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The Challenges of Non-Communicable Diseases (NCDs): Responding through Multi-sectoral Action

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37th ANNUAL SCIENTIFIC MEETING

***The Challenges of Non-Communicable
Diseases (NCDs): Responding through
Multisectoral Action***

37th ANNUAL SCIENTIFIC MEETING

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3. Name with asterisk : Corresponding Author

AGRICULTURAL SCIENCES

AS-01

GENETIC SCREENING OF THE ACID MEAT CONDITION IN DOMESTICATED SWINE USING PCR-RFLP

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The Acid Meat condition is a dominant genetic defect in the Rendement Napole (RN) gene that causes reduced water holding capacity, low pH, pale color, reduced processing and cooking yield due to increased drip, and strong metallic taste that often leads to poor meat quality. This study was conducted to determine the genotype of the RN gene of 200 breeder pigs from five farms in Luzon. They were classified as normal (rn/rn), heterozygous mutants (RN/rn), and homozygous mutants (RN/RN). This classification will allow a new breeding system to be developed ensuring that all offspring are free of the defect by simply removing the mutants on the breeding herd. Genotyping was done by collecting blood samples subjected to DNA extraction and genotyping using PCR-RFLP. The restriction enzyme used was *BsrBI*. DNA sequencing was also done to validate the results. Results revealed that out of 200 animals 134 (67%) are normal, 63 (32%) heterozygous mutants and 3 (1%) homozygous mutants for the Acid Meat condition. The screening of genetic diseases such as this will help the determination of their presence in a given swine population and reduce the unwanted effects on meat quality thus increasing its market value. Gene screening is a technique that should be utilized to detect the genes that may have a potential economic effect in increasing the meat production and quality of our swine.

Keywords: Acid Meat, RN gene, PCR-RFLP

AS - 02

**GENETIC POLYMORPHISM IDENTIFICATION OF
ESTROGEN RECEPTOR (ESR) GENE ASSOCIATED WITH
LITTER SIZE IN PHILIPPINE PIGS (*Sus scrofa*)**

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Low heritability of litter size in pigs has long been addressed by researchers through the use of marker-assisted selection (MAS). One of the major genes being studied is the *Estrogen Receptor (ESR)* gene which belongs to intracellular group of receptors localized at pig chromosome 1 (p25 - p24). The *ESR* gene was found to have a significant influence in pig's litter size without any genetic negative correlation to growth and carcass traits. Thus, in this study, polymorphism of *ESR* gene associated with litter size was identified in local pigs. Isolation of genomic DNA was done in 599 pigs of various breeds. *ESR* genotypes were identified through Polymerase Chain Reaction-Restriction Fragment Length Polymorphism (PCR-RFLP) method. The 120-bp PCR product was digested using the *PvuII* restriction enzyme. Purified PCR products were sequenced using the ABI Genetic Analyzer 3500 and the sequence information were verified with reference sequence using National Center for Biotechnology Information (NCBI) BLAST. Further sequence analysis was done using the Sequencher Software v.5.2.3. Results showed that 33% of the population has AA genotype while 67% has AB. Moreover, the allele frequencies were 0.67 and 0.33 for allele A and allele B, respectively. Verification using the NCBI Blast revealed 97-100% for AA and 93-96% for AB identities with *Sus scrofa* partial *ESR* gene intron. Sequence analysis showed that the preferred allele B is a G to A/T transition. Filipino farmers' profitability is highly dependent on the reproductive performance of their pigs, thus, selection of allele B will potentially increase the efficiency and productivity of our local pig industry. Larger sample size and association with phenotypic data is recommended for further research.

Keywords: pig, *estrogen receptor* gene, litter size, marker-assisted selection (MAS)

AS - 03

SCREENING OF RESISTANCE AND/OR SUSCEPTIBILITY OF PIGS (*Sus scrofa*) TO SALMONELLOSIS USING PCR-RFLP

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Salmonellosis can cause outbreak or septicemia, acute or chronic enteritis and wasting in weaned pigs, but may occur in other age groups. *Salmonella* in the gut of pig can contaminate carcasses during the slaughter process and their presence creates potential public health risks due to food poisoning. The bactericidal/permeability-increasing protein (BPI) gene plays an important role in the natural defense of the host and was found to be associated with resistance/susceptibility to *Salmonella* infection and identified as a candidate gene for disease resistance breeding in pig. This study was conducted to screen and determine the genotype of the pigs that are resistant or susceptible to salmonellosis using PCR-RFLP with the application of BPI gene as molecular marker for disease resistance. This screening may be helpful for the genetic improvement of porcine disease resistance to this bacterium. In this study, blood samples ($n=200$) were collected from swine breeder farms. Genomic DNA was extracted from these samples and genotyping was done by PCR-RFLP analysis using *Avall* restriction enzyme. Out of 200 samples, 182 samples were found to be resistant, 12 were heterozygous resistant and 6 were susceptible. The genotypic frequency showed that 91% pigs are resistant (GG), 6% were heterozygous resistant (AG) and 3% were susceptible (AA) to salmonellosis. The genetic screening for resistance or susceptibility using a molecular marker for disease resistance will enable us to identify animals carrying beneficial alleles that are to produce offspring with improved resistance to pathogen, thus providing information for the swine industry on improving accuracy of selection, reducing disease incidence and accelerating the rate of genetic improvement of the trait.

Keywords: BPI gene, PCR-RFLP, Salmonellosis, pig

AS - 04

**GENETIC STRUCTURE OF FOUR BOVINE
POPULATIONS IN THE PHILIPPINES USING
MICROSATELLITES**

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This study evaluated polymorphism of 11 microsatellite markers in four local genetic groups of cattle. Batanes cattle which has never been studied using microsatellites is evaluated for its genetic distance from the Ilocos cattle while Brahman and Holstein-Sahiwal are also included as there were insemination programs by the government using these two breeds. PCR products that were genotyped for each marker were analyzed using POPGENEv32. Results showed that 55% ($F_{st}=0.5501$) of the genetic variation is due to the differences between populations while the remaining 45% is due to individual variation. The F_{st} value also indicates that there were very great differences from population to population using the range proposed by Sewall and Wright. The constructed phylogenetic tree based on Nei's genetic distance using the modified neighbor joining procedure of PHYLIPv3.5 showed the admixture of Brahman and Holstein-Sahiwal having them grouped in the same clade. Batanes and Ilocos cattle were grouped in a different cluster showing that they have descended from a single parental population. This would presumably address the claim that Batanes and Ilocos cattle are genetically distant from other groups and still exist despite the artificial insemination program of the government using Brahman and other imported breeds. The knowledge about the genetic structure of this population supports the development of conservation programs for the smallholder farmers.

Keywords: Microsatellites, Populations, Genetic Structure

AS - 05

**POLYMORPHISM OF PROLACTIN RECEPTOR GENE
MARKER FOR INCREASED LITTER SIZE IN DIFFERENT
PHILIPPINE SWINE BREEDS (*Sus scrofa*)**

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The developments of molecular methods for genetic evaluation offer great potentials to hasten the process of genetic improvement and enhance the efficiency of breeding and selection in swine industry. Prolactin Receptor (PRLR), gene for litter size, is a specific receptor for the hormone prolactin, which is an anterior pituitary peptide hormone involved in many different endocrine activities and is essential for reproductive success. This study aimed to screen different swine breeds in the Philippines for PRLR genetic polymorphisms. Genomic DNA extraction from 635 blood samples was done using standard protocol. Polymerase chain reaction (PCR)-restriction fragment length polymorphism (RFLP) method, using PRLR marker, and *AluI* restriction enzyme was carried out to analyse the samples for genetic variability. ABI Genetic Analyzer 3500 was used for sequence analyses of the PCR products and the sequence information were confirmed with reference sequence using National Center for Biotechnology Information (NCBI) BLAST search. Results revealed three genotypes having genotypic frequencies of 0.12, 0.38 and 50 for AA, AB and BB genotypes, respectively. Allele frequencies for A and B were 0.50 and 0.88 respectively. Sequences also showed 98-100% for AA, 96-99% for AB and 99-100% for BB similarity with the genotype of *Sus scrofa* PRLR gene, complete coding region (cds) using NCBI BLAST. Previous studies showed that allele A of PRLR increases litter size in swine. This allele A was defined to be a G to A transition in swine chromosome 16. Screening for the favourable allele A using PRLR gene marker can positively improve the productivity of swine industry in the Philippines. Increase in the number of sample size is recommended for further study.

Keywords: swine, PRLR gene, litter size, PCR-RFLP

AS - 06

**ECOPHYSIOLOGICAL AND CYTOPHATOLOGICAL
IMPACT OF POULTRY LITTER ASH (PLA) TO
*Paramecium caudatum***

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Poultry litter Ash (PLA) is used as fertilizer due to its high phosphorus content and low solubility content. Due to its high supply, they are just dump in caves and land fields taken by the water going to rivers and lakes during rainy days. When spread on agricultural lands, excessive Phosphorous (P) is applied leading to P accumulation in soil. Accumulation of P in the soil has the potential to leave the farm's boundaries as soluble P via runoff and promotes eutrophication of surface waters affecting organisms like *Paramecium caudatum*.

The study aimed to determine the ecophysiological (in terms of food vacuole and contractile vacuole activity) and cytopathological (in terms of mortality, form of changes in the body size, shape and macronuclear changes) impact of PLA to *Paramecium caudatum*. Four varying concentrations of PLA used: 2.5 x 10⁴ ppm, 5.0 x 10⁴ ppm, 7.5 x 10⁴ ppm, 1.0 x 10⁵ ppm and control (nutrient medium only).

Results showed that there was a significant difference on the mean number of food vacuoles (fv) formed between control (fv=7.3) and 1.0 x 10⁵ ppm concentration (fv=10.3) after 30 minutes of exposure to treatment implying the capability of the organism to absorb PLA. In the contractile vacuole activity, a significant difference on the time per pulsation/contraction of the contractile vacuole of the *Paramecium* among the treatments was revealed. Zero mortality of *P. caudatum* was observed after 1, 2, and 3 hours of exposure to PLA implying that the amount of applications of the treatment in varying proportions were still tolerable to the organism. No significant difference on the size of the macronucleus shown among the treatments.

Keywords: *Paramecium*, ecophysiological, cytopathological, Poultry Litter Ash, food vacuole

AS - 07

**MOLECULAR CHARACTERIZATION OF
LYMPHOCYTE-ACTIVATION GENE 3 (LAG-3)
OF SWAMP- AND RIVERINE-TYPE WATER BUFFALOES**

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Lymphocyte-activation gene-3 (LAG3) is a membrane protein that plays an important role in the down-regulation of T cell activity during the events of chronic diseases and infection. In this study, molecular characterization of LAG3 of swamp- and riverine- type water buffaloes was done by DNA sequencing, homology and phylogenetic analysis. Bubaline LAG3 sequences contain an open reading frame of 1530 nucleotide, encoding a polypeptide of 505 amino acids. Nucleotide sequence homology of LAG3 reveals 99.7 % identity in swamp- and riverine- water buffaloes. Additionally, the putative amino acid sequence identity of bubaline LAG3 with other selected mammals is between 62-96%. LAG3 protein sequence of water buffalo contained a transmembrane domain, four extracellular domains containing different conserved regions throughout and the 'KTGELE' inhibitory motif found in the intracellular region of bubaline LAG3. However, one highly conserved cysteine residue in mammalian LAG3 was replaced by tyrosine in both swamp- and riverine- type water buffaloes. Phylogenetic analysis generated high bootstrap value between the two types of water buffalo which further confirmed the degree of relationship between bubaline species. Results of the study give insight towards the development of molecular markers for disease resistance and manipulation of responsible genes and immune molecules that influence disease progression. This is the first report that describes the genetic characteristic of LAG3 in swamp- and riverine- type water buffaloes.

Keywords: Characterization, LAG3, Water Buffalo

AS - 08

**EFFECT OF DURATION OF TRANSPORT
TIME AND HOLDING TEMPERATURE IN THE
CRYOPRESERVATION OF BOAR SEMEN**

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In the Philippines, extended boar semen is preferred over the frozen semen in doing Artificial Insemination of swine because of the premise that extended semen is of better quality and efficiency. This is not always the case as cryopreservation technique is becoming more advantageous in genetic improvement and conservation since sources of genetic materials such as semen, oocytes, embryos, somatic cells, etc. can be stored and be used after prolonged period even after the donor animal died.

A total of seven ejaculates were collected and were diluted 1:1 using Beltsville Thawing Solution (BTS), and were placed in a Styrofoam box maintained at 25-30°C. Upon reaching the PCC facility, the semen sample was cooled to 15 °C and was placed in a refrigerated centrifuge to simulate a day's travel. This was done to determine the effect of duration of transport time and holding temperature to the post-thaw motility of cryopreserved boar semen.

Lactose-Eye Yolk (LEY) freezing extender was used following FAO guidelines for freezing of Livestock genetic materials. Semen pellet had an average volume of 8.08 ml, an average motility of 65% and an average sperm concentration of 290.14×10^7 . Average post thaw motility of the semen was 18.57% although cryopreservation of the semen was done a day after the collection because the sperms had already developed resistance to cold shock being incubated for 24 hours in their own seminal plasma thus still produced live sperms.

Keywords: cryopreservation, boar semen, post-thaw motility

AS - 09

IMPROVED AMYLOSE CONTENT OF RICE (IR72) INDUCED THROUGH GAMMA RADIATION

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In general grain quality and quality preferences vary across rice growing countries and regions. Filipinos preferred translucent, well milled, long grain rice with aroma and minimal broken grains which is soft after cooling. The amylose content of rice starch is a major eating quality factor. The aim of this study is to develop rice mutants with good eating quality and low to intermediate amylose content through induced mutation using gamma radiation. Low to intermediate amylose content in rice were identified and selected among the advance generation lines irradiated with 200 and 300Gy dose of gamma radiation. Screening was done using qualitative method (Iodine staining method). Selected lines were analyzed quantitatively, to determine the percent amylose content. Percent amylose were group to several categories where; 0-6% is waxy, 6-12% is very low, 12-18% is low, 18-24% is intermediate and >25% is high. Results were further confirmed using the molecular marker technique by looking at the waxy gene which code for granule bound starch synthase I (GBSSI) and controls amylose content in rice. Among the 30 lines selected and analyzed, 2 lines were confirmed to have a gene base mutation with a low to intermediate amylose content. Thus, induced mutation using gamma radiation has successfully improved amylose content in rice (IR72).

Keywords: amylose, synthase I, waxy gene, mutation

AS - 10

SEGREGATION AND INHERITANCE OF *TY-3* GENE INTROGRESSION IN BC_1 AND F_2 POPULATIONS OF TOMATO (*Solanum lycopersicum* L.)

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Tomato (*Solanum lycopersicum* L.) is a high-value commodity in the country consumed as fresh or processed and is a rich source of vitamins, minerals and lycopene. Virus disease caused by tomato leaf curl Philippine virus (ToLCPV) is one of the most destructive diseases of tomato in the Philippines. Breeding lines from AVRDC have multiple Ty resistance genes against tomato leaf curl virus and *Ty-3* locus has been identified to be effective against ToLCPV.

BC_1 and F_2 populations were derived from the cross between ToLCPV-susceptible ‘Super Apollo’ and AVRDC resistant tomato lines containing Ty genes. A co-dominant sequence characterized amplified region (SCAR) marker was used to analyze the segregation and inheritance of *Ty-3* gene introgression in the BC_1 and F_2 populations. Chi-square analysis was used to assess the expected Mendelian ratio of 1:1 and 1:2:1 in a backcross and F_2 population, respectively. The BC_1 plants amplified either the following: a) two fragments corresponding to the *ty-3* and *Ty-3* or *Ty-3a* and b) one fragment corresponding to the *ty-3* from Super Apollo lacking the *Ty-3* gene introgression. Segregation ratio was not significantly different from the expected 1:1 ratio in a backcross population. Homozygous resistant *Ty-3/Ty-3*, heterozygous *Ty-3/ty-3* and homozygous susceptible *ty-3/ty-3* genotypes are expected in an F_2 population. The inheritance of *Ty-3* gene-specific marker fitted the expected 1:2:1 Mendelian ratio for an F_2 segregating population. The findings of the study significantly contributed to the understanding of the inheritance of the *Ty-3* resistance locus in the current tomato breeding efforts for ToLCPV resistance.

Keywords: BC_1 , F_2 , SCAR marker, tomato leaf curl Philippine virus, tomato, *Ty-3* gene

AS - 11

MULTI-LOCATION FIELD TRIALS OF BETACAROTENE-ENRICHED ‘GOLDEN RICE’ EVENT GR2-R IN THE PHILIPPINES

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Golden Rice (GR) is a new type of rice that produces the provitamin A beta-carotene in the endosperm and has the potential to help alleviate vitamin A deficiency. As part of an effort to develop and evaluate locally-adapted GR, multi-location field trials (MLT) were conducted at 4-5 locations in the country for 2-3 seasons. The agronomic traits and performance of nine advanced introgression lines of GR2 event “R” in the background of IR64 were evaluated in comparison with wild type IR64 in locations representing different rice growing environments in the Philippines from January 2012 to September 2013. While significant differences were observed among the lines and IR64, two entries (GR2-RXIR64-B3F5-148-10-10-10-12, Line 2; GR2-RXIR64-B3F5-148-10-10-10-59, Line 3) were found to be very similar to IR64 in terms of yield, days to flowering and maturity. Across seasons and locations, Line 3 produced the highest average yield of 4.32 t/ha, which is comparable to 4.72 t/ha in the wild type. All the Golden Rice lines had high total carotenoid and beta-carotene contents ranging from 4.04-10.35 µg/g and 3.50-6.08 µg/g, respectively. Line 6 (IR64XGR2-R-B3F5-239-19-9-13-32) consistently had the highest TC content with an average of 6.99 µg/g across seasons and locations. MLT results revealed that the level of beta-carotene content in the Golden Rice lines was high and stable across seasons and locations. However, more research is necessary to improve the yield and other preferred traits to ensure adoption by farmers and consumers.

