale and with relative ease wherein plant responses were utilized as indicators of air quality. Major result shows that materials exposed to a polluted area would likely decrease its reflectance mainly from visible to near infrared regions. Vegetation indices such as Ratio Vegetation Index (RVI), Normalized Difference Vegetation Index (NDVI) and Difference Vegetation Index (DVI) including Red Edge Parameter (REP) were utilized to assess potted bougainvillea plants exposed at different pollution level. Further, a spectral mixture analysis (SMA) was made to simulate the effects of exhaust pipe soot to the spectral characteristics of a bougainvillea leaf. The generated data was later used in creating a model thru Partial Least Squares (PLS) regression which produced a 0.91 coefficient of determination. The SMA-based PLS-ran model was then applied to *in situ* measured reflectance of the exposed specimen. Findings reveal an apparent association between the estimated soot content and the Total Suspended Particles (TSP). The same estimation model was also applied to multispectral high-resolution WorldView-2 imageries in producing an interpolated detailed air quality map which shows the spatial extent and concentration of suspended particulate matter. The clearest and least hazed image showed the most reasonable representation of particulate air pollution. The majority of main roads and intersections have high TSP concentration while lower level of pollution can be seen on rivers, cemetery, parks and mostly of residential areas which all suggests a valid scenario. However, some portion of vegetated areas seem to be unrealistic and does not represent TSP level as anticipated due probably to factors such as atmospheric conditions, canopy biophysical attributes, illumination conditions, soil reflectance as well as viewing geometry.

Keywords: air pollution, TSP, vegetation index, worldview-2

EST-06

DEVELOPMENT OF A COMPUTER VISION SYSTEM FOR BROWN RICE QUALITY ANALYSIS

Andres M. Tuates, Jr., Aileen R. Ligisan and Manolito C. Bulaong
Philippine Center for Postharvest Development and Mechanization,
Department of Agriculture, Nueva Ecija; amtuates@yahoo.com

Conventional brown rice analysis is done by visually inspecting each grain and classifying according to their respective categories. This method is subjective and tedious leading to errors in analysis. Computer vision could be used to analyze brown rice quality by developing models that correlate shape and color features with various classification. The objective of the study was to develop a computer vision system (CVS) for predicting quality parameters of brown rice. Brown rice training samples were collected in Nueva Vizcaya, NFA Binalonan, Pangasinan, and SM supermarket. An ordinary flat bed scanner was used as image acquisition device coupled to a laptop computer equipped with image processing and analysis software developed at PHilMech. The CVS set-up was tested using samples collected at the regional NFA warehouses. The performance of the CVS was compared to human inspection based on their capability to classify brown rice samples. An artificial neural network using probabilistic neural network (PNN) model was developed. Sensitivity analysis revealed a true positive proportion ranging from 0.8792 to 1.00. Likewise, a weight prediction model based on the projected area was made using linear regression. The developed equation is $y = 0.00148A - 0.00018$ with a R^2 of 0.854. The results of performance testing revealed that the CVS could predict the weight of brown rice and detect color-related quality of brown rice such as: sound, damaged, chalky/immature, yellow fermented, red, and paddy. Processing time for classification using the developed CVS has an average of 18.53 minutes and sixty percent of its time (equivalent to 11.24 minutes) was consumed in the manual arranging of grain samples. If a digital separation could be developed, the total time can be reduced to 7.11 minutes compared to 40.07 minutes of manual assessment. Moreover, CVS classification is more accurate compared with the human inspection.

Keywords: brown rice, computer vision system, human inspection, accuracy, repeatability

EST-07

ESTIMATION OF ABOVEGROUND BIOMASS IN MOUNT MAKILING FOREST RESERVE USING LANDSAT ETM+ DATA

Shierel F. Vallesteros[1], Nathaniel C. Bantayan[2] and Arvin P. Vallesteros[1]
[1]College of Forestry, Nueva Vizcaya State University
[2]University of the Philippines Los Baños; sfvallesteros@gmail.com

Several studies have been made to estimate the aboveground biomass (AGB) of the different forest stands in the Mt. Makiling Forest Reserve - an important mountain landscape in the Philippines for its rich biological diversity - using ground inventory data. Our study provides an estimate of the total AGB of the landscape. Inventory and Landsat ETM+ data were combined to develop AGB regression equations. The normalized difference vegetation index (NDVI) came out to be the most important predictor variable. The total AGB of MFR based on December 2009 Landsat ETM+ image is 1,602,200 tons. This translates to an average value of 368 ton^{-ha}. The forest reserve has varied land cover types but tree cover is generally high even in what are traditionally classified as cultivated, grassland and built-up areas. Our estimate seems to agree with previous estimates that are based on ground data only. Because we used an SLC-off Landsat product, or image with scan gap error, we created a simple method of filling in missing pixels and we compared the mean AGB estimates from an image with gap pixels masked out and the same mage with gap pixels were filled in.