Keywords: Golden Rice, nutritious rice, beta-carotene, multi-location field trial, agronomic performance

AS - 12

**GENOTYPE X ENVIRONMENT INTERACTION OF
WHITE QUALITY PROTEIN MAIZE (QPM) HYBRIDS**

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Newly developed white QPM hybrids when grown under wide range of conditions may not perform similarly relative to each other. Hence, determining their relative performance across different locations is highly important before it is released into the market. Thirteen white QPM hybrids and three check varieties were evaluated across three locations from July to November 2011 to determine the genotype x environment interaction and to identify the most adapted QPM hybrids across locations. The hybrid tested were the following: SMTWC 001, SMTWC 002, SMWTC 003, SMWTC 004, SMWTC 005, SMWTC 006, SMWSC 007, SMWSC 008, SMWSC 009, SMWSC 010, SMWSC 011, SMWSC0012, SMWSC 013, P30W40, IPB Var 6 and USM Var 10. The three locations used were Musuan, Bukidnon, Kabacan, North Cotabato and Banga, South Cotabato. The study was arranged in a Randomized Complete Block Design with four replications. Data were analyzed using MSTATC software. The study revealed that traits like plant height, ear height, days to silk, yield and yield components such as ear length, kernel row per ear, and grain yield varied significantly among the white QPM hybrids across locations. SMWSC 007 SMWTC 001, SMWSC 010, SMWSC 012, and SMWSC 011 were observed the most adaptive white QPM hybrids across the three test locations.

Keywords: QPM, corn, hybrids, GE interaction, Bukidnon

AS - 13

SEED DIVERSITY OF BUKIDNON UPLAND RICE (*Oryza sativa* L.) LANDRACES AND TRADITIONAL VARIETIES UNDER MUSUAN CONDITIONS

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Bukidnon which is a “pineapple country” surprisingly has several upland rice landraces and traditional varieties (URTVs) which showed some phenotypic variability. Forty-nine of 140 URTVs collected in 2010 to 2011 were used to validate the seed diversity reported by Cortes (2011) based on 13 traits. Seed samples were obtained from a field experiment at CMU-AES in 2012-2013 laid out in a 7x7 simple lattice design with two replications. Eight quantitative and 12 qualitative seed traits were characterized. ANOVA showed significant differences ($p < 0.0001$) for grain length, width and thickness; weight of 100 seeds; caryopsis length and width; and length of sterile lemma. Standardized Shannon-Weaver Diversity Index (H') estimated high variability ($H' = 0.76-0.93$) for 9 traits, moderate variability ($H' = 0.49-0.59$) for 6 traits, and low variability ($H' = 0.04-0.40$) for 5 traits. Mean H' for quantitative traits was 0.78 and 0.44 for qualitative traits. Pearson's Simple Correlation Moments revealed 69 significant associations among the seed traits, with highest for grain length and caryopsis length ($r = 0.89$). Cluster analysis using Ward's Minimum Variance showed some duplicates (100% genetic similarity) and near duplicates. Cluster I had 26 URTVs at ~28% genetic similarity and Cluster II had 23 URTVs at ~54% genetic similarity. Under Musuan conditions, the subset of 49 URTVs (mean $H' = 0.59$) from Cortes' (2011) collection of 140 (mean $H' = 0.64$) validated the moderate range of seed diversity of Bukidnon URTVs which may still have some useful alleles for upland rice breeding.

Keywords: rice, Bukidnon, seed diversity, landraces, upland rice

AS - 14

SCREENING OF MUNGBEAN FOR PRE-GERMINATION WATERLOGGING TOLERANCE

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The available moisture from the previous rice crop is said to be sufficient in fulfilling the mungbean requirement during the plant growth stage but a different scenario happens when excessive rainfall comes during the critical stage of the crop. Waterlogging during the pre-germination stage of mungbean often leads to poor seed germination and vigor thereby reduces subsequent growth and yield and even restricts nodule activity and nitrogen fixation. Hence, development of waterlogging tolerant varieties will help reduce damages brought about by heavy rains as well as help increase the adaptability of this otherwise resilient crop. Seeds of forty-nine (49) accessions of mungbean from the National Plant Genetic Resources, nine (9) Pag-asa series varieties and three (3) breeding lines were subjected to 3 days waterlogging. Germination rate between the control and waterlogged seeds almost had no difference in most of the accessions. Root length is more affected than the shoot length. In fact, only PHL 13057 had root length in control which is not significantly different to that of the waterlogged seeds. Sixteen (16) accessions, one (1) variety and two (2) breeding lines were selected based on parameters gathered for further evaluation - PHL 5241-SG, PHL 5241-DG, PHL 12625, PHL 12785, PHL 12926, PHL 12928, PHL 12949, PHL 12950, PHL 12953-DG, PHL 12954, PHL 12959, PHL 13057, PHL 15253-DB, PHL 15259-SG, PHL 15290-DGDB, PHL 15330, Pag-asa 17, 646-1 and 646-6. Selected accessions will advance to several days of waterlogging to determine the super tolerant varieties. Additional parameters will be added such as field emergence, seedling dry weight and electrical conductivity to further determine the vigor of these seeds.

Keywords: mungbean breeding, waterlogging tolerance, pre-emergence

AS - 15

QUANTIFICATION OF TE2-4 DSRNA ISOLATED FROM *Rhizoctonia solani* USING DUAL LABELED OLIGONUCLEOTIDE PROBE

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TE2-4 strain of *Rhizoctonia solani* is a wild type isolate with *Zea mays* as its plant host. The study aimed to quantify the dsRNA from TE2-4 of *R. solani* isolates using dual labeled oligonucleotide probe. Highly purified TE2-4 dsRNA isolated and characterized from wild type strain of *R. solani* was nuclease-treated, reverse transcribed, cloned and sequenced for the development of probes (di-hybrid dsRNA probe design using fluorophores and quenchers utilizing the sequenced data). Hybridization of the probe to dsRNA from TE2-4 was conducted using Real-time PCR. Out of 16 randomly selected clones that were tested for gel electrophoresis, four fragments (5, 6, 7 and 9) were cloned in a pDrive vector and selected for sequencing. Selection was based on the differences in size, concentration of the cloned fragments and the shown hue of the bands in the gel. Cloned fragments with the primers and the designed TE2-4 probe were hybridized as reflected by the determined cycle threshold (ct = 3.89 to 35.40), melting temperature (T_m = 82.6°C to 87.2°C) and sensitivity of detection (+). There was no specific pattern of proportionality (like direct or reverse) of the obtained ct values and melting temperatures against the various cDNA concentrations prepared. However, amplification/hybridization of primers and probe to plasmid and dsRNA of TE2-4 was successful.

Keywords: TE2-4, cycle threshold, cloning, hybridization, *Rhizoctonia solani*

AS - 16

**RADIATION-INDUCED MUTANT OF RICE VARIETY
NSIC Rc144 WITH BROAD-SPECTRUM RESISTANCE TO
BACTERIAL BLIGHT**

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Mutant lines of commercial rice variety NSIC Rc144 produced through ⁶⁰Co radiation treatment were screened for resistance to bacterial blight (BB). Bacterial blight screening was conducted in the field starting at M2 generation through induced leaf clipping method using the Maligaya isolate of the causal agent, *Xanthomonas oryzae* pv. *oryzae* (*Xoo*). M2 plants with <10cm lesions were selected and advanced for verification of resistance. In the next generation, 39 highly resistant M3 plants with short lesions were selected. The average lesion length in the wild type NSIC Rc144 was 23.5 cm (susceptible). Subsequent progeny evaluations resulted in the identification of 24 resistant (6.5 cm ave. lesion length) M7 sister lines whose origin can be traced to a single M2 plant. Results of DNA fingerprinting using 63 SSR markers revealed that all 24 resistant M7 lines were 100% similar with each other and clustered with NSIC Rc144 with 94% similarity. Two mutant lines, MSL 37 and MSL 40, exhibited 97.5% and 96.6 % similarity to NSIC Rc144. Disease screening using different *Xoo* races revealed that these two lines are resistant to multiple *Xoo* races. Further molecular evaluation are underway to evaluate relationship of the mutated gene(s) with known bacterial blight resistance genes.

Keywords: Induced mutation, bacterial blight resistance, DNA fingerprinting, simple sequence repeats

AS - 17

SSR-BASED DNA FINGERPRINTING AND TARGETED GENE DISCOVERY IN SELECTED PHILIPPINE SUGARCANE VARIETIES

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Cultivated sugarcane (*Saccharum spp.*) is a complex autoploid with chromosome numbers ranging from 100-130, derived from interspecific hybridizations between *S. officinarum* and the wild relative *S. spontaneum*. Characterization of different sugarcane genotypes is an integral part in establishing the genetic pedigree of current commercial varieties. Moreover, superior varieties can be developed through the use of molecular markers targeting important agronomic traits. In this study, 17 Philippine sugarcane varieties were fingerprinted using 48 *Saccharum*-based simple sequence repeat (SSR) markers available in scientific journals. SSR-based markers were selected based on high polymorphic information content (PIC) values and maximum number of alleles. The presence of SSRs was also determined in the DNA sequences of genes associated with sucrose content (Sucrose Phosphate Synthase-B, Sucrose Transporter 1 and Sucrose Transporter 4) and resistance gene-analogues (RGAs) linked to biotrophic fungal resistance. Genomic DNA was extracted from the 17 varieties using a modified cetyltrimethylammonium bromide (CTAB) double extraction method. Polymerase chain reaction (PCR) was performed using the 48 SSR-based primers for DNA fingerprinting and gene-specific primers for amplification of targeted genes. For DNA fingerprinting, PCR products were electrophoresed in 6% non-denaturing polyacrylamide gel and the resulting band patterns were scored to determine the PIC values of each SSR marker. Amplified regions of the targeted genes were sequenced and the presence of SSRs was determined using available bioinformatics tools.

Keywords: sugarcane, simple sequence repeats (SSR) markers, DNA fingerprinting, sucrose content, fungal resistance

AS - 18

GENOME-WIDE ASSOCIATION STUDY OF TOLERANCE TO FLOODING DURING GERMINATION IN RICE AND ITS BREEDING APPLICATION

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Direct-seeded rice has been progressively practiced in lowland and irrigated areas due to simplicity and cost effectiveness. Early flooding enables weed control but leads to poor crop establishment since rice germination is limited only to coleoptile elongation under flooded conditions. This entails development of varieties tolerant to anaerobic germination (AG). Genome-wide association studies (GWAS) provide promising platform for linking genomics and phenomics using diverse germplasm accessions for the identification of donors for anaerobic germination tolerance in a facile and manageable approach, hence expediting crop improvement. The diversity panel (343 accessions) consisting of 5 subpopulations was screened for AG tolerance under greenhouse conditions using seeding tray method. Seeds were sown at about 0.5-cm soil depth in each cell of the seeding tray initially half-filled with soil, covered with ~1 cm of fine soil, and then submerged in 10-cm water depth. Emergence and germination were measured at 14 d after seeding (DAS) in which seedling emergence above water is the function for survival. Dry weights of the emerged seedlings were gathered at 21 DAS to estimate for vigor. The 44K SNP genotypic data was used for association with the phenotype data using GAPIT. Analyses revealed that most of the AG tolerant varieties are japonicas with good root growth though few indicas and admixed had notable tolerance but had inferior root growth. Indicas and admix with considerable root growth under flooding are sensitive to the stress moreover, most of aromatics and aus are sensitive. Most traits had association peaks located in chromosomes 1, 4, 5, 6, 9, and 10. Further studies will confirm these genetic variations and SNP peaks will be inspected for candidate genes. Biparental crosses will be done with the identified donors for QTL analysis to facilitate breeding for varieties suitable for direct seeding.

Keywords: quantitative traits, direct seeding, anaerobic germination, varietal improvement, crop establishment

AS - 19

IDENTIFICATION AND EVALUATION OF SALINITY TOLERANCE AMONG HYBRID PARENT LINES

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Hybrid rice is known to have more tolerance to abiotic stress because of its genetic plasticity. This can be attested in experimental evidences showing some F1 hybrids adaptable to different abiotic stress condition. However, in order to develop superior hybrids adapted to abiotic stress, mining of parent lines having resistance or tolerance to various abiotic stresses should be established first. This study therefore aimed to screen the hybrid parent lines for salinity tolerance using salinity tolerance screening at seedling stage (SALTSSS), and evaluate its Na⁺ and K⁺ ion content using atomic absorption spectrophotometry (AAS). Four Cytoplasmic Male Sterile (CMS), eight restorer, and 14 maintainer lines were identified having salinity tolerance using SALTSS. This include PhilRice-bred maintainer and restorer lines (in the background of PhilRice released varieties) . Comparison of susceptible and resistant check using AAS showed that the identified parent lines having tolerance to salinity has higher Na⁺/ K⁺ ratio accumulation in both shoots and roots. A high Na⁺/ K⁺ ratio in the cytosol is essential for normal cellular functions of plants. This results indicate that maintaining higher Na⁺/ K⁺ ratio, a well-known mechanism for maintaining cell homeostasis, helps the plant in reducing Na⁺/ toxicity in the cell. These lines with salinity tolerance can now be directly used in developing F1 rice hybrids adapted for saline area.

Keywords: cytoplasmic male sterile, maintainer, restorer, atomic absorption spectrophotometry

AS - 20

MORPHO-AGRONOMIC DIVERSITY OF SOME UPLAND RICE VARIETIES FROM IRRI UNDER MUSUAN, BUKIDNON CONDITIONS

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Maximizing rice production of upland agro-ecosystems can help achieve rice sufficiency in the country. This study was conducted from October 2013 to March 2014 to determine the: (1) morpho-agronomic diversity of 15 upland rice varieties (URVs) and 4 inbreds from IRRI, (2) relationships among their morpho-agronomic traits, and (3) their genetic relationships. Data from 32 traits were analyzed using Standardized Shannon-Weaver Diversity Index (SSWDI), Pearson's Simple Correlation Moments (PSCM), and Ward's Minimum Variance for cluster analysis. SSWDI estimated high variability for 10 quantitative traits ($H' > 0.76$) except for days to maturity ($H'=0.71$) and grain length ($H'=0.70$) with only moderate diversity. Mean diversity for 12 quantitative traits was high ($H'=0.85$) but low ($H'=0.20$) for 15 qualitative traits. The genotypes were non-variable ($H'=0.00$) for leaf blade attitude, culm attitude, ligule color and panicle attitude of branching. PSCM revealed 48 positively associated traits and 18 negatively associated traits. Highest positive correlation was between days to first heading and days to main heading ($r=0.88$), whereas, rice bug infestation and awn presence showed the highest negative correlation ($H' = -0.90$). Cluster analysis that produced two groups showed Cluster I with 8 genotypes at 71% genetic similarity and Cluster II with 11 genotypes at 59% genetic similarity. No duplicates (100% similarity) were identified. Results suggest that the IRRI URVs may have potential alleles for developing improved upland rice cultivars.

Keywords: rice breeding, Bukidnon, genetic diversity, upland rice, IRRI

AS - 21

**MOLECULAR ANALYSES OF THE ABACA
(*Musa textilis* NEE CV. ABUAB) FILTERED-GENOME
USING NEXT GENERATION SEQUENCING AND
SANGER-BASED SEQUENCING**

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There is no existing genomic information on the Philippine endemic abaca which is the country's most economically important fiber crop. This study aims to start building the genomic resources of abaca and fast-track marker assisted breeding of improved abaca varieties.

Full genome sequencing and assembly in many plant genomes have been complicated by the large fraction of repetitive DNA, to enrich for genes and low-copy sequences, methylation-sensitive restriction enzyme, with six base pair recognition site, was evaluated on genomic DNA of abaca as a different approach for gene enrichment. *PstI* was used to digest abaca genomic DNA and 400 bp fragments were sequenced using Ion PGM System Ion 318C Chip V2. Microgenomic library was constructed to verify the Next Generation Sequencing (NGS) data, employing Sanger-based sequencing.

Total of 3,949,794 NGS reads were obtained and assembly of the sequences revealed 3,853 contigs. From the reads, *PstI* reduced the number of sequence reads with repeat elements to 3.1% and 86.3% had significant expressed sequence tag (EST) alignment. *PstI*-Filtered genomic DNA was also used to construct microgenomic library with only 1.3% repetitive elements but generated 86.6% significant expressed ESTs alignment. Total of 68 SSR-based primers were successfully designed and 57% were verified by e-PCR.

The abaca functional gene database is being constructed. This strategy was able to capture functional gene space with less repetitive elements (DNA transposons, LTR retrotransposon, Non-LTR).

Keywords: abaca, exome, hypomethylated, ABTV

AS - 22

GENOME-WIDE ASSOCIATION STUDY (GWAS) FOR SALINITY TOLERANCE IN RICE

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Three hundred twenty five lines that were previously genotyped were used to screen/evaluate physiological traits for salinity tolerance and to map loci controlling salinity tolerance through Genome-wide association studies (GWAS). The lines were grown in hydroponic solutions (Yoshida solution) for three weeks and then exposed to salt stress 10 d after germination to an EC6 dsm-1 followed by EC12 dsm-1. Phenotypic data were recorded for shoot length, root length, fresh shoot weight, fresh root weight, dry shoot weight and dry root weight. Measurements of chlorophyll, sodium and potassium concentrations were assessed. The genotype data obtained from the 44K data set and phenotypic data were run on TASSEL using General Linear Model (GLM). Genome-wide association studies identified highly significant peaks for salinity tolerance on chromosome 1 (%K shoots, %Ca, %Ca+b, %Cb, biomass shoots, plant height shoots); chromosome 2 (%K shoots, %Ca, %Ca+b, %Cb, SES); chromosome 3 (%K shoots, %Ca, %Cb, biomass shoots, SES); chromosome 4 (biomass shoots, plant height shoots); chromosome 5 (%Ca+b, biomass roots, biomass shoots, SES); chromosome 6 (%Ca, %K shoots, %Cb, %Ca+b, biomass shoots); chromosome 7 (%Ca+b); chromosome 9 (%Ca, %Cb and %Ca+b); chromosome 10 (%K shoots, %Ca+b, % K roots); and chromosome 12 (%K shoots, plant height shoots). Threshold is 2.7×10^{-7} at a significance level of 1% after Bonferroni multiple test correction (0.01/36901). SES scores significantly correlated with biomass roots, biomass shoots, plant height roots, plant height shoots, %Ca, %Cb, %Ca+b, % Na shoots, % K shoots, % Na roots, % K roots, % NaK shoots and % NaK roots at 1% level of significance. Candidate genes at most significant association are now being identified for future MAS in molecular breeding programs for salinity tolerance.

Keywords: Genome-wide association study, salinity tolerance, rice, TASSEL

AS - 23

DNA BARCODING OF PHILIPPINE TRADITIONAL AND MODERN RICE VARIETIES

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DNA barcoding is a method for reconstructing the taxonomic classification at the molecular level through gathering sequences. This study was undertaken to obtain a DNA barcode from traditional and modern rice varieties, using standard markers set forth by the International Barcode of Life. Chloroplast loci were used in resolving varietal genotype differences within traditional and modern rice varieties. The three loci: *rbcl*, *matK* and *trnH-psbA* were evaluated in terms of ease of amplification and sequencing, sequence quality and discriminatory power. All exhibited 100% PCR amplification and sequencing success across 70 rice cultivars. The DNA sequences from different varieties were analyzed using Mafft alignment procedure in Jalview. Results showed highest frequency of SNPs in *matK* locus. To estimate nucleotide diversity and genetic relationships among traditional and modern rice varieties, parameters of estimates of nucleotide diversity were calculated. Results revealed *matK* locus obtained the highest nucleotide diversity among traditional and modern varieties with $\theta = 0.01828$. Also, *matK* locus obtained the highest nucleotide diversity within traditional and modern rice varieties with $\theta = 0.02086$. Neutrality tests were investigated by calculating Tajima's *D* and Fu and Li's *D** and *F** values. All yielded negative values implying a bias towards an excess of rare alleles in the population which may indicate recent population growth and selection. A multi-locus analysis produced a more resolved tree than single locus analysis. As a benchmark study in barcoding of Philippine rice varieties, these data can be used in further standardization and establishment of DNA barcodes and will provide significant information that can be utilized in plant breeding purposes in rice varieties.

Keywords: dna barcoding, single nucleotide polymorphisms, *rbcl*, *matK*, *trnH-psbA*

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**METABOLIC RESPONSES TO SALINITY STRESS OF
RICE GENOTYPES WITH VARYING TOLERANCE**

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Salinity is a major constraint for rice production, especially in coastal deltas. Several mechanisms are associated with salt tolerance in rice, including changes in synthesis and transport of metabolites and ions, both at the cellular and the whole plant level. This study attempts to determine the variation in metabolic profiles in tolerant and sensitive rice genotypes in response to salt stress at seedling stage.

NSIC222 (sensitive) and FL478 (tolerant) were used to assess changes in selected metabolites in response to salt stress of 100 mM NaCl. Plant responses were determined by measuring Na⁺ concentrations in leaf samples. A GC-MS-based protocol was used to investigate early metabolite changes following salt stress for 24 hours.

After 24 h in 100 mM NaCl, FL478 had lower amino acid profiles (especially glutamine, aspartic acid, and serine), and silanol and organic acids such as octadecanoic acid, than the sensitive NSIC222 suggesting no apparent cell damage and better tolerance as a consequence of lower Na⁺/K⁺ ration in the cytoplasm. Indole-3-acetonitrile (IAN) and L-proline were found in both varieties after salt stress but absent under control conditions with concentrations significantly higher in FL478 than in NSIC222. Increasing metabolite levels (IAN) could help cope with the increased osmotic potential. Only a few metabolites responded to salt stress after 24h of treatment, probably as a shock-response rather than adaptive responses that require longer time to develop.

Keywords: rice, metabolomics, GC-MS, salinity tolerance

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GENETIC ANALYSIS OF IR64 MUTANT LINES OF RICE (*Oryza sativa* L.) CONTRASTING IN SALINITY TOLERANCE AT SEEDLING STAGE

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The present study was carried out to identify quantitative trait loci (QTL) controlling salinity tolerance in rice using SSR (simple sequence repeat) and SNP (single nucleotide polymorphism) genotyping. F₂ populations were developed from crosses of an IR64-derived salt-tolerant mutant (D167-1-3) with IR29, a sensitive variety, as well as between an IR64-derived sensitive mutant (S730-1) and FL478, a highly tolerant RIL. About 188 F₂ plants of each of the two crosses were phenotyped by screening for salt tolerance at the seedling stage using hydroponics. The segregation patterns of these mutations were studied to test the feasibility of using these populations to map the underlying mutant loci. A genetic linkage map for the F₂ of the cross between FL478 and sensitive IR64 mutant was constructed with 69 SSRs/InDel markers and 142 SNP markers which covers 1,431.2 cM with an average distance of 14.05 cM between loci. Four QTLs were identified using Simple Interval Mapping found on Chromosome 3 and 4, associated with plant vigor (qv3.1, qv4.1) and shoot length (qsl3.1, qsl4.1). Linkage analysis was also performed with the F₂ population from the cross between IR29 and tolerant IR64 mutant with the 68 SSR and 104 SNP markers. Nine QTLs were detected: qses3.1, qsl3.1, qsd3.1, qrl3.1, qrl12.1, qsf3.1, qsk2.1, qsnk3.1, and qchlb6.1 for traits like SES, shoot length, plant vigor, root length, shoot fresh weight, and shoot Na⁺/K⁺ ratio. To assert more accurately the significant threshold of each QTL detected, permutation analysis was performed to reconfirm the presence of each QTL across the 12 chromosomes. QTLs reconfirmed through these permutations may potentially be useful as fine-mapping targets for map-based gene cloning and functional analysis and also for breeding by combining these QTLs in desirable genotypes using marker assisted backcrossing.

Keywords: rice, QTL, salinity tolerance, SSR, mutant

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DIFFERENTIAL GROWTH RESPONSE OF CONTRASTING RICE (*Oryza sativa* L.) GENOTYPES UNDER FLOODING DURING GERMINATION

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Anaerobic stress is one of the major abiotic problems causing great loss in crop production especially in rice. Climate change which causes rise in sea level greatly influences flooding which significantly affects crop cultivation. Thus, identifying tolerant genotypes tolerant to anaerobic conditions during germination is necessary. The objectives of this work are to: perform detailed phenotyping of the germination events under flooding and normal condition; monitor developmental stages, particularly dissect variations on organogenesis and associate the observed disparities to distinct strategies of tolerance; and detect and quantify hydrogen peroxide (H_2O_2), one of the reactive oxygen species, with 3,3'-diaminobenzidine staining to determine the H_2O_2 pattern during germination and to elucidate its role in developmental transition or stress responses. Six genotypes from different sub-groups namely: NSFTV I.D. No. 13, 19, 61, 71, 212 and 216 were sown under flooding and control conditions. Ma-Zhan Red and IR42 were used as tolerant and sensitive checks, respectively. Morphological growth parameters such as root and shoot development, coleoptile emergence, and radicle protrusion were recorded at three time points: day 2, 4 and 7 after sowing. Histochemical staining of H_2O_2 was performed using 4-d and 7-d-old seedlings. NSFTV I.D. No. 216 from temperate japonica group showed significantly higher tolerance to anaerobic stress displaying faster coleoptile and radicle elongation started at day 4 after sowing while slow or no coleoptile and radicle elongation observed on other varieties. In addition, H_2O_2 concentration was found to be higher in genotypes that have failed to elongate its coleoptiles and radicles but lower in NSFTV I.D. No. 216 variety. The identified genotype possibly is a good donor for tolerance of flooding during germination and should be further evaluated.

Keywords: *Oryza sativa* L., anaerobic stress, H_2O_2 concentration, elongation ability, submergence tolerance

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PHILIPPINES TRADITIONAL RICE (*Oryza sativa*) VARIETIES CLASSIFICATION INTO *Japonica* and *Indica* USING CHENG'S INDEX

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One hundred seventy (170) different Philippine traditional varieties were classified into *japonica* and *indica* group using the six characteristics in determining varieties following Cheng's Index which were glume color at heading, glume hairiness, leaf pubescence, interval between 1st and 2nd node of panicle axis, grain shape and phenol reaction.

Morphological traits like basal leaf sheath color, leaf blade anthocyanin coloration, leaf blade attitude (penultimate leaf), collar color, auricle color and ligule color were also evaluated. The traits were based on the Descriptors for Wild and Cultivated Rice (IBPGR-IRRI Rice Advisory Committee, 1980).

Cheng's index validated the previous study done by Philippine Rice Research Institute (PhilRice) on the same groupings of traditional rice varieties based on Single Nucleotide Polymorphism (SNP). The result of traditional rice varieties classification using Cheng's index corroborates with that of SNP in terms of morphological and biochemical traits.

Since *japonica* and *indica* varieties are specific to certain types of ecosystems, the government through the Department of Agriculture (DA) will find it useful to farmers.

Keywords: traditional rice varieties, *japonica*, *indica*, cheng's index

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ANALYSIS OF GAMMA RAY-INDUCED HEIGHT-RELATED SORGHUM MUTANTS

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Sweet sorghum (*Sorghum bicolor* L. Moench), is known for its high sugar content in the culm, which makes it an important bioenergy crop. One way to improve it is by understanding the genetic mechanisms controlling its various traits (e.g. plant height) by analyzing a library of mutants. Here, about 5000 seeds of sweet sorghum were subjected to 200 Gy of gamma radiation. The resulting M2 lines were screened for morphological mutants. As a result, some plant height-related mutants, namely 1 severe dwarf, 3 slender and 1 semi-dwarf were isolated.

The severe dwarf mutant (*br6ox*) showed twisted and irregular leaves that resembled known brassinosteroid (BR)-related mutants of rice. Consistent with the rice mutants, it had an abnormal skotomorphogenesis in the dark. Its height was also rescued by the application of brassinolide (BL), which suggested its deficiency in BR. After sequencing the mutant at different BR-biosynthetic genes, the gene *BR6ox*, which is involved in several steps in the production of BR, was found to be mutated. This finding was supported by *Agrobacterium*-mediated transformation.

The 3 slender mutants showed a striking resemblance to a rice mutant, *slr1*, which is defective in a DELLA protein that functions as a negative repressor of gibberellin (GA) signaling. As expected, sequencing the *SLR1* gene of the mutants revealed two alleles, both having a 2-bp deletion at the repression domain-coding region of the *SLR1* gene, which results in constitutive GA response and hyper-elongation in the mutants.

Lastly, the semi-dwarf mutant with brachytic culm was analyzed based on the assumption that it could be related to a previously reported agriculturally important *dw3* auxin mutant of sorghum. Analyzing the *DW3* gene of the mutant revealed a 5-bp deletion at the exon 1 of the mutant. This novel allele in sweet sorghum background has an important implication for agriculture since its mutation type is stable unlike the gene traditionally used for *dw3*-related semi-dwarf sorghums.

Overall, this study shows the usefulness of gamma ray for the systematic mutagenesis of sweet sorghum and the high correspondence of sorghum mutants to known rice mutants.

Keywords: sweet sorghum, dwarf, mutant, gamma ray, height

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MONITORING PANICLE INITIATION DEVELOPMENT TO SAFEGUARD THERMO-SENSITIVE GENETIC MALE-STERILE HYBRID SEED PRODUCTION OF NSIC RC 202H AND 204H

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Seed setting on thermo-sensitive genetic male-sterile (TGMS) line depends primarily on its flowering synchronization with the pollen line. Accurate prediction of flowering time is an important factor which determines management decisions in order to optimize hybrid seed yields. In rice, flowering date is predicted by the basis of panicle initiation. During the 2014 dry and wet seasons, hybrid seed production experiments were conducted. Panicle development of parent lines of Mestiso 19 (NSIC RC 202H) and Mestiso 20 (NSIC RC 202H) were evaluated at three-day interval starting from the development of panicle primordia to flowering. Results showed that panicle of TGMS line of Mestiso 19 develops 3-4 days later than its pollen parent while TGMS line of Mestiso 20 is 1-2 days ahead of its pollen parent. During the stages III-VIII of panicle development, the difference in panicle length between parents of Mestiso 19 and 20 are 10 ± 3 mm and 4 ± 0.5 mm, respectively. From this study, it is concluded that sowing dates of parent lines of both TGMS hybrids should be adjusted according to ineval differences in panicle development.

Keywords: thermo-sensitive, male-sterile, rice, hybrid seed production, panicle initiation

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BREEDING FOR VIRUS RESISTANCE IN SQUASH (*Cucurbita moschata* Duchesne ex Poir.)

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Genetic resistance is the simplest, most effective and efficient approach in limiting losses to virus diseases in squash such as Squash Leaf Curl Virus (SLCV), Zucchini Yellow Mosaic Virus (ZYMV) and Papaya Ringspot Virus (PRSV). Since local varieties are generally susceptible to virus diseases, breeding lines from foreign sources with resistance to these viruses can be crossed with the local accessions in order to recombine the desirable traits from the two groups of germplasm. Hence, this paper presents results of the breeding efforts we are doing in order to come up with virus resistant varieties. The first year of our breeding activities were devoted to evaluation of germplasm and hybridization between the foreign (breeding lines from the Asian Vegetable Research and Development Center identified to be resistant to viruses) and local (susceptible) accessions. Crosses were done based on the result of initial field trial and on the initial and confirmatory screening of ZYMV and PRSV resistance under greenhouse conditions. For the second and third year of our breeding activities, generation advance and backcrossing were done. The segregating lines were evaluated and the selected plants were selfed or sibbed for generation advancement. Selection between lines and selection within the lines were conducted. Nine (9) lines were selected based on resistance to viruses in the field, earliness, good eating quality, fruit thickness and fruit weight). The selected breeding lines will be evaluated further both in the field and greenhouse.

Keywords: squash breeding, virus resistance

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MORPHOLOGICAL AND PHYSIOLOGICAL SCREENING OF UPLAND RICE LANDRACES IN MAASIM AND ALABEL, SARANGANI PROVINCE, PHILIPPINES

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The study was undertaken to assess the morphological variability of 26 upland rice cultivars collected in Maasim and Alabel, Sarangani Province and to evaluate physiological responses of traditional rice cultivars to drought and salt stress. A total of 12, 27 and 17 morphological parameters respectively were evaluated during the vegetative, reproductive and post-harvest stages and were henceforth analyzed using principal component analysis (PCA) and cluster analysis. The traditional cultivars were subjected to different levels of salt concentration (4dS/m, 8dS/m, 12 dS/m, and 20dS/m) and different levels of PEG concentration (10%, 15% and 20%) for drought and salt screening. UPGMA dendrograms generated from morphological data revealed the divergence of *Manumbay*, *M'labat* and *Larangan* from the rest of the cultivars during vegetative stage, *Blawen* during reproductive stage and *Unknown (Pilit)* and *Pilit na dili mabal'an* during post-harvest stage. PCA, on the other hand, identified most of the quantitative traits as discriminant traits in grouping cultivars in both dendrograms and scatterplots. Results of physiological screening for both drought and salinity during germinative and seedling stages showed that all evaluated parameters were inhibited by increasing NaCl and PEG concentrations. Among the cultivars that were screened, *Azucena M* was considered to be least tolerant to drought as shown by its poor performance in most of the assessed parameters while *Larangan*, *Mayaman* and *Lanuton* were drought tolerant cultivars. *Mayaman* was also considered as the most tolerant cultivar to salt stress while *M'likat Blawen* and *M'likat Lagfisan* were least tolerant. Results of this study therefore provide baseline information for varietal selection for cultivation in drought-prone and saline soils especially during these times when the specter of global climate change is an imminent possibility in the coming years.

Keywords: drought, salinity tolerance, upland rice, morphological

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**GENETIC DIVERSITY AND POPULATION STRUCTURE
OF *IN SITU* POPULATIONS OF *Oryza rufipogon*
IN LAKES APO AND NAPALIT, BUKIDNON**

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Oryza rufipogon Griff. is one of the important wild rices in rice breeding. In the Philippines, its natural populations had been reported only in Lake Apo, Bukidnon. In 2012 however, other populations were confirmed in Lake Napalit, Bukidnon. This study was conducted from October 2013 to February 2014 in both lakes to determine their morphological and molecular diversity, as well as, population structures. Twenty-four quadrants from Lake Napalit populations (LNP) and 14 from Lake Apo populations (LAP) were established and characterized for morphological diversity. DNA from leaf samples per quadrant were analyzed using 99 polymorphic SSR markers. Five of 17 quantitative characters (ligule length, leaf blade length and width, flag leaf length and width) differed between populations as per t-test. Standardized Shannon-Weaver Diversity Indices (H') showed LAP with higher levels of diversity than LNP. Sixteen and 42 pairs of morphological characters were correlated in LAP and LNP, respectively. Cluster analysis based on Ward's Minimum Variance using 33 morphological traits revealed that LAP and LNP were generally 40.20% genetically similar. However, molecular analysis showed higher genetic diversity in LNP than LAP. Nei's genetic distance and F_{st} estimates also showed that LAP and LNP were distinct. F_{is} and F_{it} values revealed that LAP and LNP were non-randomly mating. LNP therefore can be potential sources of new alleles for rice breeding but there are increasing threats to the populations in both lakes.

Keywords: wild rice, *Oryza rufipogon*, Bukidnon, genetic diversity, population structure

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GENETIC PURITY TESTING OF PARENTAL LINES USING CONVENTIONAL GROW OUT TEST

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Genetic purity test is mandatory for seed certification to ensure that seeds released for cultivation are free from genetic contamination. Grow-out test (GOT) is one way of testing genetic purity of seed lots based on morphological criteria of the true-to-type plants. The objective of the study is to evaluate the purity of parental lines seed lots produced at the Philippine Rice Research Institute. Samples were grown in 20cm x 20cm grow-out matrix with 500 hills per plot. The experiment was laid out in a randomized complete block design (RCBD) with 3 replications.

Twenty-seven seed lots of parental lines (3 PRUP TG101, 9 PRUP TG102, 9 IR68897-A and 6 IR58025-A) produced on dry season 2014 were tested. Genetic purity through visual evaluation was conducted based on the base color, plant height, days to heading and grain shape. Sixteen of the 27 seed lots had purity of 97% below and were rejected. Off types had purple-colored bases, taller or shorter as compared to the majority of the population, had different grain characteristics and were early or late to head. Among the parental lines tested, 6 lots of IR68897-A, 1 lot of PRUP TG101 and 3 lots of PRUP TG102 had the highest purity percentage of 98. On the other hand, 2 lots of IR58025-A had the lowest (92%). These impurities may be caused by improper post-harvest practices.