Keywords: Aboveground biomass, NDVI, scan-gap error, Makiling

HEALTH SCIENCES

HS-01

MOLECULAR IDENTIFICATION OF T4 AND T5 GENOTYPES OF *Acanthamoeba* ISOLATES IN THE PHILIPPINES

Corazon C. Buerano[1,3], Abigail D. Trinidad[1], Lindsay Sydney N. Fajardo[3], Irwin Y. Cua[2], **Michael O. Baclig**[3], Filipinas F. Natividad[3]
[1]University of the Philippines Diliman, [2]International Eye Institute, and [3]Research and Biotechnology Division, St. Luke's Medical Center;
mobaclig@stluke.com.ph

Acanthamoeba species are ubiquitous free-living single-celled, opportunistic pathogens, which can be isolated from water, soil, dust in the air, and from other organisms. It can cause sight threatening *Acanthamoeba* keratitis as well as the rare but fatal encephalitis in humans. Traditionally, laboratory procedures to detect this organism include culture on non-nutrient agar with heat-killed *E. coli* (NNE) and microscopic examination. Identification can easily be done at the genus level but not at the species level. A recent way of detecting and identifying the organism propagated on NNE is through molecular means. This technique is based on the presence of ASA.S1, a partial 18S ribosomal DNA (Rns) gene unique to the genus. Subgeneric level of identification can be achieved by genotyping. Here we report on the genotyping of *Acanthamoeba* species in corneal scrapings from three keratitis patients and in nasal swabs from six unrelated healthy volunteers. A 461-bp amplicon was amplified using genus specific JDP1 and JDP2 primers. DNA sequencing of the PCR product was carried out using conserved 892 and 892C primers to determine the sequence of diagnostic fragment (DF3) of Rns. Phylogenetic tree was constructed using MEGA5. Results showed that isolates from all three corneal scrapings and from five out of six nasal swabs belonged to genotypeT4, whereas one nasal swab was of the genotype T5. Phylogenetic analysis showed that these isolates clustered with the reference sequences most similar to them. T4 (89%) is the predominant genotype found among nine isolates analyzed in this study. Molecular-based technique is a useful tool for the identification of genotypes of *Acanthamoeba* from other free-living amoebas. Genotyping helps in decision-making for clinical management of *Acanthamoeba* infection, in tracking the source of infection, as well as in epidemiological and environmental studies.

Keywords: *Acanthamoeba*, genotyping, keratitis, 18S ribosomal DNA

HS-02

ASSESSMENT OF DISTAL GUT MICROBIAL DIVERSITY AMONG FILIPINO CHILDREN OF DIFFERENT NUTRITIONAL STATUS THROUGH THE rRNA GENE

Leslie Michelle M. Dalmacio[1], Raul V. Destura[2] and Evelyn Mae Tecson-Mendoza[3]
[1]College of Medicine, [2]National Institutes of Health, UP Manila and
[3]Institute of Plant Breeding, UP Los Baños; lesmdmc@gmail.com

Acanthamoeba species are ubiquitous free-living single-celled, opportunistic pathogens, which can be isolated from water, soil, dust in the air, and from other organisms. It can cause sight threatening *Acanthamoeba* keratitis as well as the rare but fatal encephalitis in humans. Traditionally, laboratory procedures to detect this organism include culture on non-nutrient agar with heat-killed *E. coli* (NNE) and microscopic examination. Identification can easily be done at the genus level but not at the species level. A recent way of detecting and identifying the organism propagated on NNE is through molecular means. This technique is based on the presence of ASA.S1, a partial 18S ribosomal DNA (Rns) gene unique to the genus. Subgeneric level of identification can be achieved by genotyping. Here we report on the genotyping of *Acanthamoeba* species in corneal scrapings from three keratitis patients and in nasal swabs from six unrelated healthy volunteers. A 461-bp amplicon was amplified using genus specific JDP1 and JDP2 primers. DNA sequencing of the PCR product was carried out using conserved 892 and 892C primers to determine the sequence of diagnostic fragment (DF3) of Rns. Phylogenetic tree was constructed using MEGA5. Results showed that isolates from all three corneal scrapings and from five out of six nasal swabs belonged to genotypeT4, whereas one nasal swab was of the genotype T5. Phylogenetic analysis showed that these isolates clustered with the reference sequences most similar to them. T4 (89%) is the predominant genotype found among nine isolates analyzed in this study. Molecular-based technique is a useful tool for the identification of genotypes of *Acanthamoeba* from other free-living amoebas. Genotyping helps in decision-making for clinical management of *Acanthamoeba* infection, in tracking the source of infection, as well as in epidemiological and environmental studies.

Keywords: *Acanthamoeba*, genotyping, keratitis, 18S ribosomal DNA

HS-03

DIAGNOSIS AND MOLECULAR CHARACTERIZATION OF *Trichomonas vaginalis* IN SEX WORKERS IN THE PHILIPPINES

Macario Ireneo P. Queza[1] and **Windell L. Rivera**[1,2]
[1]Institute of Biology, College of Science, [2]Molecular Protozoology Laboratory, Natural Sciences Research Institute, University of the Philippines Diliman; wlrivera@science.upd.edu.ph

Trichomonas vaginalis is a pathogenic protozoan which causes the sexually transmitted infection, trichomoniasis. The absence or non-specificity of symptoms often leads to misdiagnosis of the infection. In this study, 969 samples consisting of vaginal swabs and urine were collected and screened from social hygiene clinics across the Philippines. Of the 969 samples, 216 were used for the comparative analysis of diagnostic tools such as wet mount microscopy, culture and PCR utilizing universal trichomonad primers, TFR1/2 and species-specific primers, TVK3/7 and TV1/2. PCR demonstrated higher sensitivity of 100% compared to 76.92% of the wet mount. PCR primer set TVK3/7 and culture had the same and the best expected average performance (ROC, 0.9848). Prevalence of infection in the sample population was 6.81%. Restriction fragment length polymorphism (RFLP) and phylogenetic analyses of the 18S rRNA gene and ITS1-5.8S-ITS2 region revealed that majority of the *T. vaginalis* isolates belonged to one main group. This study could serve as a trigger in enhancing cooperation among health institutions including local government units, health departments, non-government organizations, research and the academe to improve the prevention of the increasing cases of STI/STDs in the country.