DNA fingerprinting utilizing simple sequence repeats (SSR) markers is currently undertaken to confirm these results.

Keywords: grow out test, seed lots, parental lines, genetic purity, off types

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**PHYSIOLOGICAL RESPONSE OF RICE AND WEEDS
UNDER ANAEROBIC GERMINATION AND ITS
IMPLICATIONS FOR CROP MANAGEMENT**

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Weed infestation is the major predicament in direct seeding in which its control heavily relies on herbicide application. Imposing early flooding limits weed growth but most rice varieties had poor seedling establishment due to anoxic stress. Understanding the mechanisms associated with weed and rice response under anaerobic germination (AG) is critical in developing integrated weed management approaches in direct-seeding. The response of three rice genotypes: Khao Hlan On (KHO), Mazhan Red (MR), and IR64; and two *Echinochloa* spp: *E. colona*, *E. crus-galli* to early flooding were evaluated. Dry seeds were sown at 1-cm soil depth and flooded to 0, 1, 5 and 10 cm depths. Lipid peroxidation, total phenolic content (TPC), reactive oxygen species (ROS) scavenging enzymes and amylase activity were assayed in germinated seeds at 4 d after sowing (DAS). Seedling emergence and growth were assessed at 21 DAS. Flood-tolerant rice genotypes; KHO and MR had higher seedling emergence, faster shoot and root elongation and higher biomass production with 5 cm and 10 cm flooding. Lower MDA content, higher TPC, higher superoxide dismutase (SOD), catalase (CAT), ascorbate peroxidase (APX), guaiacol peroxidase (POX) and, higher amylase activities of tolerant rice genotypes were associated with their high seedling emergence under flooding. In contrast, higher lipid peroxidation, lower TPC, lower ROS scavenging enzyme and amylase activities in IR64 rice genotype and *Echinochloa* spp., were associated with lower emergence, growth and biomass production under flooding. Biomass accumulation, root and shoot elongation, antioxidant content, and activities of ROS scavenging enzymes and amylase had significant positive correlations with emergence at 21 DAS. Early flooding of 5 cm to 10 cm is effective for managing these weeds in direct seeding when AG tolerant rice genotypes are used.

Keywords: early flooding; direct seeding; antioxidant; *Echinochloa* sp. ; weed management

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MORPHO-AGRONOMIC DIVERSITY OF SOME TRADITIONAL CORN (*Zea mays* L.) VARIETIES FROM BUKIDNON

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Genetic diversity is the key to overcome the hump in corn varietal improvement. For possible future gene mining, morpho-agronomic diversity of 29 traditional corn varieties (TCVs) collected in Bukidnon was determined in 2013-2014. This study also determined the degree of association among traits and the genetic relationships among the genotypes. Data from 19 quantitative and 16 qualitative traits were analyzed using ANOVA for RCBD with two replications, Standardized Shannon-Weaver Diversity Index (SSWDI), Pearson's Simple Correlation Moments (PSCM), and Ward's Minimum Variance for cluster analysis. ANOVA revealed highly significant variations ($p < 0.01$) among TCVs for days to 50% seedling emergence and tasseling, ear height and plant height at maturity, days to maturity, weight of 100 seeds, cob diameter, kernel width, and number of kernels per row. Quantitative traits were generally highly diverse ($H' > 0.75$) with grain yield having the highest diversity ($H' = 0.91$) as estimated by SSWDI. However, qualitative traits showed low diversity ($H' = 0.30$). PSCM showed that grain yield was positively and significantly associated with eight traits, where the highest was with ear diameter ($r = 0.64$). Cluster analysis based on 35 traits however, revealed that Lawaan and Bulldog, Kalarikay and Silangan, MBC CWC and Tinigib #4, Sigi-sigi #1 and Calempos #2, Tinigib #2 and Sige-sige #6 (yellow), and Sigi-sigi #2 and MLAB Red were duplicates (100% genetic similarity).

Keywords: corn, *Zea mays*, Bukidnon, morpho-agronomic diversity, traditional varieties

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**ORGANIC SEED-PROTECTANTS AGAINST BEAN
BEETLE, *Callosobruchus maculatus* (FAB.) (COLEOPTERA:
CHRYSEMELIDAE: BRUCHINAE), ON STORED
MUNGBEAN, *Vigna radiata* (L.) R. WILCZEK**

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Screening and evaluation studies were conducted to identify effective mungbean seed protectants against *Callosobruchus maculatus* (Fab.). Among the 25 powdered materials, 26 lambanog-extracted solutions and eight edible oils tested under free-choice and no-choice bioassays, the powdered materials of black pepper, marigold, ashed beetle, kamias, ipil-ipil, lambanog extracts of marigold, ipil-ipil, guava, luyang dilaw, and edible oils of vegetable, sesame, olive, canola, coconut, palm, corn, and virgin coconut oil were the most promising treatments for each preparations. However, after the final bioassay, none of the treatments can significantly deter oviposition, while only edible oils were very effective in reducing F1 emergence.

Bioassay studies revealed that edible oils are effective at 0.5% to 1.0% v/w dosages. At a high dosage of 2.5% (v/w), edible oils can slightly reduce germination rate, but can be managed by pre-germination treatment of 1% soap solution. Post-oviposition test revealed that edible oils possess larvicidal properties against bean beetles by suffocating the larvae inside the seed after oil penetration. The edible oils were found effective for two months, but possibly longer, against all the life stages of bean beetles. The edible oils prevented respiration, hence, the mode of action is mainly a physical type of activity and any chemical toxicity or deterency is only secondary.

Keywords: *Callosobruchus maculatus*, oviposition deterrence, F1 emergence, powdered materials, lambanog-extracted solution

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MYCORRHIZAL FUNGI AND COMPOST CONTRIBUTE HEAVY METAL TOLERANCE OF COVER CROPS IN MINEWASTE SOIL

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Mine waste dumpsite in Barangay Capayang, Mogpog, Marinduque has been abandoned and barren for 25 to 30 years. The soil contains copper as high as 1000ppm with patches of talahib, *Acacia auriculiformis* and ferns. Fruit bodies of ectomycorrhizal fungus *Pisolithus* were observed in *A. auriculiformis*. A nursery experiment was conducted to determine the contribution of mycorrhizal fungi and compost on the heavy metal tolerance of legume cover crops for rehabilitation. Surface sterilized seeds of kudzu (*Pueraria lobata*), kumpitis (*Clitoria ternatea*), patani (*Phaseolus lunatus*) and (*Desmodium cinereum*) were sown in pots filled with 2:1 mixture of mine waste soil and compost. Mycorrhizal fungi (Mykovam or MineVAM at 5g plant⁻¹) were placed directly beneath the seeds (five seeds pot⁻¹ thinned to two seedlings after one month). Results show that compost and mycorrhizal inoculation increased (50%) seedling growth and survival except kumpitis, four months after planting. Kumpitis survived only if inoculated with mycorrhiza. Mykovam and MineVAM were equally effective for kumpitis. Kudzu was the best among the four legumes especially when inoculated with mycorrhizal fungi with or without compost. MineVAM was best for kudzu, patani and *Desmodium*. Mycorrhizal kudzu and *Desmodium* gave the highest stem length and biomass. Non-mycorrhizal kudzu gave the highest Cu concentration (18 mg/g) followed by kumpitis (13 mg g⁻¹). In mycorrhizal plants, Cu concentration ranged from 5 to 13 mg g⁻¹. MineVAM inoculated plants gave the highest (45 mg plant⁻¹) root Cu uptake and Mykovam inoculated plants had the lowest (30 mg plant⁻¹). The results show that kudzu and *Desmodium* are candidate cover crops in minewaste site amended with compost and mycorrhizal inoculation for better growth, survival and increased tolerance to heavy metals.

Keywords: Mykovam, MineVAM, *Desmodium*, kudzu, Marinduque

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**ROLE OF GIANT BAMBOO (*Dendrocalamus asper*)
ON SOIL EROSION AND SEDIMENT YIELD REDUCTION
WITHIN TAGANIBONG SUB-WATERSHED IN
BUKIDNON, PHILIPPINES**

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The main stream of Taganibong watershed in Bukidnon drains to the Pulangi river system that supports the National Power Corporation (NAPOCOR) Pulangi IV dam. This watershed has problem on flooding downstream due to soil erosion and siltation occurrences during heavy rainfall. This study is aimed to quantify the erosion and sediment yield of the bamboo stand within taganibong watershed and compare this in an area devoid with bamboo stands. The two areas serve as the research site of the study where 9 erosion plots were established per site to measure soil erosion. In determining sediment yield, three sediment collectors were established per site to trap the flowing water in the stream.

Findings showed that bamboo stands can withhold soil loss of up to 80% when compared with an open area. Significant difference was observed in soil erosion between giant bamboo stand and an open area with 19 Ton Ha-1 and 107.28 Ton Ha-1, respectively. In terms of sediment yield, bamboo stand is considerably lower ranging from 1.09 to 1.45 gram/m²/hr as against the open area with values ranging from 21.95 to 59.53 gram/m²/hr. The results of the study may imply that giant bamboo is effective in reducing soil erosion and sediment yield which are the major causes of siltation and flooding along lowland areas.

Keywords: Taganibong, watershed, soil erosion, sediment yield, Giant Bamboo

AS - 39

**GIS-BASED ASSESSMENT OF GROUNDWATER SUPPLY
AND DEMAND FOR DRINKING AND IRRIGATION
IN SELECTED BARANGAYS OF BATAAC,
ILOCOS NORTE, PHILIPPINES**

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The study was done in selected barangays of Batac, Ilocos Norte to assess the groundwater supply and demand for drinking and irrigation purposes using geographic information system (GIS). Aquifer in the study area was characterized by conducting pumping test. Locations of pumped wells were determined using Global Positioning System (GPS) Receiver. Point data on hydraulic properties was determined and used in the estimation of available groundwater supply in the study area. A map on transmissivity, specific yield and specific capacity was generated using GIS. Groundwater demand in the area was estimated based on domestic consumption of current population and average seasonal groundwater supplied to different crops planted in the area. Transmissivity in the area ranges from 65.53 m²/day to 825.48 m²/day while specific yield and specific capacity in the study area ranges from 0.000948 to 0.025021 and 31.76 m²/day to 153.08 m²/day, respectively. Results of the study revealed that the safe yield (24,140 m³/day) in the area is more than enough compared to the groundwater demand (10,478.64 m³/day). Groundwater demand in the area only accounts for about 40% of the total groundwater supply. However, management of our groundwater resources is becoming more important as the demand for domestic and agricultural purposes increases. Therefore, sustainability criteria must be formulated to maintain a reliable and adequate water supply for the future.

Keywords: groundwater supply, groundwater demand, safe yield, hydraulic properties, geographic information system

AS - 40

CBFM: MAKING THE MOST OF NTFPs

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The project has generated data and information on the availability of non-timber forest products (NTFPs) in 9 Community-Based Forest Management (CBFM) areas studied; and their suitability for handicraft production.

The seminars/trainings held on NTFPs collection, processing, utilization and marketing for handicrafts significantly affected the people's way of life by giving them livelihood at sustainable harvest level for NTFPs. The upgrading and innovative skills these farmers obtained led them to develop new products from alternative raw materials by NTFP collectors and handicraft producers. Some People's Organizations have already market of their woven products indicating of bright hope for steady income among farmers and forest dwellers in the rural communities.

Installations of mechanical equipment to press leaves of selected NTFPs prior to their weaving had already been recommended to 3 rural communities with strong support from Local Government Units (LGUs) and other cooperators.

The positive results of the project would somehow be a big boast to the growth of handicraft industry in the Philippines.

Keywords: ntfps, cbfm, handicraft, livelihood, sustainable

AS - 41

DOCUMENTATION OF DIPTEROCARP SPECIES IN SECOND GROWTH FOREST IN SELECTED MUNICIPALITIES OF ILOCOS NORTE

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Nowadays, only few remnants of dipterocarps forests are left in the Philippine archipelago due to illegal logging and conversion of forestland into permanent human settlements. Dipterocarps are the most important source of timber and the greatest biodiversity of South East Asia. Some of these species are already critically endangered, hence, an inventory of these remaining dipterocarp species are very vital to initiate programs for the protection and conservation of dipterocarp species. This study aims to: (1) identify the dipterocarp species available in Ilocos Norte and; (2) characterize the identified dipterocarp species in terms of leaf and bark including their species classification. The study used the Quadrat method of sample collection. Identified dipterocarp trees in Ilocos Norte includes yakal (*Shorea astylosa*), palosapis (*Anisoptera thurifera*), Red Lauan (*Shorea negrosensis*), White Lauan (*Shorea contorta*), Narig (*Vatica mangachapoi*), Mayapis (*Shorea squamata*) and Guijo (*Shorea guiso*). A total of one hundred fifty nine (159) dipterocarp species was recorded in all the sites where palosapis is the most dominant in all the sites. Moreover, most of the documented dipterocarp species were considered as tree in terms of growth classification with an average diameter at breast height (Dbh) of greater than 10 cm followed by seedling (< 5cm) and sapling (5.01-10 cm). Leaf and bark characteristics of the dipterocarp species were varied from one site to another. Based on IUCN Red List Classification, all the documented dipterocarp species in Ilocos Norte were critically endangered. Relevant policies and program initiatives in the protection and conservation of the remaining dipterocarp species in Ilocos Norte provides maximum environmental services to stakeholders.

Keywords: Dipterocarp, biodiversity, forest, Diameter at breast height, Quadrat

AS - 42

ADLAY (*Coix lacryma-jobi* L.) FIELD PERFORMANCE UNDER DIFFERENT PLANT DISTANCES

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The Philippine government through the DA-BAR spearheaded the search for a low-input crop that would address food security in the country. Adlay or Job's tears (*Coix lacryma-jobi* L.), which is a weedlike-crop was studied through adaptability and yield trials. Several menu of technology were studied and one of these was on the appropriate planting distance for the test crop. This study was conducted to evaluate the performance of Gulian Adlay variety as affected by different planting distances under Musuan, Bukidnon condition. This study was laid out in strip plot in RCBD with the different row distances (R1-70cm, R2-80cm and R3-90cm) as the vertical factor and the hill distances (H1- 40 cm, H2-60 cm, H3-80m) as the horizontal factor, in three replications at Musuan, Bukidnon from June 2012 to January 2013. Data gathered were analyzed using ANOVA and LSD was used for treatment comparisons. As per ANOVA, all parameters measured were not significantly influenced by row and hill distances, except on the number of grains per panicle, filled grains per panicle and grain yield per hectare. A significant interaction between hills x row distance was observed on the grain yield of Gulian and it was noted that the best planting distance for this variety was 90cm x 80cm during wet season trial.

Keywords: adlay, plantin distance, hill, row, grains

AS - 43

MONITORING RICE AND CORN CROP CULTIVATION IN NORTHERN PHILIPPINE USING MODIS DATA

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Satellite remote sensing data are used to study the distribution and estimate the areal coverage of the two most dominant crops, namely, rice and corn, in the Philippines. The EOS/Terra MODIS data were used to assemble a 15-year time series of monthly NDVI data over Northern Luzon at a resolution of 250m. The monthly data were used to investigate seasonal patterns of crops and to derive nine phenological parameters from the distributions of rice and corn in Northern Luzon which in turn were used in conjunction with a maximum likelihood classifier to discriminate areas planted by rice and those planted by corn during the wet and dry seasons. Classification was done in areas that usually have two cropping seasons and where the starts of the planting seasons are consistent with those expected from climatology. The resulting maps show a spatial distribution of corn and rice crops during the wet and dry seasons that are generally plausible and found to be highly correlated and comparable, with some exceptions, to data published by the Bureau of Agricultural Statistics.

Keywords: Rice, Corn, MODIS, Phenology, Remote sensing

AS - 44

GROWTH, YIELD AND FRUIT QUALITY OF 'SENSUOUS' PINEAPPLE IN RESPONSE TO VARYING PLANTING DENSITIES

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New and improved crop genotypes need to have the optimal cultural methodologies such as optimum planting density. A study was conducted to (1) evaluate the effect of varying planting densities on the growth, yield and fruit quality of a newly developed pineapple genotype named 'Sensuous' and to (2) determine the planting density that will give its best growth, fruit yield and quality. Treatments were four planting densities: T1- 75,000 plants per hectare (pph), T2- 65,000 pph, T3- 55,000 pph and T4- 45,000 pph. The experiment was laid-out in a Randomized Complete Block Design (RCBD) with four replications. Heaviest fruits (mean of 1.77 kg/fruit) were obtained from 55,000 pph but was comparable with the fruit weight in 65,000 pph (mean of 1.68 kg/fruit). Mean yield/ha (i.e. number of fruits/ha) of 'Sensuous' pineapple was indirectly proportional with average fruit weight. Significant increase of Pack 5 (2.05- 2.4 kgs) fruits was noted at 45,000 and 55,000 pph with 8,830 and 7,476 fruits, respectively; compared to 65,000 pph (4,686 fruits) and 75,000 pph (4,875 fruits). Pack 7 (1.45- 1.69 kgs), Pack 8 (1.21- 1.44 kgs) and Pack 9 (1.08- 1.20 kgs) fruits were significantly higher in 75,000 and 65,000 pph compared to 55,000 and 45,000 pph. Highest number of boxes was recorded in 75,000 pph with 5,717 and the least number of boxes (3,994) produced was from 45,000 pph. Finally, fruit quality was not affected by varying planting densities.

Keywords: pineapple, planting density, fruit quality, novel pineapple variety

AS - 45

GRAIN SPAWN VIABILITY OF OYSTER MUSHROOM (*Pleurotus sajor-caju*) AT DIFFERENT STORAGE CONDITIONS AND PERIOD

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Spawn is the mushroom mycelium growing on a substrate which serves as the planting material in mushroom cultivation. The quality of spawn is one of the most important factors for successful crop. The method of spawn storage of mushroom is one that gives great impact of mushroom yield.

The study was conducted using 2X5 factorial design arranged in completely randomized design (CRD) replicated 3 times. The study therefore, made to evaluate grain spawns viability stored at different conditions and period. The different storage conditions were assigned in Factor A, while the different storage periods were assigned in Factor B.

Results revealed that the grain spawns viability of oyster mushroom at different storage conditions and period influence the growth and performance of the oyster mushroom. On the basis of the results, among the 2 different storage conditions, grain spawns stored at refrigerator temperature (A1) consistently showed the best yield performance of *P. sajor-caju* compared to grain spawns stored at room temperature (A2). On the other hand, mushroom grain spawns stored at 2 to 3 months (B2) and (B3) exhibited good results considering the growth and yield performance of *P. sajor-caju*.

Keywords: spawn, grain spawns, yield performance, oyster mushroom, cultivation

AS - 46

ASSESSMENT OF FUNGAL DISEASES IN OPV CORN (*Zea mays* L.) APPLIED WITH BIOFERTILIZER

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Application of biofertilizers not only minimize fertilizer loss and maximize nutrient uptake but also reduce incidence of pests and diseases of crops. Hence, a study with the objective of attaining good yield performance and fungal disease resistance in corn (Open-Pollinated Variety) was conducted to determine the effective biofertilizer for recommendation to farmers.

The study was laid-out using Randomized Complete Block Design with three (3) replications at the Agricultural Experiment Station, CMU, Musuan, Bukidnon. The four (4) brands of biofertilizers used were: Exquisite DB, BiosparkTM, X-Tekh, and Wellgrow.

Disease assessments show that there are only three (3) major fungal diseases identified during the Wet Season, namely: Stenocarpella Leaf Blight (caused by *Stenocarpella macrospora*), Curvularia Leaf Spot (due to *Curvularia lunata*) and Corn Rust (due to *Puccinia polysora*). CMU Var 12 was susceptible to Curvularia Leaf Spot. Plants applied with Exquisite DB had a mean of 65.94%. However, plants were Moderately Resistant to Stenocarpella Leaf Blight having 27. 81%, as the highest mean, for plots applied with Exquisite DB. All plants were Resistant to Corn Rust, however, the lowest mean (9.42%) was exhibited by plants applied with X-Tekh.

Analysis of variance indicated no significant difference among treatment means for Stenocarpella Leaf Blight and Corn Rust diseases while a significant difference was noted for Curvularia Leaf Spot. For yield, there was no significant difference among the treatment means but of the four biofertilizers applied, highest Adjusted Grain Yield (kg/ha) was recorded from plots applied with Exquisite DB with an average yield of 4,805.56 kg/ha.

Keywords: *Stenocarpella macrospora*, *Curvularia lunata*, *Puccinia polysora*, OPV, resistance

AS - 47

MYCORRHIZAL BANANA CVS LAKATAN AND CAVENDISH GREW HEALTHY IN *Fusarium* WILT INFESTED AREAS IN MINDANAO

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Banana is one of the top fruit exported in many countries and considered as one of the dollar earner for the Philippines. However, *Fusarium* wilt infestation devastated the banana industry in Mindanao, thus, this study was conducted to determine if Mykovam mycorrhizal biofertilizer can restore the productivity of *Fusarium* wilt infested area in Panabo City, Davao del Norte and in Nabunturan, Compostella Valley previously planted with banana cvs. Lakatan and Cavendish, respectively. Planting materials were suckers from four-year old mycorrhizal (SM) or non-mycorrhizal mother (SNM) plants or tissue cultured (TC) meriplants. The last two planting materials were inoculated with Mykovam™ (10g per plant) during field planting while suckers from mycorrhiza ones were not re-inoculated. Lakatan experiment was established under coconut palms or under open field, whereas, Cavendish experiment was done under open field conditions following RCBD with five blocks and 3m x 3m spacing. All plants received 100g NPK two months after planting and 100g plant-1 after three months. Results show that, all the banana plants grew healthy and there were no signs of *Fusarium* wilt disease one year after field planting. At 9th month after inoculation or field planting, suckers started to have flowers/fruits, whereas, TC plants had flowers on the 11th month. One year after planting, TC Lakatan gave a 10% more fruits under coconuts and 7.6% in the open than from suckers. SNM plants gave more (8.7%) fruits than those taken from the SM (3.8%) plants, SNM plants might have more root colonization that translated into more fruits than from the SM plants which may also require re-inoculation. In conclusion, Mykovam™ biofertilizer can restore the productivity of banana cvs. Lakatan and Cavendish in *Fusarium* wilt infested areas in two provinces in Mindanao, Philippines.

Keywords: Panama disease, mycorrhiza, Mindanao, meriplants, suckers

AS - 48

AGRICULTURAL LIMING CONTROLS RHIZOME ROT OF GINGER (*Zingiber officinale* Rosc.)

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Ginger rot is now the most devastating disease of ginger. Chemical control was proven ineffective and costly, since the causal organism are easily transferred through seedpieces; and propagate very fast in acidic soils, which is a characteristic of ginger-growing areas.

We measured disease severity index (DSI) and disease incidence (DI) of ginger rot, and compared the rhizome yield, weights of marketable and non-marketable rhizomes in four soil pH levels: Treatment 1 (T1): original soil pH; 4.97 (control); Treatment 2 (T2): Soil pH adjusted to pH 6; Treatment 3 (T3): Soil pH 7; and Treatment 4 (T4): Soil pH 8, to investigate the potential of a liming program to control ginger rot.

DSI and DI were in the order $T1 > T2 > T4 > T3$. DSI is strongly negatively correlated to soil pH ($R = -0.96$; $R^2 = 0.93$). DSI and DI were lowest when soil pH was maintained at neutral or near neutral (T3). However, both DSI and DI increased when the soil pH was raised from 7.0 to 8.0.

Rhizome yield was in following order: $T3 > T4 > T2 > T1$ with values 7.72, 6.96, 6.46, and 5.78 tons per hectare, respectively. The best yield was from plots ameliorated to soil pH 7 (T3). DSI is negatively strongly correlated with rhizome yield ($R = -0.96$; $R^2 = 0.93$), indicating that decreasing the disease severity had improved the rhizome yield.

The resulting proposed liming program could possibly solve the ginger rot problem of Nueva Vizcaya and the Philippines.

Keywords: ginger rot, disease severity index (DSI), disease incidence (DI), agricultural liming

AS - 49

BROMELAIN POWDER RECOVERY OF COMMERCIALY GROWN PINEAPPLE PLANTS AT VALENCIA CITY, BUKIDNON, PHILIPPINES

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Bromelain is a proteolytic enzyme present in the different parts of a pineapple plant. Bromelain extraction gives serious attention to one of the pineapple exporters from Valencia City, Bukidnon for its economic importance especially in the pharmaceutical market. Preliminary investigation was conducted to determine the bromelain powder recovery from different growing stages of two cultivated pineapple varieties. The treatments were: T1) 19-month old 'Sensuous' pineapple plant stump, T2) 14-month old 'MD2' pineapple ratoon sucker, T3) 34-month old 'MD2' pineapple plant and T4) 19-month old 'MD2' pineapple plant. Pineapple stump juices were extracted using the juice extractor prototype from Taiwan. The extraction of bromelain powder was performed at the Biotechnology Researches Services located at Alanib, Lantapan, Bukidnon. Highest amount of bromelain powder (1.15 g bromelain powder/kg stump) was recovered from 19-month old 'Sensuous' pineapple plant stump. The 34-month old 'MD2' pineapple plant had a 1.13 g/ kg recovery, whereas, 0.9 g bromelain/ kg stump was extracted from 19-month old 'MD2' pineapple plant. The lowest bromelain recovery of 0.7g/kg was from 14-month old 'MD2' pineapple ratoon sucker.

Keywords: bromelain, Bukidnon, pineapple, MD2 pineapple, pineapple stump

AS - 50

SOAKING TIME AND ITS EFFECTS ON THE MILLING RECOVERY AND GRITS QUALITY OF PARBOILED ADLAY (*Coix lacryma-jobi* L.)

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Adlay or Job's tears (*Coix lacryma jobi* L.) is a weed-crop recently introduced as a staple crop in the Philippines for food and nutrition security. Menu of technology (MOT) have been undertaken by DA-BAR since 2011 to include postharvest handling like parboiling of adlay grains prior to milling. This study was conducted to compare the possible effects of soaking time on the milling recovery and grits quality of parboiled adlay. This study was laid in a 3 x 4 factorial in CRD with three replications at the Seed Technology Laboratory of Central Mindanao University, Musuan, Bukidnon from May 2013 to January 2013. The grains of three adlay varieties were assigned as Factor A (V1-Ginampay, V2-Tapol, V3-Gulian) and soaking time in hot water (S1-0 hours, S2-2 hours, S3-3 hours, S4-4 hours) as Factor B. Data gathered were analyzed using ANOVA and LSD for treatment mean comparisons. As per ANOVA, all three parameters measured significantly differed among treatments. Parboiling significantly affected the milling recovery and milling yield of adlay grains. Grains soaked for 2 to 4 hours had higher milling recovery than unsoaked treatment. Likewise, grains soaked for 3 hours (S-3) had higher milling yield and Gulian variety consistently obtained higher milling recovery and milling yield than Ginampay and Tapol. It was revealed that parboiled Gulian had more head grits with rough-textured grits compared to other varieties used. Therefore, Gulian could be a more suitable variety for parboiling at 3-4 hours.

Keywords: adlay, parboiling, milling yield, milling recovery, grits

BIOLOGICAL SCIENCES

BS - 01

DIVERSITY OF ORCHIDS IN MT. SINAKA, NORTH COTABATO

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This study specifically aims to identify, describe, determine the species composition, assess the local and conservation status, and determine the diversity indices of orchids in Mt. Sinaka, North Cotabato. Sampling plots were established across vegetation types and an alpha taxonomy was done from base to peak of the mountain.

A total of 95 species belonging to 37 genera were recorded. Among 37 genera, *Dendrochilum* is well represented with 10 species followed by the *Bulbophyllum* (9), *Appendicula* (6) and *Dendrobium* (6) while 23(63%) genera represented with a sole species. Among these species, 11 are widespread, 21 endemic, 1 critically endangered, 1 endangered, 23 new record in the region, 18 new record in Mindanao, 5 new record in the Philippines and 6 undescribed species. Locally, most of the orchid species were found to be rare. Mt. Sinaka's orchid showed Shannon Index of Diversity of $H' = 1.2573$ showing Dipterocarp forest with the highest diversity index of $H' = 1.0855$ followed by mossy forest ($H' = 1.0829$) then montane ($H' = 1.0542$). However, among the three vegetation types, montane forest has remarkably high number of species yet low in diversity. Mt. Sinaka showed low to medium orchid species diversity yet a reservoir of threatened, endemic, new record species, locally abundant, common and rare orchids.

Keywords: Mt. Sinaka, Diversity, Distribution, North Cotabato, Orchids

BS - 02

HABITAT USE AND SITE FIDELITY OF IRRAWADDY DOLPHINS (*Orcaella brevirostris*) IN BAGO-PULUPANDAN COASTAL WATERS, NEGROS OCCIDENTAL, PHILIPPINES

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This study is part of continuous efforts to document and monitor a small population of Irrawaddy dolphins in the coastal waters of Bago and Pulupandan, Negros Occidental and aimed at investigating the dolphins' habitat use and site fidelity. A total of 26 days from April until August 2014 were spent surveying the dolphins in an area of approximately 16 kilometers of coastline. The coastline was divided into sectors of approximately 1 kilometer each. Habitat use was measured by the total time spent by dolphins in a particular sector over the total observation time in any sector (Coefficient Area Use) (Karczmarski et al., 2000) while site fidelity was measured as the number of days a dolphin was identified as a proportion of the total number of days the survey were conducted. Among the 16 sectors, dolphins showed a significantly higher preference (Coefficient of Area Use of 0.18) to a shallow area adjacent to the mouth of Bago River (Sector 10). Using Duncan Multiple Range Test, dolphin's preference to sectors 7, 8, 9, 10 and 12 were all found to be significantly different from the other sectors. Foraging was often observed more than any kind of behavior (Activity Index mean at 254.61), an indication that the area is an important feeding ground for the Irrawaddy dolphins. Socializing (AI = 111.29) was also observed, often between calves and adults, and also between two or more adults. Using Spearman Rank Correlation Coefficient (ρ_s) the correlation coefficient between Area Use and Site Fidelity was computed to be 0.681 and significant at the $\alpha = 0.01$ level, indicating a significant correlation between the two variables. The results of this investigation have shown the importance of the area to Irrawaddy dolphins as a major feeding and nursing ground and recommends proper management of solid wastes, fisheries and boat traffic.

Keywords: Irrawaddy dolphins, Site Fidelity, Habitat Use, Conservation and Management, Bago-Pulupandan

BS - 03

DISTRIBUTION OF MOSS FLORA IN MONTANE FOREST OF MT. APO NATURAL PARK

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Mosses are the most conspicuous element of the bryoflora layer of the montane forest and play significant role as bioindicators of environmental change and nutrient cycling of the forest. Species richness of moss flora were examined through floristic survey. Plot sampling in a 20 x 20 meter quadrat and transect walk was employed. Distribution patterns of diversity, habitat preferences and bryophyte cover were likewise documented. Species identification were based on taxonomic characters.

Floristic survey revealed that the moss flora in the montane forests are characterized into different taxa having a total of 74 species, 35 genera and 19 families. Leucobryaceae and Sematophyllaceae predominated in the upper montane forest in terms of the number of species and Meteoriaceae and Sematophyllaceae family in the lower montane. Further examinations show 17 possibly new species distributed into representative genera such as *Leucobryum*, *Macromitrium*, *Braunfelsia*, *Trismegistia*, *Polytrichum*, *Acroporium*, *Pogonatum*, *Calymperes* and *Fissidens*. The moss habitat preferences were confined in their order of abundance at decayed logs, tree trunks, hanging twigs, litters, soil and fallen branch. Moss cover ranges 80-85% at the montane forest.

In general, the moss floral species exhibited different species diversity at different elevations. The current data is an important considerations in monitoring bryophyte species diversity, and conservation initiatives be established as to its management and protection measures.

Keywords: Species richness, diversity, bryoflora, bioindicator

BS - 04

DIVERSITY OF BUTTERFLIES IN MT. MALAMBO 2, DATU SALUMAY, MARILOG DISTRICT, DAVAO CITY

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Diversity assessment of butterflies was conducted to provide data on the species composition and species level diversity of butterflies across vegetation types in Mt. Malambo 2, Davao City. The study employed opportunistic, visual collection and transect line methods. A total of thirty two (32) species of butterflies were collected in Mt. Malambo 2, Davao City belonging to twenty six (26) genera and five (5) families of butterflies. The study revealed that butterfly richness was high in montane forest with (27) species of butterflies, followed by the agroecosystem (12) species and the lowest is the mossy forest with (3) species. *Ypthima stelleri stelleri* was the most abundant species in agroecosystem and montane forest and *Mycalesis felderi felderi* in the mossy. Shannon Wiener index showed higher level of diversity in Montane forest ($H' = 1.297$), lower in Agroecosystem ($H' = 0.885$) and the Mossy forest ($H' = 0.458$). Cluster analysis on similarity of species composition revealed 2 major clusters of habitats. Mossy forest was the most ecologically different habitat with a $Si = 8.82\%$ and agroecosystem combined with montane forest with a $Si = 50.47\%$. Mt. Malambo 2 has a low diversity of butterflies based on the Kruger scale this is probably due to human disturbances. The data implies a need for local formulation of conservation strategies.

Keywords: Diversity, Status, Butterflies, Conservation, Mt Malambo 2, Philippines

BS - 05

**RAPID BIODIVERSITY ASSESSMENT OF BASAW LAKE
PENABLANCA, CAGAYAN, NORTHERN PHILIPPINES:
BASIS FOR SUSTAINABLE ECO-TOURISM
DEVELOPMENT**

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Basaw Lake, with geographic location of 17° 36' 12.2" to 09.9" latitude and 121° 49' 21.1" to 50° 37.9" longitude, with lake surface area of 15.6 ha, is being eyed as the next eco-tourism site of Penablanca, Cagayan. This study was undertaken to assess the biological status of Basaw Lake. Rapid biodiversity assessment using transects, maps, and quadrat methods were used.

Findings revealed a total of 21 faunal species – fish (6), shellfish (8), shrimp (1), crab (1), turtle (1) and birds (4) on site. Collected mollusks were classified into families Planorbidae, Ampullariidae, Cyclophoridae, and Thiaridae. Fishes were classified into families Anabantidae, Cichlidae, Clariidae, Gobiidae and Opichthyidae. Families of collected crustaceans were Palaemonidae and Potamidae while birds were Anatidae, Meropidae, Apodidae, and Accipitridae. There were also a total of 15 floral species-trees (13), palm (1), and aquatic plant (1). Trees were classified into families Dipterocarpaceae, Ebenaceae, Rubiaceae, Myrsinaceae, Euphorbiaceae, Clusiaceae, and Araliaceae; Palm under Malvaceae and aquatic plant under Nelumbonaceae.

Zooplankton findings showed 17 species belonging to 15 genera, 11 families and 5 orders. Order includes Phyllopoda (4), Calanoida (3), Cyclopoida (4), Monogononta (4), and Bdelloidea (2), respectively. Intensive survey should be continuously conducted to document all the species present including endemics within the area as basis for sustainable eco-tourism development. Conservation of the lake including all habitat types to protect many valuable populations particularly the edible species should be given priority.