Keywords: *Trichomonas vaginalis*, diagnosis, PCR, microscopy, culture, phylogenetic analysis

HS-04

Trichomonas vaginalis INDUCES APOPTOSIS IN HUMAN LUNG ALVEOLAR BASAL CARCINOMA EPITHELIAL CELL LINE A549

Daile Meek C. Salvador[1], Sonia D. Jacinto[1] and Windell L. Rivera[1,2]
[1]Institute of Biology, College of Science, [2]Molecular Protozoology Laboratory, Natural Science Research Institute, University of the Philippines Diliman;
dmcsalvador@gmail.com

Trichomonas vaginalis, a known inhabitant of the genitourinary tract has been identified in the respiratory tract of neonates and adults. The unusual presence of *T. vaginalis* in this site is associated with respiratory infections. However, the medical significance of this occurrence is unclear. In this study, the pathogenic potential of *T. vaginalis* in human lung alveolar basal carcinoma epithelial cell line A549 was investigated. It was shown that *T. vaginalis* can induce apoptosis in A549 cells as determined by TUNEL assay and transmission electron microscopy. After six hours of incubation with *T. vaginalis* there were about 20% TUNEL-positive A549 cells indicating apoptotic cells. Electron microscopic observations of infected A549 cells with trichomonads demonstrated apoptotic morphological features such as nuclear membrane disintegration, intense vacuolarization in the cytoplasm and chromatin condensation in the nucleus. Results from this study suggest the possible pathogenic effect of *T. vaginalis* to lung cells. To our knowledge, this is the first study to document the apoptotic potential of *T. vaginalis* in A549 cells. Continued researches are recommended to establish the clinical presentation of *T. vaginalis* in lung cells.

Keywords: *Trichomonas vaginalis*, A549 cells, apoptosis, host-parasite interactions, human lung cells

HS-05

IMMUNOMODULATORY EFFECT OF *Tinospora rumphii* Boerl LOTION IN *Sarcoptes scabiei* var *hominis*-INFECTED PATIENTS AND ITS PREDICTED SHELF LIFE: A PILOT STUDY

Agnes L. Castillo[1,2], Marina O. Osi[2] , John Donnie A. Ramos[2], Jean L. De Francia[3], Marylaine U. Dyjunco[4] and Peter F. Quilala[1,5]
[1]Faculty of Pharmacy [2]The Graduate School, University of Santo Tomas, [3]Dept of Pediatrics, [4]Dept of Internal Medicine, [5]Dept of Emergency Medicine, St. Luke's Medical Center; agnes_412@yahoo.com

Scabies is a major public health problem affecting 10% of the general population. It is caused by the *Sarcoptes scabiei* mite that has the ability to modulate the host's inflammatory and immune responses. A randomized, controlled, double-blind, pilot clinical study was performed to investigate the immunomodulatory effect and clinical efficacy of the *Tinospora* lotion in 66 scabies-infected patients through Enzyme-linked Immunosorbent Assay (ELISA) for Interleukin-1, Interleukin-6, Interleukin-8 and Monocyte Chemoattractant Protein-1 (MCP-1) in the serum samples. The pediatric patients were treated with *Tinospora* and Permethrin lotions for three consecutive days for two weeks and blood extraction was performed before treatment, during and after treatment. Clinical assessment of each patient was performed every week for five weeks. *Tinospora* lotion is comparable with Permethrin as anti-scabies agent ($p=0.315$) with significant reduction in the mean global evaluation score from baseline (7.20 ± 0.48 vs 7.264 ± 0.44) to day 28 (0.933 ± 0.35 vs 0.95 ± 0.25). No significant difference in the clinical improvement of the patients treated by both lotions ($p=0.9123$) and at different periods of observation ($p=0.4747$). The mean clearance time is 23, 20.47 to 25.53; and 21, 17.39 to 23.67; $p=0.226$ for *Tinospora* and Permethrin lotions, respectively. *Tinospora* lotion significantly reduced the IL-1, IL-6, lL-8 levels from Day 14 to Day 28 ($p=0.0002$, $p=0.0002$, $p=0.0065$) which is comparable to Permethrin lotion ($p<0.050$) with the exception of MCP ($p=0.3497$). Its predicted shelf life is 6 months. *Tinospora* lotion exhibits significant antiscabies activity through down-regulation of IL-1, IL-6 and IL-8 levels. Its incorporation as therapeutic reagent in Sarcoptes scabiei infections is highly recommended.