Keywords: Basaw lake, rapid biological assessment, sustainable eco tourism

BS - 06

SPECIES RICHNESS OF ANURANS IN MT. APO, MAKALANGIT, NEW ISRAEL, NORTH COTABATO

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Species of amphibians which mostly comprise of the anurans are highly specialised in terms of habitat and the climatic conditions they need for survival. These characteristics make them good bio-indicators since they are susceptible to environmental disturbances. Together with the habitat degradation and the general lack of data on the ecology, distribution and population trends makes conservation strategies difficult to plan which therefore calls for an intensive overview of these important species as a first step in addressing this biodiversity concern. Inventory of anurans in the montane forest of Mt. Apo, Makalangit, New Israel, North Cotabato has been conducted. Two stations were established, the first station is a riparian ecosystem located at N 060 56.853 and E 1250 14.360 with an elevation 1879 masl. and the second station is a terrestrial ecosystem situated at N 060 56.992 and E 1250 13.971 with an elevation of 1992 masl. A total of 6 species of frogs classified under 3 genera and 3 families were recorded. Two species (*Megophrys stejnegeri* and *Philautus acutirostris*) were assessed as endemic but are also noted to be vulnerable. The primary threat to the anurans is habitat loss in which anurans are closely associated with the tropical ecosystem since they are dependent to the canopy and microhabitat provided by the tropical rainforest. However, tropical forests has now become susceptible to degradation due to unmanaged exploitation of these reserves caused by anthropogenic activities which puts a need to conserve and protect the forest to prevent the loss of the important anuran species'.

Keywords: amphibians, endemic, vulnerable, disturbance

BS - 07

DIVERSITY OF ANURANS IN KAHIWAON STREAM AND BAGIK-IKAN RIVER IN MT. KALATUNGAN, BARANGAY PORTULIN, PANGANTUCAN, BUKIDNON

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Anurans are very sensitive to environmental changes, for this reason they are considered to be important bio-indicators, meaning that the status of their populations can be used to monitor the health of the surrounding ecosystem. At present, the status of Mt. Kalatungan in the mountain range is considered partly disturb due to deforestation and habitat loss of both flora and fauna. Consequently, efforts to collect baseline data about occurrence, distribution and status of population of anurans are needed. Inventory were done in two stations. Station 1 (Kahiwaon stream) is located at N 07. 90479 ° E 124. 86174 ° with elevation 1283 masl and station 2 (Bagik-ikan River) located at N 07. 90361 ° E 124.86691° with elevation 1234 masl. A 350 meters belt transect walk was done in each study station. A total of one hundred seventy three (173) individuals representing twelve (12) species in six (6) families of anurans were recorded in the two study stations. The most abundant species is *Ansonia mcgregori* with relative abundance (26.59%). There were three species listed in the list of vulnerable to extinction in the wild category: these are *Ansonia mcgregori*, *Ansonia Muelleri* and *Rhacophorus bimaculatus*; and one near threatened species, *Limnonectes magnus*. A higher abundance and diversity of anurans was observed in kahiwaon stream with H' value 0.754. This inventory of anurans in Mt. Kalatungan documented five (5) endemic species.

Keywords: bio-indicator, status, endemic species

BS - 08

**SPECIES COMPOSITION OF HARVESTMAN
(ARACHNIDA-OPILIONES) IN AGROECOSYSTEM
AND FOREST PATCH OF ACMONAN,
TUPI, SOUTH COTABATO**

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Harvestman belongs to order Opiliones under class Arachnida. The group is consist of long legged arachnids which play an essential role in the process of nutrient cycling as biomass convertors and habitat quality indicator Yet, they are poorly known especially in the Philippines. Thus, the study was conducted to document species of harvestman in agroecosystem and forest patch of Acmonan, Tupi, South Cotabato using transect walk sampling technique and sifting leaf litters. Result of the study reveals 9 species of harvestman belonging to 2 suborders – Euphnoi and Laniatores, and 7 families: Metopilio, Phalangidae, Oligophinae, Gagrellinae, Leiobuninae, Zalmoxidae, and Epinidanidae. Suborder Euphnoi dominates with 7 species collected and identified. Furthermore, the data shows that only family Gagrellinae found both in agroecosystem and forest patch of the sampling area. The rest of the members of the families are disconcordant species. They were specific in the forest patch. The data implies that remaining forest patch in the said area must be conserved.

Keywords: Harvestman, Arachnida, Acmonan, Philippines

BS - 09

SPECIES COMPOSITION AND STATUS OF BUTTERFLIES IN THE AGROECOSYSTEM AND FOREST PATCH OF ACMONAN, TUPI, SOUTH COTABATO

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Butterflies are good indicators of the health status of certain ecosystem because of their sensitivity to environmental alterations. Despite the fact, few studies had been conducted on this important taxon especially in the province of South Cotabato. Thus, an inventory of species composition and status of butterflies was conducted in agroecosystem and forest patch in Acmonan, Tupi, South Cotabato using transect walk sampling technique. Result of the study reveals 34 species belonging to 5 families. Nymphalidae dominates with 16 species, followed by Lycaenidae with 7 species then Papilionidae and Peiridae with 5 and 4 species, respectively. Hesperidae is least represented with only 2 species identified. The study further reveals 4 endemic: *Celarchus archagathos archagathos*, *Ragadia melindena melindena*, *Ypthima s. stellera*, and *Ypthima sensilis* (Mindanao endemic); 3 rare: *Euripus nychtelius nysia*, *Symbrenthia hypatia matuti* and *Ypthima sensilis*, and 5 uncommon species. One species is new record in Mindanao- *Euripus nychtelius nysia* and one site endemic - *Symbrenthia hypatia matuti*. Result implies that these habitats are home for butterflies and must be conserved to balance with livelihood development in the community.

Keywords: butterflies, Acmonan, Tupi, agroecosystem, forest patch

BS - 10

**SPATIAL DISTRIBUTION OF GYMNOSPERMS IN
MT. SINAKA, NORTH COTABATO**

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This study was conducted to provide a list of gymnosperms present; construct a distribution map; and assess local and conservation status of each gymnosperm species. Transect walk from the base to the peak on both trails located in two barangays was done. Gymnosperms were collected, identified, assessed and geotagged to generate distribution maps along elevation gradient and vegetation types. A total of 77 individuals under 7 species belonging to 5 genera and 2 families were observed including *Agathis philippinensis*, *Dacrycarpus cumingii*, *Dacrydium elatum*, *Phyllocladus hypophyllus*, *Podocarpus costalis*, *Podocarpus neriifolius* and *Podocarpus rumphii*. The seven species were found distributed at different elevations (1102-1488 masl) showing increasing altitude trend in the pattern of species abundance and elevation but showed a clear drop after 1301 masl. All species observed were assessed locally rare and one species was recorded as endangered, one vulnerable, one near threatened and the rest were classified as least Concern. It can be concluded that the species richness of gymnosperms in Mt. Sinaka is low, and that it needs to be conserved and monitored closely to help prevent decreases in its population. Further studies is recommended.

Keywords: gymnosperms, mt. sinaka, spatial distribution, species richness, status

BS - 11

LOCATION AND ASSESSMENT OF PLUS TREES OF SOME DIPTEROCARP AND PREMIUM INDIGENOUS TREE SPECIES IN ILOCOS NORTE, PHILIPPINES

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Populations of indigenous tree species in the country are threatened by deforestation and climate change. One of the mechanisms for the conservation of the germplasms of these species is the collection and preservation of planting materials from superior mother trees. Thus, a study was conducted to: document the location of plus trees of dipterocarps and premium indigenous tree species; characterize and assess the phenotypic quality of the plus trees; and develop data base and maps on the distribution of the plus trees in Ilocos Norte.

Potential plus trees were assessed using the protocol for hardwood species. Candidate trees were characterized and rated based on stem growth, bole form, health and branching characteristics.

A total of 237 plus trees belonging to 13 species were identified, seven Dipterocarps and six premium species. These were located in six municipalities, namely: Batac, Dingras, Pagudpud, Pasuquin, Piddig and Nueva Era. Pagudpud had the most diverse species of plus trees, with seven species, closely followed by Nueva Era with five species. Plus trees of dao and all the dipterocarp species were located in second growth natural forests, while ipil, molave, narra and supa were found in plantations.

Top five species in terms of number of selected plus trees are narra, palosapis, tanguile, white lauan and yakal. These were marked and geo-tagged. Location maps of the marked trees were developed for each species using GIS.

The results imply that good quality plus trees of dipterocarp and premium species are still growing in the province. These trees can be used in future germplasm collection and conservation activities as well as tree improvement initiatives.

Keywords: plus trees, Dipterocarps, premium species, phenotypic quality, indigenous tree species

BS - 12

**SPECIES RICHNESS, ASSESSMENT AND DISTRIBUTION
OF ODONATA ACROSS VEGETATION TYPES IN
MT. SINKA, NORTH COTABATO**

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This study generally aimed to determine the species richness, assess the local and conservation status and record the distribution of Odonata species across vegetation types in Mt. Sinaka, North Cotabato. Field work was conducted on Agro-ecosystem, Dipterocarp forest and Montane forest using opportunistic sampling and visual searching techniques. Insect sweep nets were used for the collection of the species. Twenty six species were recorded under 17 genera and 7 families. Among these species, 14 are Zygopterans and 12 are Anisopterans. Species richness was highest in agro-ecosystem (S=21) and lowest in montane forest (S=3). Species abundance was highest in agro-ecosystem with 126 individuals followed by dipterocarp and montane forest, both with 4 individuals. Species richness and species abundance were considerably high in areas with open canopy and water bodies. The presence of oriental species suggests that the area is disturbed. Local and conservation status of Odonata recorded eleven species were endemic (4 Philippine endemic and 7 Mindanao endemic) in which 9 are Zygopterans and 2 are Anisopterans. The presence of endemic species suggests that Mt. Sinaka is of conservation importance. Most of the observed species were found in specific vegetation and only *Teinobasis annamaijiae* and *Risicnemis tendipes* are shared by agro-ecosystem and dipterocarp, and dipterocarp and montane forests respectively.

Keywords: odonata, species richness, conservation status, distribution, Mt. Sinaka

BS - 13

**SURFACE ZOOPLANKTON COMMUNITY
COMPOSITION IN WHALE SHARK (*Rhincodon typus*)
FEEDING GROUNDS OFF SOGOD BAY, SOUTHERN
LEYTE DURING AUGUST 2013 TO MARCH 2014**

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Sampling stations in the study site off Sogod Bay, Southern Leyte was established along the feeding grounds of whale shark (*Rhincodon typus*). The whale shark season in the area is known to last from November to July. Water samples and physico-chemical parameters from three sampling stations were taken and collected once a month in August and October in year 2013 within the off whale shark season period, and March 2014 within the whale shark season. Abundance, composition, and diversity of zooplankton groups encountered were quantified. Copepods dominated by 66% (Order Calanoida 26%, copepod nauplius 16%, Order Cyclopoida 14% and Order Harpacticoida 10%) of the total zooplankton population. Samples obtained during the whale shark season, March 2014, showed the highest total zooplankton abundance at 7.7x10³ind./L. This month also yielded the highest zooplankton community diversity of H'=2.53. October 2013 had the least total density of 1.9x10³ind./L; while August 2014 samples had the least zooplankton diversity of H'=1.58.

Keywords: zooplankton, whale shark, *Rhincodon typus*, Sogod Bay

BS - 14

**DISTRIBUTION OF BATS ACROSS VARIOUS
HABITAT TYPES IN THE SMALL-SCALE
GOLD MINING SITE OF MASABONG, ROSARIO,
AGUSAN DEL SUR, PHILIPPINES**

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Caraga is one of the richest regions in Mindanao in terms of mineral deposits where mining operations proliferate. Although mining is known to be economically rewarding, it is also thought to be destructive to biodiversity in the region where wildlife studies are scarce. This research employed mist netting to determine the richness, diversity, trophic guilds, conservation status and geospatial distribution of bats across different habitat types (cultivated, mixed cultivated and forested and early secondary forest) within the small-scale gold mine site in Masabong, Rosario, Agusan del Sur. Ten Megachiropteran bat species were found in the area with a diversity of $H' = 1.55$. Early secondary forest had the highest richness (9) and diversity (1.79). Bat community structure was represented by 70% frugivores and 30% nectarivores. The low relative abundance of the vulnerable *Megaerops wetmorei* (0.02) and the near-threatened *Eonycteris robusta* (0.19) and the presence of six endemic species *Eonycteris robusta*, *Eonycteris spelea*, *Haplonycteris fischeri*, *Harpyionecterus whiteheadi*, *Ptenochirus jagori* and *Ptenochirus minor* implied conservation value of the area. The results suggest that such small-scale gold mine area needs conservation attention to mitigate further destruction of potential habitats for bats especially for the endemics and threatened species caused by mining, logging, land-use change and bat hunting. A thorough ecological study on bats and habitat relationships will yield more information and insights about the possible effects of mining on bat community dynamics and thus a scientific basis for the formulation of ordinances and policies that would mitigate the adverse impacts of mining on bat fauna.

Keywords: bats, small-scale, mining, diversity, distribution

BS - 15

CORRELATING MANGROVE DIVERSITY AND SOIL CHARACTERISTICS IN SARANGANI BAY, PHILIPPINES

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Mangrove diversity and soil characteristics were correlated to give an insight on the spatial characteristics of mangroves in the sampling areas. Species diversity was computed and the data on abundance was square root transformed for biological data analysis. The soil characteristics were determined using granulometric method. Univariate and multivariate analyses were employed to correlate the biotic and abiotic relationships. A total of 64 quadrats were established using a purposive sampling method. There were 20 species of true mangroves were observed belonging to 12 different families. Species richness, abundance and Shannon diversity was highest in Alabel sampling site ($P < 0.001$). Dominance and evenness was highest in Glan with no significant difference in Maasim sampling site. Medium sand comprised 30.69% of soil in Maasim, gravel (29.19%) in Alabel and silt/clay in Glan (24.88%). *Rhizophora mucronata* and *Sonneratia alba* were dominant in medium sand soil in Maasim, *Rhizophora apiculata* and *Aegiceras floridum* in the gravel soil of Alabel, and *Rhizophora apiculata* and *Sonneratia alba* also in the silt/clay soil in Glan sampling site. Using Pearson correlation, Shannon diversity was positively correlated to very coarse sand ($P > 0.01$); gravel in Alabel ($P < 0.05$); and fine sand in Glan ($P > 0.01$). Cluster analysis showed distinct cluster of data true to the sampling sites. This observation was also supported with non-metric multidimensional scaling (nMDS). Analysis of similarities revealed that sampling sites were moderately similar ($R = 0.5547$). The study provided an insight of mangrove and soil relationships which is important in conservation and rehabilitation efforts in the area.

Keywords: mangrove diversity, Pearson correlation, multivariate analysis, cluster analysis, Sarangani Bay

BS - 16

SPECIES RICHNESS OF BIRDS IN A LOWLAND SECONDARY FOREST IN MUSUAN ENVIRON

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Avian fauna is one of the largest components of biodiversity of the tropical forests in the Philippines. However, due to the habitat loss brought by human impacts; the country ranks second in the number of threatened endemic birds in the world hence most of this threatened birds are found in Mindanao. The declining species of avifauna has become a worldwide concern in our biodiversity thus denotes the need to determine the species of birds as a first step in addressing this biodiversity issue. Inventory of birds in the secondary forest of Sawmill, Central Mindanao University, Musuan, Bukidnon has been conducted. Three stations were established within the site with a total of 147 net-days. A total of 9 species classified under 7 families and 9 genera were noted. Three species were assessed as endemic (*Phapitreron leucotis*, *Hypsipetes philippinus* and *Pycnonotus uristictus*). Based on the result most of recorded species were insectivorous and frugivorous which are susceptible due to the loss and alteration of habitat. Habitat disturbance would directly and indirectly affects the birds with regards to their food requirement since these would also change the composition of the plant and invertebrate resources that they consume. The food preferences and also the availability of food determines the species composition of birds thriving in an area which therefore calls for the conservation and protection of the forest to avoid the loss of birds species which are subjective and dependent to their environment.

Keywords: endemic, frugivorous, insectivorous, disturbance

BS - 17

PHILIPPINE WILD GINGERS (ZINGIBERACEAE): REDESCRIPTION FROM FOREST PATCHES OF BISLIG, SURIGAO DEL SUR

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Studies regarding the Zingiberaceae (wild gingers) of the Philippines are wanting. A taxonomic revision of the family is needed to understand its various aspects especially that the family is an important natural resource that provides products for food, spices, dyes and aesthetics to man. Botanical fieldworks were conducted at Bislig forest, Surigao del Sur by following forest trails. Wild gingers seen were documented. The study revealed the presence of 8 species of Zingiberaceae namely: *Alpinia flabellata* (Ridl.) *Alpinia* sp., *Etlingera philippinensis* (Ridl.) R. M. Sm., *Geocharis fusiformis* (Ridl.) R.M. Sm., *Globba leucantha* Miq., *Plagiostachys* sp.1, *Plagiostachys* sp.2 and *Zingiber* sp. These species belong to 2 subfamilies (Alpinoideae and Zingiberoideae), 3 tribes (Alpinieae, Globbeae and Zingibereae) and 6 genera. Floral morphology varied among the different species hence was useful in the construction of taxonomic key specifically inflorescence position and shape of floral bracts. Cluster analysis of the 8 species using Bray-Curtis analysis revealed 4 groups, the *Zingiber* group, *Plagiostachys* group, *Alpinia* group, and the *Globba-Etlingera-Geocharis* group. The generated dendrogram support the generic separation of the said species. Further *Globba leucantha* is a new record to the Philippines.

Keywords: *Geocharis fusiformis*, *Etlingera*, *Alpinia*, attenuate, sinuate, floral bracts

BS - 18

**PHILIPPINE WOOD-ROTTING BASIDIOMYCETES,
Lentinus tigrinus AND *Lentinus sajor-caju*, IN SUBMERGED
CULTURE EXHIBIT ANTIOXIDANT PROPERTIES**

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Functional foods are enriched or modified foods which are consumed as normal diet to provide healthful benefits. In addition to their medicinal importance, mushrooms have also been reported to exhibit antioxidant properties. With the increasing demand of functional foods with antioxidant properties, it is necessary to establish new sources such as wild edible mushrooms which could provide beneficial effects to human health. Herein, we conducted this study to elucidate the free radical scavenging activity and total phenolics of *Lentinus tigrinus* and *Lentinus sajor-caju* submerged culture using different indigenous culture media. Results revealed that *L. tigrinus* efficiently grew on rice bran decoction which significantly had the highest yield of mycelia (11.53 g), volume loss of the medium (24.33 ml), radical scavenging activity (18.94%) and total phenolics (26.59 mg AAE/g sample). Similarly, rice bran decoction significantly recorded the highest yield of mycelia (9.75 g), volume loss of the medium (20.95 ml), scavenging activity (16.94%) and total phenolics (25.60 mg AAE/g sample) for *L. sajor-caju*. Both species also showed considerable antioxidant properties when cultured in coconut water, corn grit decoction and potato broth. Hence, it is noteworthy that both studied *Lentinus* species hold promising antioxidants which are influenced by different culture media.

Keywords: *Lentinus*, antioxidants, functional foods, phenolics, mycelia

BS - 19

LABORATORY CULTURE OF *Mongolodipatomus birulai* (RYLOV, 1923) AND *Arctodiaptomus dorsalis* (MARSH, 1907) (CALANOIDA: DIAPATOMIDAE)

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The past decade has seen a renewed interest on zooplankton studies, mostly dealing with the discovery of new species, systematics, distribution, limnology, ecology and aquaculture. Unfortunately, very little research on the life cycle and development of these animals has been done in the Philippines. This study focused on the determination of laboratory culture conditions for *Mongolodipatomus birulai* and *Arctodiaptomus dorsalis*, concentrating on the effects of temperature and food concentration, and observing the different life stages of each species. Results show that both species are able to thrive in a temperature range of 24 – 30°C on a diet of *Chlamydomonas reinhardtii*. This research is the first attempt to culture calanoid copepods in the country and will be useful in observing the life history of both species. The methods used can be further refined and used to establish standard protocol for the establishment of laboratory cultures in the future.

Keywords: copepod, rearing, nauplii, temperature, *Chlamydomonas*

BS - 20

**AVIFAUNA IN OIL PALM PLANTATION AND ADVANCED
SECONDARY DIPTEROCARP FOREST OF
MT. MAGDIWATA, SAN FRANCISCO, AGUSAN DEL SUR**

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Assessment of birds was conducted on Mt. Magdiwata, San Francisco, Agusan del Sur from October to November, 2011 using fixed radius point count method. The study compared the habitat characteristics, bird species richness, abundance and diversity of birds in oil palm plantation and the advanced secondary dipterocarp forest on Mt. Magdiwata. Habitat assessment results showed that there was significantly higher percentage cover of understory plants and epiphytes in the advanced secondary forest while there was significantly higher percentage cover of fruiting trees in oil palm plantation. There was a total of 76 bird species detected in the two sites, of which 32 were Philippine-endemics. There were 55 bird species in the oil palm plantation, of which 21 of them were Philippine endemics, one was Mindanao-endemic and one was threatened while there were 63 species in the advanced secondary dipterocarp forest of which, 28 species were Philippine-endemics, one was Mindanao endemics and four were threatened. There was significantly higher species richness, abundance and diversity of birds including the non-endemics in oil palm plantation. However, there was significantly higher richness and diversity of endemic birds in advanced secondary dipterocarp forest. The study suggests that conversion of advanced secondary dipterocarp forests to oil palm plantation may result to habitat loss of some forest endemic birds and the existing threatened endemics on Mt. Magdiwata. Proper land use management and regulation of oil palm plantation expansion must be prioritized as part of long-term forest management plan.

Keywords: oil palm plantation, Philippine-endemics, Mindanao-endemics,

BS - 21

BIOGEOGRAPHIC DISTRIBUTION OF STREBLIDAE IN THE PHILIPPINES (DIPTERA: BRACHYCERA: CALYPTRATAE)

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Streblids are obligate, highly specialized haematophagous hippoboscoids that are ectoparasitic on bats. This bat flies are largely confined in the subtropical and tropical but no taxa occurs in both biogeographic realm. Distributional evidence suggests that the distribution of these taxa is same as their host species and affinity of Philippine streblids is predominantly Malaysian. In the Philippines, there are 13 recognized species of streblids belonging to two subfamilies (Ascodipterinae and Brachytarsinae) representing five genera (*Ascodipteron*, *Brachytarsina*, *Maabella*, *Megastrebla*, and *Raymondia*). Of the known Philippine streblids, half of them are confined in the country. This exemplifies that the bat fly fauna especially streblids have high proportion of endemic forms (50% endemism). Among the ecoregions in the Philippines, Greater Luzon (10 species) and Greater Mindanao (7 species) harbour the highest diversity in terms of streblid fauna. Among the five genera, only one genera contains endemic species, the rest has its distribution throughout the Sundaic subregion extending to the Papuan subregion of the Australasian zoological realm.

Keywords: bat flies, Streblidae, biogeography, distribution, Philippines

BS - 22

DIVERSITY AND STATUS OF BUTTERFLIES AT THE UNIVERSITY OF SOUTHERN MINDANAO (USM), KABACAN, COTABATO

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Butterflies play an important role in our ecosystems. Their presence and diversity indicates the quality of the environment. Yet, their conservation in the lowlands are scanty. This paper provides information on the species-level diversity and status of butterflies in the two habitats within USM Campus viz., USM housing and Agro-ecosystem of Kabacan, Cotabato using time constraint and opportunistic sampling techniques with four hours sampling (8-12) exposure within one-month in 2014. Result of the study recorded 20 species of butterflies during the sampling period with 28 individuals from housing and 35 from agroecosystem. The USM Housing had 14 species and agroecosystem had 13 species with higher mean number of individuals. Diversity level using Shannon index (H') showed higher level of butterfly diversity (1.05) in the USM housing compared to agroecosystem (0.97). *Euchrysops cnejus* dominates with 9 individuals collected followed by *Junonia hedonia ida* with 6 individuals. Meanwhile, *Halpe luteisquama*, *Pelopidas mathias mathias*, *Zizula hylax pygmaea*, *Catopsila pyranthe pyranthe*, *Junonia almana almana*, *Melanitis leda leda*, and *Menelaides polytes ledebouria* with 1 individual each collected. Result also reveals 2 Philippine endemic, 1 rare and 17 common species. Similarity of species composition showed low $Si=29\%$ indicates that there is still the need to conserve the butterflies in the lowlands specially that 69% are disconcordant species. The results further suggest that each habitat are important for the existence of butterflies.

Keywords: butterfly, lowland, Cotabato, Mindanao, Philippines

BS - 23

EFFECTS OF SILTATION ON CORAL REEFS NEAR KEY MINING AREAS IN SURIGAO DEL NORTE, PHILIPPINES

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The effects of siltation on coral reef cover and reef fish communities near the key mining areas in Claver, Surigao del Norte was investigated during dry and wet season, in 2013. A total of five sampling stations were established in the coral reef areas in Claver and Gigagit municipalities. The benthic cover of the life form attributes including silt cover were measured using line intercept technique. Reef fish richness, abundance and biomass were determined using fish visual census. Sediment traps were used to measure sedimentation rate. The coral condition index in Taganito Reef and Karaang Banwa stations decreased from fair during dry season to low during wet season. Silt percentage cover and fall out of sediments were highest in Taganito Reef and Malingin Island stations. These two silted stations were closest from Taganito River mouth, probably the biggest contributor of silts discharged to the marine environment in Claver. Taganito Reef was severely affected by siltation than other monitored stations. Sedimentation rate in all stations ranged from 327 - 462 g/m²/day could be classified as severe catastrophe for some coral communities based on the review paper of Erftemeijer et al. Cabgan Island station, the farthest station from the Taganito River mouth was still receiving silts ranges from 329 – 397 g/m²/day. This indicates that a coral reef in the eastern part of Cabgan Island has already been affected by silts probably attributed by large scale mining activities. Fish biomass index and fish density index of high and medium imply that Cabgan Island may still be productive. The presence of refugia or Marine Protected Area in the western part of Cabgan Island may contribute for the high fish density index in the eastern part of Cabgan Island.

Keywords: siltation, coral cover, fish biomass, sedimentation rate

BS - 24

**FISH KILL INVESTIGATION THROUGH WATER
QUALITY ASSESSMENT IN LAKE BUHI,
CAMARINES SUR, PHILIPPINES**

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The Food and Agriculture Organization (FAO) of the United Nations defined aquaculture as the farming of aquatic organisms, indicating that some sort of intrusion to the rearing process and aquatic environment is done to enhance production. The intensity of fish farming production causes the water quality to deteriorate since there is a significant increase in organic deposition brought about by uneaten fish feed and faecal discharge from fish. An extreme consequence of this deterioration in water quality is the phenomenon of fish kills. Fish kills occurring to cultured fish represent potentially huge economic losses and indicate a severe environmental problem where they occur. An important lake where a disturbing trend of fish kills have occurred is Lake Buhi in Camarines Sur. Determining whether it is the unsustainable aquaculture practices of the fish cage operators in Lake Buhi causing the massive fish kills is the most pressing question that stakeholders have nowadays. The investigation necessitated an analysis of eleven water quality parameters: depth, light penetration, pH, conductivity, turbidity, dissolved oxygen, temperature, total suspended solids, phosphates, nitrates, and sulphates. Eight sampling stations were chosen based on their associated land and water uses and sampling was undertaken on September and November 2013 and April and August 2014. The water quality analysis was combined with fish cage distribution mapping using Integrated Land and Water Information Systems (ILWIS) and a 100 respondent survey on aquaculture practices. Descriptive statistics showed the overall water quality of Lake Buhi unable to meet standards set by DAO 34 for its official classification: Class B. Assuming normality, two way anova showed that most parameters were significant among the eight stations and four sampling periods with a p value of 0.000 for most parameters. Fish cage distribution revealed unrestrained proliferation of fish cages in that quadrant of the lake. This investigation revealed that fish kills were strongly induced by a deteriorated water quality brought about by intensive aquaculture. This data helps the local government of Buhi in developing a community based action plan to fix the fish kill problem and save Lake Buhi.

Keywords: aquaculture; fish kill; Lake Buhi; water quality

BS - 25

LAKE PULANGUI: ASSESSMENT ON FISHERY AND ITS PRODUCTIVITY

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This study was conducted to update the current status of fisheries and fish production in Lake Pulangui in Bukidnon. Ten percent (40) of the total fishermen (respondents) in different age brackets were interviewed; and supplementary questionnaires were given as well to obtain information on lakes status and production. Results revealed that there was a gradual decreased in the total number of fishermen (326) in this study as compared to the retrieved data from the years 2011 (379) and 2005 (390). Gill-nets, cast-nets, and fish-pots are the commonly used fishing gears. However, 6 illegal fishing gears (gill-net #7, mosquito net, electric fishing, chemical poisoning, drag-net, and *tikbong*) were occasionally reported in the area. Twelve faunal species composed of 8 fishes, 2 gastropods, 1 bivalve, and 1 crustacean were recorded in the lake. On the other hand, the average CPUE (Catch Per Unit Effort) is 6 kilograms which means that the lake has a fish production of 713 tons in a year. The CPUE is 42% lesser as compared to the year 2011; this is attributed to the high rate of sedimentation in the lake, which makes the area fragmented and less productive. Among the species, two fish species (*Oreochromis niloticus* and *Cyprinus carpio*) and 1 crustacean (*Macrobrachium rosenbergii*) were the commonly harvested and sold in different price brackets (P 25-60/kilo for *O. niloticus* and P 35-60/kilo for *C. carpio*). The average kilogram of fish sold per day/person is 3 kilograms with a price of P35/kilo, thus, revealing total annual revenue of P 12,493,950.00. The results indicate that there is indeed a decreased in the fish production due to the alteration of lake's physical property.

Keywords: Fish Production, CPUE, Fishing Gears, *Oreochromis niloticus*, *Cyprinus carpio*

BS - 26

**PHILIPPINE SCALY TREE FERNS: DIVERSITY
AND CONSERVATION STATUS**

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The Scaly Tree Ferns belong to the family Cyatheaceae. The islands of New Guinea and Borneo (Indonesia, Malaysia), and the Philippines are part of the Malesian region and considered as the main center of diversity of scaly tree ferns with 250 species. This research was conducted to determine the species richness, distribution and conservation status of the species of Cyatheaceae. Field surveys from different places in the Philippines and herbarium examinations were conducted. A total of 40 species are known which belong to three genera: *Alsophila*, *Gymnosphaera* and *Sphaeropteris*. Twenty species of *Alsophila*, 17 species of *Sphaeropteris* and 3 species of *Gymnosphaera*. As to the species richness, Mindanao and Luzon Islands had the highest species richness with 20 species each and the least in the Visayas Islands with 8 species. Majority of the species were found in mountain ecosystems with high altitude and high relative humidity. *S. elmeri*, *S. glauca* and *S. lepifera* were the common species found in the major island in the archipelago. New distribution records of *S. robinsonii* and *S. negrosiana* in Mindanao were first documented in the study. Assessment of the species revealed 23 Philippine endemics and of these, 15 species are site endemics. Furthermore, 30 species are considered nationally threatened, with 5 species critically endangered, 13 endangered and 12 vulnerable.

Keywords: Cyatheaceae, species richness, distribution, threatened

BS - 27

RAPID HABITAT ASSESSMENT OF FLOOD PRONE AREAS OF SELECTED CRITICAL RIVERS IN MINDANAO, PHILIPPINES

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Ten selected critical rivers in Mindanao were rapidly assessed to determine the current status and degree of impairment as basis in recommending intervention and rehabilitation plans. In-situ measurement of water quality parameters, interview questionnaires and secondary data, geo-statistical analysis, and some geomorphic characterization were employed in the study.

Tago River in Surigao del Sur was the most deteriorated with severely scoured banks and channelized stream with high risk to population. The ranks of increasing degree of impairment of rivers follow the order: Padada <Tanda <Dipolog <Mandulog <Iponan <Cabadbaran <Surigao <Tago. Several stressors were identified to have influenced each river's integrity which includes major economic activities along the river such as unregulated physical resource extraction like mining and quarrying and intensive agricultural cultivation. Upstream areas of the watersheds and riparian zones lack vegetation which makes surrounding built up and residential areas more vulnerable to flooding. It is recommended that greenbelt establishment and environmental protection ordinances by the LGU must be implemented. Hydrologic analysis is recommended, moreover, comprehensive watershed assessment studies must be employed for holistic rehabilitation strategies and remedial activities. An institutional governing board be created for effective coordination of government policies.

Keywords: watershed, assessment, characterization

BS - 28

SPECIES COMPOSITION AND ABUNDANCE OF ZOOPLANKTON IN PULANGUI LAKE, BUKIDNON

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Pulangui Lake is a man-made lake which has a total area of 1,985 hectares and an offshoot after Pulangui River was dammed in 1985 by the National Power Corporation to generate hydroelectric power source. At the present time, Lake Pulangui's function as reservoir decline due to the erosion from cultivation of soil around the vicinity. This study aims to update the previous list of zooplankton species found in Pulangui Lake and determine their abundance and to identify water quality indicator species. The samples were taken from three stations. Station 1 is located at mouth of the river. Station 2 is located at the central part of the lake in Dologon and Station 3 located near at RR spring resort. Sampling of zooplanktons was done using conical plankton net. Two replicates in each site were collected. The samples was immediately added with 10 ml Lugols solution and then preserved in 10% formalin. A total of 46 species of zooplanktons were found in Pulangui Lake. Ten (10) species were unidentified. Station 2 had the highest density of zooplankton with 31.44×10^3 indv/L, followed by Station 1 with 0.719×10^3 indv/L, and station 3 with 0.236×10^3 indv/L. Pulangui lake was dominated by the rotifers with 63% of the total zooplankton species. The dominant species found was *Anuraeopsis navicula*, *Trichocerca myersi*, *Brachionus caudatus*, *Calanoid sp1*, *Trichocerca elongata*, and *Calanoid naupilus*. The presence of *Brachionus angularis*, *Brachionus calyciflorus*, *Brachionus caudatus*, *Brachionus demidiatus*, *Brachionus plicatilis* and two species of *Keratella* (*Keratella Tropica* and *Keratell earlinae*) indicates the existence of organic pollution. However, the presence of *Calanoid naupilus* in the three station indicates a good water quality despite the presence of organic pollution.

Keywords: rotifers, water quality indicator species

BS - 29

**SPECIES COMPOSITION OF HARVESTMAN IN THE
FOREST PATCHES IN MT. KALASUNGAY,
MALAYBALAY CITY, BUKIDNON**

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There are relatively little known about the habitat preferences of most species of harvestmen especially in the Philippines. We investigated the harvestman dwelling in the leaf litters in disturbed and undisturbed area of dipterocarp forest of Kalasungay, Malaybalay City, Bukidnon. A total of sixteen (16) individuals were collected. Eight (8) individuals were collected for family Zalmoxidae, five (5) for Epidanidae, two (2) for Podactidae and one (1) for Eupoinidae. These include adults of species from the families Epidanidae, Zalmoxidae and Podactidae. Our results indicate that the Zalmoxids were the most abundant species occur in the leaf litter. More population and species composition were found in the undisturbed forest. This may be due to the fact that harvestman rely in leaf litters for food. So that in the more disturbed habitat, few harvestman inhabits due to leaf litter movements by carabao and other live stocks that are moving that consequently move also the leaf litters making unstable habitat for harvestman. The data implies that harvestman can serve as model organism to indicate the history and the quality of the place and thus implies conservation measures.

Keywords: Harvestman, species composition, Mindanao Philippines

BS - 30

SPELEOLOGICAL AND ECOLOGICAL ASSESSMENT OF CAVE-ROOSTING BATS IN SUMALSAG CAVE SYSTEM, BUKIDNON, PHILIPPINES

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Sumalsag Cave System is considered as the longest cave in Northern Mindanao, Philippines. Exploration of the understudied cave system was done from December 2013 to October 2014. Speleological survey of speleothems and speleogens were performed to describe the geomorphology of the cave. Field sampling was conducted using a combination of mist netting and emergent survey method, and capture-mark and release technique. Baseline data on species richness, population density, conservation and ecological status of cave-roosting bats were determined and assessed. The fieldwork was conducted for a total of 15 netnights with a capture effort of 180 net/hours. Results of the study revealed 6 cave-roosting bat species belonging to 3 families and 5 genera. Two endemic species were documented viz., *Ptenochirus jagori*, a Philippine endemic species and *Ptenochirus minor*, a Mindanao endemic species. Speleological assessment showed physical damages and destruction of cave structures due to unregulated anthropogenic activities. Over-exploitation of cave resources such as guano extraction, mining, and illegal poaching for bushmeat resulted to unprecedented and significant decline in population of cave-roosting bats. With the record of threatened species *Miniopterus schreibersii*, this study classifies the Sumalsag cave system into Class II category wherein geologically and biologically sensitive sections of the cave should be provisionally closed for restoration and immediate conservation measures of threatened and endemic bat species.