Keywords: *Tinospora*, scabicide, immunomodulatory,interleukin, MCP-1

HS-06

A DOUBLE BLIND RANDOMIZED CONTROLLED TRIAL ON THE EFFECTIVENESS OF 10% LEMONGRASS OIL (*Cymbopogon citratus*) VS. 1% CLOTRIMAZOLE SOLUTION IN TREATING *TINEA CORPORIS* AND *TINEA CRURIS*

Pamela Christine C. Cue[1], Rosalinda C. Torres[2] and Arnelfa C. Paliza[1]
[1]Department of Dermatology, University of Santo Tomas Hospital, [2]Chemicals and Energy Division, Industrial Technology Development Institute, Department of Science and Technology; pamelacue@yahoo.com

Superficial fungal infection is among the most common reasons for dermatologic consultation. This superficial infection is usually treated with topical antifungal agents such as the azoles & allylamines, sold usually as topical creams but not in solution forms. The essential oil of *Cymbopogon citratus* (lemongrass) exhibits antifungal activity. This project therefore aims to compare the efficacy of 10% lemongrass oil with 1% clotrimazole solution in treating *tinea corporis* and *tinea cruris* in terms of complete cure and adverse events. Ninety-six patients clinically and mycologically diagnosed with *tinea corporis* and/or *tinea cruris* were assigned randomly to apply either 10% lemongrass oil or 1% clotrimazole solution twice daily for 4 weeks. Clinical and mycological evaluations were conducted at baseline, and weekly up to 2 weeks post-therapy. Complete cure was achieved if there was clinical and mycological cure at 4 weeks. There was no statistically significant difference in terms of complete cure at four weeks between the two groups ($p = 1.0$, Fisher's exact test). There was no recurrence 2 weeks post-treatment in both groups. Erythema and burning sensation from the application of lemongrass were observed in two patients. This randomized controlled trial showed that 10% lemongrass oil was as effective as 1% clotrimazole solution in treating *tinea corporis* and *tinea cruris* based on clinical, mycological and complete cure assessments.

Keywords: lemongrass, tanglad, clotrimazole, *tinea corporis*, *tinea cruris*

HS-07

CELLULAR RESPONSE TO *Aglaia loheri* Blanco ACTIVE PRINCIPLE, MALDI 531.2[M+H]$^+$ IS PREDICTED BY GENES

Else F. Galutan[1], Sonia D. Jacinto[1] and Thomas Efferth[2,3]
[1]Institute of Biology, University of the Philippines Diliman, [2]University of Mainz, Germany, [3]German Cancer Research Center, Heidelberg, Germany;
akosielse@gmail.com

The expression of genes can be influenced by the presence of drugs or chemicals in cellular environment. The newly isolated *Aglaia loheri* active principle, Maldi 531.2[M+H]$^+$ was investigated for its *in vitro* cytotoxicity against human leukemia cell lines, CCRF-CEM and their multidrug resistant (MDR) type, ADR5000-CEM. Changes in the regulation of genes of two human leukemic cell lines were also evaluated after treatment with the active principle. XTT tetrazolium hydroxide for the non-radioactive quantification of cell proliferation and viability was used for cytotoxic test, and human illumina chip ID 6247215020 for DNA microarray analysis. Maldi 531.2[M+H]$^+$ showed potent anticancer activity against both CCRF-CEM and ADR5000-CEM cells with IC50 of 0.02 and 0.03µM respectively. The active principle further caused down-regulation of genes associated with cell survival: *ALDH1A2* and *AKR1C3,* including genes which play a role in maintaining mitochondrial DNA, NIPSNAP1. The data indicate that cytotoxic principles derived from *A. loheri* maybe a valuable source for the development of novel treatment options for cancer as it is seen that cellular response to Maldi 531.2[M+H]$^+$ is predictable by genes.

Keywords: *Aglaia loheri*, cytotoxicity, expression analysis, illumina sequencing, multidrug resistance, leukemia

HS-08

HAIR LEAD BIO-MONITORING AMONG SCHOOL CHILDREN IN THE PROVINCE OF CAVITE, PHILIPPINES

Janet P. Macawile[1] and Glenn L. Sia Su[2]
[1]De La Salle University Dasmariñas, Cavite
[2]University of the Philippines Manila; siasug@gmail.com

Airborne lead is one of the pressing environmental problems that cause neuropsychological impairments to people who are exposed to it. In assessing people's exposure to airborne lead, bio-monitoring techniques has been used as an indicator of chemical exposure. This study aims to determine the hair lead concentrations among school children in the Province of Cavite and compare the hair lead concentrations of the school children living and studying in the urban and rural areas of the Province of Cavite, Philippines. Consenting public and private school children of the municipalities of Bacoor and Alfonso were involved in the study. Hair strands were obtained from each student and analyzed for lead concentrations. Results of hair lead concentrations were compared for significant differences between the public and private schools in both areas using the t test under the $P < 0.05$ level of significance. A total of 922 consenting school children participated in this study. The mean $\pm$ SD hair lead concentrations of all school children surveyed was 0.2814 ± 0.1245 ppm. Hair lead concentrations of children studying in public schools (0.3044 ± 0.1081 ppm) were higher relative to those in private schools (0.2259 ± 0.1428 ppm). School children residing in the urban areas (0.3079 ± 0.1442 ppm) had a higher hair lead concentrations compared to those residing in the rural areas (0.2499 ± 0.0863 ppm). Hair lead concentrations of school children living in urban and rural areas and those studying in private and public schools in Bacoor and Alfonso were found to be significantly different ($t = 9.096$ and $t = 6.867$, respectively, $P < 0.05$). Findings indicate that school children are exposed to airborne lead. Higher hair lead concentrations were evident among school children who were residing in urban areas and studying in public schools.

Keywords: Airborne Lead, School children, Bio-monitoring, Cavite, Chemical Exposure

HS-09

HPLC ANALYSIS OF CORTISOL AND CORTISONE IN HUMAN URINE

Ma. Cristina B. Portilla[1], Jessa Karyl R. Apa[2],
Jason Paul C. Monlinong[1] and **Cherrie B. Pascual**[1,2]
[1]Research and Biotechnology Division, St. Luke's Medical Center,
[2]Institute of Chemistry, University of the Philippines Diliman;
mcbportilla@yahoo.com

Cortisol is a steroid hormone which increases blood sugar, suppresses the immune system and aids in fat, protein and carbohydrate metabolism. It is clinically important to measure urinary free cortisol and its metabolite, cortisone, to diagnose and treat adrenal dysfunctions like Cushing's and Addison's syndrome. A reversed-phase HPLC method was developed for the determination of free cortisol and cortisone in human urine, using 6α-methylprednisolone as internal standard. The steroids were separated on a Lichrosphere C18 column using mobile phase of 40:60(v/v) acetonitrile:water mixture with UV detection set at 248 nm. The average retention times were 7.9 minutes for cortisol, 8.5 minutes for cortisone and 10.0 minutes for 6α-methylprednisolone. Linear response for cortisol and cortisone dissolved in mobile phase and spiked in urine was within the range 0.50-10.00 μg/mL. The limit of detection (LOD) for cortisol and cortisone was 0.002 μg/mL and 0.001 μg/mL respectively, while the the limit of quantification (LOQ) was 0.007 μg/mL and 0.003 μg/L respectively. Intra-batch and inter-batch CV were all less than 13%. Prior to chromatography, samples were extracted with solid-phase extraction (SPE) column. Recoveries after SPE ranged from 90.3-115.3% for cortisol and 93.0-107.1% for cortisone. Human urine samples were analyzed and cortisol concentration ranged from 0.06-0.09 μg/mL which was within the normal cortisol concentration range of 0.05-0.16 μg/mL. The method described here may be used to quantify cortisol and cortisone in human urine.

Keywords: HPLC, cortisol, cortisone, chromatography, SPE

HS-10

DETECTION OF DENGUE VIRUS USING A QUARTZ CRYSTAL MICROBALANCE (QCM)-BASED IMMUNOSENSOR

Jason Paul C. Monlinong[1], **Olga Corales**[2], Roland Jay Miguel[3], Luis Sison[3], Cherrie Pascual[1,2] and Ronald Matias[1]
[1]Research and Biotechnology Division, St. Luke's Medical Center,
[2]Institute of Chemistry and [3]College of Engineering,
University of the Philippines Diliman; jpcmonlinong@yahoo.com

Continuing efforts to develop fast and reliable methods for the early detection of dengue virus in human blood samples prompted us to develop a Quartz Crystal Microbalance (QCM)-based immunosensor. Following surface functionalization on the gold electrode surface of the quartz crystal, the immunosensor was used to detect dengue viral antigen using a laboratory-fabricated QCM set-up. Dengue monoclonal antibody (mAb) was immobilized on the gold electrode surface of the 5-MHz crystal using Protein A. C6/36 cells were then infected with dengue 2 viruses and propagated. Harvested infected culture fluid was utilized to determine the sensitivity of the QCM-immunosensor. Binding of the dengue virus antigen to the immobilized dengue monoclonal antibody induced detectable changes in the oscillation frequency of the quartz crystal. Baseline oscillation frequencies (finitial) were measured and compared with the oscillation frequency at the time of binding of the dengue antigen to the dengue mAb (f_{final}). Quantification of the frequency shifts ($\Delta f = f_{final}-f_{initial}$) yielded a reliable signal for the detection of the dengue virus. Parameters that were optimized for the QCM-immunosensor include dengue mAb concentration, Protein A concentration and incubation time. Optimum parameters used in the fabrication of the immunosensor were the following: 120 min of Protein A incubation using 10.0 mg/mL Protein A concentration and 180 min of dengue mAb incubation using 0.1 mg/mL dengue mAb. The QCM-immunosensor shows promise as a reliable diagnostic method for the detection of dengue. Using this technology, clinical samples will be tested parallel to IgM Capture ELISA and real-time PCR methods which are currently used to diagnose dengue virus infection.

Keywords: dengue viral antigen, Quartz Crystal Microbalance (QCM), immunosensor, Protein A, monoclonal antibody (mAb)

SOCIAL SCIENCES

SS-01

CONSIDERING FARMERS' PREFERENCES IN BREEDING AND DISSEMINATION OF WHITE CORN VARIETIES AS STAPLE FOOD

Romeo V. Labios[1], Jocelyn D. Labios[1], Proceso Manguiat[2], Dona Bae Malayang[1], Bernabe Cia[2], Leonardo Tamisin, Jr., Avelita Rosales[3], Teresita Mangaya-ay[4] and Jessie Lumbao[5]
[1]Agricultural Systems Cluster, [2]Crop Science Cluster, UP Los Baños,
[3]Department of Agriculture Region IVA, [4]DA Region VII, [5]DA Region XII;
romeolabios@gmail.com

Farmers' evaluation, through participatory approaches, of the performance of improved open- pollinated white corn varieties was conducted in wet season 2011 in selected municipalities of Isabela, Quezon, Bohol, and North Cotabato. Eleven improved open pollinated white corn varieties and farmers' variety, as local check, were included in participatory varietal selection (PVS) trials. The study aims to increase productivity, yield and income of farmers utilizing the PVS approach and technology innovation systems. Using the PVS trials, preference analysis (PA) involving male and female farmers was conducted at physiological maturity. Based on visual evaluation, the following characteristics were mostly preferred: resistance to pests and diseases, plant height, ear size and weight, grain quality, and good root anchorage. PA further revealed that both male and female farmers strongly agreed on their preferences for the best performing varieties (r=0.635; r=0.141). In addition to PVS, sensory evaluation (SE) was also conducted to solicit farmers' opinion on the eating quality of the different white corn varieties. This process of selecting the most preferred varieties involving farmers facilitates varietal improvement, adoption, and dissemination. Findings from this study also reveal that PVS approach requires an understanding of the biophysical, socio-cultural, and economic circumstances of white-corn farming communities. This could contribute to addressing food security and nutrition, as well as providing farmers with suitable varieties in their locality.

Keywords: white corn, participatory varietal selection, preference analysis, sensory evaluation

SS-02

THE LINK BETWEEN EXTREME POVERTY AND YOUNG DEPENDENTS IN THE PHILIPPINES: EVIDENCE FROM HOUSEHOLD SURVEYS

Dennis S. Mapa, Manuel F. Albis and Michael C. Lucagbo
School of Statistics, University of the Philippines Diliman;
cdsmapa@yahoo.com

The high level of extreme poverty or those experiencing hunger in the country is the most pressing issue that needs to be addressed by our policymakers. Official government statistics and data from self-rated hunger surveys show an increasing trend in hunger incidence among households. On the one hand, data from the National Statistical Coordination Board (NSCB) show that the percentage of households experiencing hunger almost remained the same from 8.2 percent in 2003 (equivalent to 1.36 million households) to 7.9 percent in 2009 (1.45 million households). On the other hand, the Social Weather Stations (SWS) quarterly surveys on hunger incidence show an increasing trend in the percentage of families that experienced hunger, reaching 21.5 percent (about 4.3 million households) in the 3rd Quarter of 2011, the highest since December 2009. This study looks at the determinants of extreme poverty among households using the data from the Family Income and Expenditures Survey (FIES) by applying the concept of regression discontinuity design to distinguish the characteristics of "extremely poor" (subsistence poor) from "poor" households. Using a *logit* model on the pooled FIES data in 2003, 2006 and 2009, the results show that presence of a young dependent in the household increases the probability that the household will be *extremely poor* by about 4 percentage points, controlling for other factors. Other variables that influence the probability of the household being *extremely poor* are the education of the household head and percentage of cash transfer from abroad. Moreover, regional characteristics such as varying food prices and underemployment rate explain a lot about the probability of the household being *extremely poor.* The study shows that we cannot ignore the evidence linking population growth and poverty. Development policies aimed at addressing poverty incidence in the country must include measures that will manage the country's bourgeoning population.

Keywords: extreme poverty, regression discontinuity design, young dependents, *logit* model, population management

SS-03

THE INCOME-HAPPINESS PARADOX AMONG FILIPINO PARTICIPANTS: DO DAILY INCOME, HOUSING TYPE, AND EDUCATION INFLUENCE SUBJECTIVE WELLBEING?

Elaine P. Durado and Nixon V. Agaser
Department of Psychology, College of Arts and Sciences,
Central Luzon State University, Nueva Ecija; nixonagaser@yahoo.com

Among people from developed countries, growth of income has weak relationship to happiness; the greater the income, the lesser influence it has on subjective wellbeing (SWB). This study explores how socio-economic status based on income per day, housing type, and educational attainment affects SWB among Filipino participants. We used Diener's Satisfaction With Life Scale (SWLS) and a researchers-developed work and family satisfaction scale in obtaining data on SWB. One hundred fifty respondents, purposively recruited from high income (mean=P1,500 income/day) to low income (mean= P30/day) earners with mean age = 36.8 participated in the study. Type of house was evaluated using the rural community population indicator of 2010 being used by local government units. Results showed that income per day is significantly correlated with work satisfaction ($r=.28$, $p=0.01$) but not with life and family satisfaction while housing type is significantly related to overall life satisfaction ($r=.30$, $p=0.01$) and work satisfaction ($r=.38$, $p=0.01$). Educational attainment is not in any way correlated to work, life, and family satisfactions. Data also show that moderate to high income earners especially those with type A housing have higher overall life satisfaction compared to those in the lower income groups. No observe asymptotic trend on the SWB among higher income earners suggesting that income still largely contributes to ones SWB. We conclude that happiness of people from poor countries such as the Philippines is still greatly affected by increase in one's socio-economic status particularly income and housing type. It is with surprise, however, that among the participants educational attainment seems to have no role on happiness.

Keywords: subjective wellbeing, income, housing, education, happiness

SS-04

DEVELOPMENTAL DIFFERENCES OF CHILDREN IN PRIVATE PRESCHOOLS AND DAY CARE CENTERS

Nixon V. Agaser and Melanie T. Salagubang
Department of Psychology, College of Arts and Sciences,
Central Luzon State University, Nueva Ecija; nixonagaser@yahoo.com

This study examines the influence of preschool education and day care program on the motor, cognitive, language, self-help, and social-emotional development of children aged 4-5 in Umingan, Pangasinan. One-hundred eight children grouped into three (out-of-school children [OSC], n=37; day care, n=34; and private preschool, n=37) participated in the study. We used Form-2 of the Revised Early Childhood Development Checklist (ECD) in determining developmental differences among the three groups. Among four years old, results indicate that children in private preschool are significantly better in receptive language, cognitive, and social-emotional domains compared to children in day care and OSC. Children in day care are significantly different only in the fine motor domain as compared to OSC. No significant differences were found in expressive language, self-help, and gross motor. Relative to the ECD norm, however, the participants are slightly delayed in their overall development index. Among five years old, children in private preschool are far better in gross and fine motor, receptive language, cognitive, and social-emotional domains compared to day care and OSC. In contrast, OSC children are significantly better in self-help as compared to the private preschool and day care groups. As against the norm in the ECD, all five year old participants are significantly delayed in their overall development index. Overall, results indicate that formal preschool education but not day care program seems to influence significant differences in children's development especially in language, social-emotional, and cognitive domains. However, the significant delay in the children's overall development index relative to the ECD norm may reflect problem on the quality of preschool education in rural communities.

Keywords: motor, cognitive, language, development, preschool

SS-05

LEARNING STYLES OF ENGINEERING TECHNOLOGY STUDENTS AND THEIR CONCEPTUAL UNDERSTANDING ON THE PARTICULATE NATURE OF MATTER

Elizabeth L. Marasigan[1] and Erwin P. Elazegui[2]
[1]Chiang Kai Shek College,
[2]Technological University of the Philippines Manila;
ngsepe@yahoo.com

This research study investigated the learning styles of engineering technology students and explored their understanding on the particulate nature of matter. The sample consisted of 40 engineering technology students enrolled in General Chemistry. The study was a descriptive research-causal comparative and designed to accommodate both qualitative and quantitative analysis. Qualitative method was used to analyze the inputs of the students in the Visual Conceptual Questionnaire (VCQ). Quantitative method was used in describing the profile of the students learning styles and determined the relationship on the conceptual understanding of the particulate nature of matter. Results showed that out of 40 students, 12 students (30%) were accommodators, 5 students (12.5%) were assimilators, 9 students (22.5%) were convergers and 14 students (35%) were divergers. The students level of understanding is most likely incline towards partial understanding. This suggests that student answers to VCQ on the particulate nature of matter showed partial misconception but indicating some degree of relevance toward the concept. Considering the results for the One-Way ANOVA Test, there is no significant difference between the scores of students on their learning styles. This further connotes that the learning styles of students does not affect their conceptual understanding in the nature of matter. Results of the study also implies that chemistry teachers should also focus on the microscopic level aside from macroscopic level in teaching the nature of matter since it is fundamental in learning the concept of matter.

Keywords : learning styles, conceptual understanding, visual conceptual questionnaire, misconception, particulate nature of matter

SS-06

PERCEPTIONS OF FACULTY AND STUDENTS IN THE AGRICULTURE PROGRAMS OF THE ISABELA STATE UNIVERSITY AT CABAGAN CAMPUS

Audrey B. Simon and Gerald G. Claravall
Isabela State University Cabagan, Isabela; audnica@yahoo.com

This study is conducted to determine the reasons in the declining number of students in agriculture programs of the Isabela State University (ISU), Cabagan Campus. It specifically sought to determine the following: a) general perceptions in agriculture of faculty and students; b) reasons of agriculture students in enrolling; and c) perceptions of faculty and students on the decreasing number of enrollees in the university's agriculture programs. Descriptive method of research was used in this study in seeking answers to the problems. One hundred students and twenty faculty members randomly selected from the four colleges of the campus were the participants of this study. There were two sets of questionnaire used in gathering the data. The first set of questionnaire measured the perceptions of the faculty while the second set determined the perceptions of the students in agriculture programs of the university. Frequency distribution, weighted mean, percentage distribution and a five-point Likert-type scale were used in the analysis and interpretation of the data. This study found that the participants perceived agriculture to be one of the major contributors in the economic development of the country. However, they also perceived that agriculture programs are less attractive, less useful, and less suitable to the new generation. This is because according to them the young generations of today do not want to work in the farm anymore which contributed to the decline of enrolment in the agriculture programs. Moreover, majority of the students who are taking agriculture programs are those who really have the passion in agriculture and others are those that have no other option but to take the opportunity of enjoying the free tuition fee education offered by schools with agriculture programs.

Keywords: agriculture, agriculture programs, perception in agriculture, agriculture usefulness, agriculture suitability, agriculture attractiveness, declining enrollment

SS-07

HANDLING KNOWLEDGE AND IDEAS AS PATTERNS: EMPLOY PARADIGMS AS PACKETS FORMING NON-REGULAR INTERLOPING FINITE FRACTAL

Wilfredo I. Jose
Department of Chemical Engineering
University of the Philippines Diliman
wijose2002@gmail.com

Based on more than two decades of research on the applications of paradigms, I came out with a creativity technique, "Generating New Ideas through Probing Paradigms" as an alternative to brainstorming. As a byproduct of that research, I developed a concept of representing knowledge and ideas in terms of paradigms as patterns within patterns within patterns… - much like a non-regular interloping finite fractal. The creativity technique consisted of the following steps: (a) decide on the subject matter, (b) determine the paradigm, (c) probe the paradigm, (d) map ideas in the mind, and (e) connect ideas to produce new ideas. This needed a basis and framework. The formulation is as follows. A paradigm is a model, map, pattern, etc, and has many definitions. According to Stransfield, a paradigm is a compact representation of reality with less mass and energy. In the brain, the idea or concept in memory corresponds to a particular pattern of activity of a group of connected neurons and synapses. Instead of mapping the paradigm physically on paper, we map it in our mind. A paradigm is like a packet. Spread it out and its components are also paradigms. Spread a component packet and we will find that it also consists of paradigms and so forth and so on. The components of a paradigm are ideas. Some of the ideas may have already been in the mind and only the connections have to be modified. Organized ideas constitute knowledge and represented by paradigms. Within the mind the interconnection can be to any logical paradigm. Thus, we can picture the system as a finite non regular fractal that is interloping. This implies that mathematics and statistics can be applied to knowledge creation, idea generation, and knowledge management. The system can also explain the concept of paradigm shifts.

Keywords: creativity, knowledge, idea, paradigms, fractals

SS-08

INTEGRATING SCIENCE AND LOCAL KNOWLEDGE FOR CLIMATE CHANGE IMPACTS AND VULNERABILITY ASSESSMENTS

Juan M. Pulhin, Rex Victor O. Cruz, Maricel A. Tapia,
Rose Jane J. Peras and Chandyllane G. Cantre
College of Forestry and Natural Resources
University of the Philippines Los Baños; jpulhin@yahoo.com

This project aims to build the capacity of concerned stakeholders in the province of Albay in assessing the impacts of and their vulnerability to climate change and sea-level rise with the use of a computer modeling system and complemented by the local knowledge of the people. It serves as a pilot site in the Philippines for the assessment of climate change impacts and vulnerability using SimCLIM, a modeling system for examining the effects of climate variability and change over time and space. Case studies in upland and coastal communities, using household survey, participatory rural appraisal techniques, among others, were conducted to demonstrate the assessment. The upland communities were highly exposed to typhoons and El Niño, while the coastal communities were affected by floods and storm surges during typhoons. Adaptation strategies were mostly spontaneous and meant to bear the losses from the impacts. Meanwhile, future climate change and sea-level rise scenarios generated through SimCLIM, using ensembles and SRES (Special Report on Emission Scenarios) A1FI set at high sensitivity, presented a 4-5˚C increase in temperature and about 10% increase in precipitation in 2100 in the *barangays* where the upland communities are located, and 1.3-meter sea level rise in the same year in the eastern coast of Albay, where lies the coastal communities. Combining both computer-based modeling system and participatory approaches in the conduct of assessment proved useful, particularly in developing adaptation strategies, as the former demonstrated the 'forward-looking' aspect of climate change while the latter put into context the vulnerability of the group assessed taking into account the non-climatic factors. The approach also familiarized the local communities and other stakeholders with the concepts of climate change.

Keywords: climate change, sea-level rise, SimCLIM, vulnerability, local knowledge

SS-09

DISASTER RISK REDUCTION AND MANAGEMENT: CRITICAL FACTORS FOR SUCCESS AT THE LOCAL GOVERNMENT LEVEL

Franco G. Teves
Office of the Vice-Chancellor for Research & Extension, Mindanao State University-Iligan Institute of Technology; franco_teves@yahoo.com

This paper identifies weaknesses and gaps in the Disaster Risk Reduction and Management Plan (DRRMP) implementation at the local government level. The purpose is to help stakeholders to effectively operationalize existing DRRMP, or design one that highlights identified critical factors. The approach used is qualitative in nature that considers direct observations on the management of the recent flood disaster in Iligan City triggered by typhoon *Sendong*, in-depth interviews of randomly chosen survivors, and analysis of RA 10121 (Philippine Disaster Risk Reduction and Management Act of 2010) and the local Disaster Risk Reduction and Management Plan. There was some incongruence in the local hazard maps with the actual land use as housing projects sprouted close to the banks of a major river. These were wiped out during the recent flood. There was no apparent participation of all stakeholders, particularly the communities exposed to risks, in the formulation of the local DRRMP. This deprived the affected communities the opportunity to vital information and capacity-building for resilience. There was no functional early warning system in the affected communities, an important component in disaster risk reduction, and no visible posting of directions on what to do and where to go in times of disaster. Forced or pre-emptive evacuation of residents at risk right after upgrading of typhoon signal number one to number two, was not implemented. Early mobilization of means for emergency management was also problematic. Other weaknesses and gaps identified concern functions of the Local DRRM Office (LDRRMO). The weaknesses and gaps identified may be a mirror of other local DRRMPs in the country. A serious review and implementation of RA 10121 at all levels, is urgently needed for a truly functional DRRM.

Keywords: disaster risk, hazard maps, typhoon *Sendong*, flood, resilience

INDEX of MAJOR AUTHOR