Keywords: speleology, ecology, assessment, cave-roosting bats

BS - 31

**STATUS OF HARVESTMAN IN THE VICINITY OF
BUSAY SPRING RESORT, MT. MALAMBO,
DATU SALUMAY, PHILIPPINES**

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Harvestmen are the less studied group Arachnids. Their presence and diversity indicates the history and quality of the environment but their biology, ecology and taxonomy are still undocumented here in the Philippines. Studies on arthropod fauna here in Mindanao is so scanty. Thus, this paper aimed to contribute data on the species composition and status on harvestmen in the vicinity of Busay Spring, Mt. Malambo, Datu Salumay, Davao District. Three study stations were sampled: Eastern side, Western and the Southern side of Busay spring. The site is a dipterocarp forest with a little degree of disturbance due to ecotourism. A total of twelve species of harvestman were listed. These belong to 3 suborders and 5 families. Six of the species were possibly new to Science for possible classification, identification and description. They are more abundant in a less disturbed habitat. The Busay Spring of Mt. Malambo is the home of 12 rare species of harvestman that are possibly endemic to the Philippines.

Keywords: Harvestman endemic Philippines Mindanao

BS - 32

**THE CLADOCERAN AND DIATOM ASSEMBLAGES
OF SEDIMENT CORES FROM LAKES MOHICAP AND
PAOAY: THEIR UTILIZATION FOR A COMPARATIVE
PALEOLIMNOLOGICAL ANALYSIS**

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Sediments have now become a promising tool in determining ecological changes due to its very particular sensitivity to anthropogenic activities, and its ability to integrate millions of biological and geochemical. In this study, diatom and cladoceran analyses was used to investigate two lakes with different geological and limnological origins (Lakes Mohicap and Paoay) located in the island of Luzon which are known to be vulnerable to eutrophication due to existing pressures from anthropogenic activities. Our objective is to determine the change in the cladoceran and diatom assemblages in order to reconstruct the past ecological conditions of the lakes mentioned. In our results, the cladoceran assemblages for Lake Mohicap was dominated by ephippia of *Ceriodaphnia* sp. and *Bosmina* sp., while Lake Paoay was dominated by *Chydorus* sp. suggesting high frequency of environmental stressors in Lake Mohicap compared to Lake Paoay. Diatom assemblages for both lakes were dominated by *Nitzschia* sp. and *Diadesmis* sp. which are usually found in high nutrient lakes indicating eutrophication. The distribution of diatom and cladoceran taxa in the sedimentary profile reflect the high trophic condition and vulnerability of both lakes to elevated anthropogenic activities, thus lake conservation and mitigation approaches have to be implemented as ill-effects of human disturbances continue to affect and threaten our freshwater ecosystems. This also suggest the potential of Paleolimnology to be integrated in the Philippines as a tool for efficient lake restoration and management.

Keywords: Sediments, eutrophication, ephippia, *Chydoridus* sp., *Nitzschia* sp.

BS - 33

**MERCURY ANALYSIS OF MUSCLES OF SELECT
BIOINDICATOR FISHES AND SEDIMENTS IN TAMBIS
RIVER, BAROBO AND THE COASTAL AREAS OF
HINATUAN, SURIGAO DEL SUR, PHILIPPINES**

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Mercury analyses of fish muscles of select bioindicator fish species and sediments in the Tambis River System, Barobo and Hinatuan, Surigao del Sur was determined between index seasons (dry and wet) of 2014 to trace mercury content in fishes and sediments near areas practicing artisanal small scale gold mining. Three species of bioindicator fishes were used namely *Naso hexacanthus*, *Lutjanus fulviflamma* and *Anguilla marmorata*. Sediments where the fishes were caught were also analyzed for total mercury (tHg) concentration. Results revealed that *A. marmorata* had the highest concentration of tHg in muscles for the two index seasons (dry= 0.153 ± 0.018 ppm; wet= 0.227 ± 0.069 ppm) and while *N. hexacanthus* had the lowest muscle tHg concentration (dry= 0.0072 ± 0.007 ppm; wet=below detection limit). The sediment tHg analysis showed that Station 3 and 2 of Tambis River System had the highest tHg concentration for the dry season while Tambis River System Station 3 and Hinatuan River Station 1 had the highest tHg for the wet season. Data analysis revealed a significant lower tHg concentrations in both fish and sediment samples in the Tambis River System for the dry season. However, correlation analyses of tHg in fish and sediment samples between dry and wet season did not show significant relationship. Sediment samples with the highest tHg levels were mainly composed of coarse sand. Levels of tHg in both fish and sediment samples met the prescribed standard limits although these levels may pose potential risk of bioaccumulation in humans with constant consumption of Hg-contaminated fish in the areas studied.

Keywords: Responsible mining, Artisanal small scale gold mining

BS - 34

**MACROINVERTEBRATE FAUNA OF TWO FRESHWATER
BODIES IN BUTUAN CITY, AGUSAN DEL NORTE,
PHILIPPINES**

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Macroinvertebrates have been utilized to monitor water bodies to evaluate water quality and complement physical chemical surveys. The water quality of two important water systems in Butuan City—Taguibo River and Ampayon Stream was assessed in 2014 using selected physico-chemical factors (pH, Dissolved oxygen, salinity, Total dissolved solids and temperature) in combination with macroinvertebrate composition, scoring and diversity indices. Results show that a total of 27 species from 19 families of macroinvertebrates were collected. Taguibo River had higher species richness and abundance with 23 species compared to the Ampayon stream with 17 species. In Taguibo river, aquatic insects, particularly Taxa 1 and Taxa 2 species (mostly Ephemeroptera, Hemiptera and Odonata) make up 75 % of abundance followed by gastropods at 17.2%. In Ampayon stream however, aquatic insects were relatively few (61%), with notable presence of pollution indicator macroinvertebrates such as midges and leech species. Taguibo river exhibit significantly better pH, DO, TDS and Conductivity compared to Ampayon stream where signs of water quality deterioration were evident. Overall, results show that Taguibo River has higher macroinvertebrate composition and exemplify better physico-chemical characteristics, with water quality index score indicating “good” water quality compared to Ampayon stream which was assessed to be of “poor” water quality. It is highly recommended that care for the Taguibo watershed be improved and cleanliness in Ampayon stream be heightened to improve water quality and increase the diversity of macroinvertebrates.

Keywords: Water quality, watershed, freshwater pollution

BS - 35

CHARACTERIZATION OF MARINE PIGMENTED BACTERIA ISOLATED FROM THE MUCUS AND FRAGMENT OF *Acropora tenuis* D.

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The marine flora and fauna are considered as rich source of unique biological and chemical diversity with potential for various industrial applications such as food colorants, nutritional supplements, color additives, textile dyeing, pharmaceuticals, enzymes, cosmetics, fine and agrochemicals.

Ten (10) pigmented bacterial isolates from the mucus and fragment of *Acropora tenuis* D. with following varying colors: red, orange, peach, violet, brownish, black and yellow designated as Isolates 1-10 were morphologically and biochemically characterized in terms of shape, Gram staining affinity, Casein Hydrolysis Test, Starch Hydrolysis Test, Lipid Hydrolysis Test, Gelatin Hydrolysis Test and Hemolysin Test.

Most of the Isolates are cocci while the others are bacilli. All the Isolates showed negative results in the gelatin and lipid hydrolysis tests. While Isolates 4 and 7 turned positive for the protease and starch tests. Similarly, Isolates 3 and 10 are positive both in the Protease and Hemolysin tests while the other Isolates are negative to all the additional tests. The isolated pigmented bacteria from the mucus and fragment of *A. tenuis* could be explored further for their promising industrial application.

Keywords: pigmented bacteria, *Acropora tenuis* D., coral

BS - 36

**CHARACTERIZATION AND ANTAGONISTIC
POTENTIAL OF MUCUS-ASSOCIATED BACTERIA
FROM *Sarcophyton* sp.**

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Corals host verdant varieties of heterotrophic bacterial communities such as those on the coral tissue, surface mucus layer and calcium carbonate skeleton, each of which has a distinct bacterial population. These bacterial associates play cardinal role in maintaining the health of the host organism by producing unique bioactive secondary metabolites which can be utilized as source of lead compounds for industrial, biotechnological and pharmaceutical applications. Bacterial strains associated with the surface mucus of *Sarcophyton* sp. (SMAB) were morphologically and biochemically characterized and studied for antagonistic activity against three (3) bacterial pathogens namely *S. aureus*, *P. aeruginosa* and *E. coli*. Of the twelve (12) bacterial isolates, only seven (7) bacteria showed antagonistic activity against at least one of the tested bacterial pathogens. The active isolates were further subjected to agar-well diffusion method. Out of the seven isolates, two (2) SMAB were good in activity against *P. aeruginosa* with zone of inhibition (ZOI) between 9-15 mm and one against *E. coli*. Similarly, two (2) were moderately active (ZOI= 5-8mm) against the same test organisms, while three (3) SMAB were weak in activity (ZOI=1-4mm) against *S. aureus*. Results indicated that the biological activity observed in the antagonistic bacteria, offers opportunities for further chemical analyses, such as isolation of the active compounds responsible for the activity.

Keywords: antagonistic activity, bioactive compounds, *Sarcophyton* sp., corals

BS - 37

***Ex Situ* PROPAGATION AND PRELIMINARY
PHYTOCHEMICAL EXAMINATION OF
Alocasia sandariana W. BULL (FAMILY ARACEAE)**

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Alocasia sandariana has been classified as critically endangered and noted to have limited information regarding the presence of medically important phytochemicals. The corms of the plant specimens were collected and propagated in four treatments: T0 (Soil taken from the natural habitat), T1 (2 vermicast: 1 loam: 1 sand), T2 (1 vermicast: 2 loam: 1 sand) and T3 (1 vermicast: 1 loam: 2 sand). These were replicated three times and arranged in Completely Randomized Design (CRD). Data was gathered weekly and were subjected to Analysis of Variance (ANOVA). No significant differences were observed in terms of the number of shoots, leaves and spadices and in terms of leaf blade and spadix lengths, petiole circumference and plant height. Moreover, 100% survival was observed in the specimens after 10 weeks. Leaf blades and petioles of plant specimens which were removed from the corms before planting were subjected to hexane and methanolic extractions. Thin-layer chromatography was done subsequently which detected alkaloids, phenolic compounds (phenols, flavonoids and tannins), saponins and terpenoids. Test results showed the difference in phytochemical concentration and the number of spots isolated in leaf blades and petioles of hexane and methanolic extracts. In line with the results, it is concluded that *A. sandariana* can be successfully propagated ex situ and has the presence of abundant phytochemicals.

Keywords: *Alocasia sandariana*, propagation, corms, thin-layer chromatography, phytochemicals

BS - 38

**ACTICON: ACTINOBACTERIA AGAINST
Fusarium oxysporum TR4 IN CAVENDISH BANANA
PLANTED IN STO. TOMAS, DAVAO DEL NORTE**

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The Cavendish banana (*Musa cavendishii*), a cultivar of *Musa acuminata* ranked No. 1 with 22% share in Philippine food exports. A major threat to the production is *Fusarium* Wilt caused by *Fusarium oxysporum* f. sp. *cubense* (Foc) affecting the Philippine banana Industry since 2002 up to the present in Mindanao. The search for sustainable and effective control under natural condition is one of the main thrust of the banana industry. This study aims to evaluate the efficacy of the formulated ActiCon in controlling the Foc in an abandoned banana farm in Sto. Tomas, Davao Del Norte.

Results of the field experiment showed that ActiCon significantly controlled Foc in Cavendish with a mortality rate of 33% in preventive method of ActiCon application while a 56.77% mortality rate was observed in the control set-up with no ActiCon treatment. Moreover, a total of 661.7kgs and 323.8 kgs Cavendish banana was harvested for the preventive treatment and control set-up after the fourth harvest, respectively.

The HPLC profile of the components of the ActiCon, AQ30 and AQ121 was determined. The AQ30, which is 31.35% of the total crude extract eluted at room temperature (RT) is 10.52 minutes with a maximum absorption at λ 269, 344 and 659nm. The AQ121, which is 38.04% of the total crude extract eluted at RT is 18.03 min with a maximum absorption at λ 200, 300, 341, 353 and 402 nm.

Keywords: actinobacteria, biocontrol agents, cavendish banana, *Fusarium oxysporum* TR4

BS - 39

**INFLUENCE OF POTASSIUM SOLUBILIZING
BACTERIA ON GROWTH AND RADIOCESIUM
ACCUMULATION OF KOMATSUNA (*Brassica rapa* L. VAR.
PERVIRIDIS) GROWN IN CESIUM-CONTAMINATED
FUKUSHIMA SOILS**

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Potassium (K) supply exerts the greatest influence on plant radiocesium (Cs) uptake from soil solution. The presence of potassium solubilizing bacteria (KSB) increases the availability of K⁺ in the rhizosphere, thus enhancing the cationic interaction between K and Cs. In this study, five KSB isolates were obtained from soybean rhizosphere on modified Aleksandrov medium containing mica as K source. Based on biochemical and 16S rRNA gene sequence analysis, the bacteria were identified as *Bacillus megaterium* strain CCMM B583, *Pseudomonas putida* strain ATCC 17527, *P. frederiksbergensis* strain M60, *Burkholderia sabiae* strain Br3407, and *P. mandelii* JR-1. The KSB isolates were evaluated for plant growth promotion, potassium (K) uptake and radiocesium accumulation of komatsuna in three different cesium-contaminated Fukushima soils. Inoculation with KSB showed beneficial effects on plant growth and increased the overall plant biomass production (≈40%). KSB inoculation also significantly increased the radiocesium accumulation, with much greater magnitude in roots than in shoots. The results indicated that KSB inoculation may be essential in managing cesium-contaminated soils and manipulating radiocesium transfer from soils to plants.

Keywords: potassium solubilizing bacteria, 16S rRNA, radiocesium, Aleksandrov medium, cesium-contaminated soils

BS - 40

ANTIMICROBIAL PROPERTIES OF ACTINOMYCETES ISOLATED FROM BALISONG CAVE, PILAR, CAPIZ

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Philippine caves have been little studied for their potential as sources of novel microbial species and bioactive compounds. Actinomycetes from caves are of special interest because of their versatile metabolic activities and the most important property is its ability to produce various antibiotics valuable for medical, veterinary and agricultural use. There is an urgent need to find new antimicrobial agents that are effective against multidrug resistant bacteria and against new emerging infections. The objective of this study is to determine the effectivity of new actinomycete isolates from rare environments.

Actinomycetes were isolated from Balisong cave, Natividad, Pilar, Capiz and screened for their activity against Methicillin-resistant *Staphylococcus aureus* (MRSA), *Pseudomonas aeruginosa*, *Salmonella typhimurium*, *Klebsiella pneumonia*, *Candida albicans* and *Ralstonia solanacearum*. Actinomycete isolate No. 4 greatly inhibited the three test organisms, MRSA (25.95mm), *E. coli* (11.65mm) and *R. solanacearum* (22.35mm) by agar plug method. However, *S. typhimurium* (13.6mm) was inhibited by isolate No. 2 while *K. pneumonia* (15.1mm) was inhibited by isolate No. 6. *P. aeruginosa* was not inhibited by all the actinomycete isolates while Actinomycete isolate No. 1 inhibited *C. albicans* by 15.25mm.

Bioactive compounds from cave actinomycetes might be a good source of novel antibiotics which might be better than the existing one.

Keywords: actinomycetes, *Klebsiella*, MRSA

BS - 41

CHARACTERIZATION OF BACTERIAL ISOLATES ASSOCIATED WITH IDENTIFIED SYMPTOMS OF INFECTION IN *Porites lobata* D. FROM CURRIMAO BAY

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Coral disease is an increasing concern across diverse reef communities worldwide because it has become a significant agent of coral mortality. Symptoms of disease observed in coral communities occur as a response to biotic stressors such as bacteria and fungi and/or abiotic stressors such as increases in water temperature, UV radiation, sedimentation or localized pollution.

The study identified the common symptoms of infection in *Porites lobata* from Currimao bay through morphological description of the lesions such as type, pattern, color, location, distribution and margin. Morphological and biochemical characterization of bacterial isolates associated with the mucus and fragments of *P. lobata* showing symptoms of infection and the detection for the presence of *Vibrio* and *Pseudomonas* was also conducted.

The following six (6) symptoms were observed in the area: white spot with tissue loss; pinkish violet distinct lining; purple discoloration; distinct pink lining; white discoloration and violet nodular tissue discoloration. Results showed that there are diversities of bacteria residing in each of the colonies of *P. lobata* showing symptoms of infection different from the colonies without symptoms of infection and from the surrounding water medium. Some of the associated bacteria isolated are pathogenic while presence of *Vibrio* and *Pseudomonas* were detected on the samples. This baseline information can be used for future in-depth studies targeting specific diseases, to further elucidate pathogens, the disease progression and impacts to the reef community.

Keywords: Coral disease, *Porites lobata*, Currimao Bay

BS - 42

**PHYTOCHEMICAL, ANTIOXIDANT LEVELS AND
ANTIBACTERIAL ACTIVITY OF THE FLUIDS FROM
THE UNOPENED PITCHER PLANTS**

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Drinking the fluids from the unopened pitcher plants can alleviate digestive ailments as local people claimed. However through literature search this has no scientific basis. Here, we report some preliminary data of the potential uses of *Nepenthes ceciliae* and *Nepenthes pulchra*.

The total phenolic content of the fluid of *N. ceciliae* is 598 mg/ml and for *N. pulchra* is 395.05 mg/ml (expressed as gallic acid equivalent) as estimated by Folin- Ciocalteu method. While the total flavonoid contents (expressed as µg Quercitin equivalent/ml) is 169 µg/ml and 51 µg/ml for *N. ceciliae* and *N. pulchra* respectively. The radical-scavenging activity of the fluid as measured by 2,2-diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging assay showed strong activity as 91% of the free radicals was scavenged by the anti-oxidants present in *N. ceciliae* per 50 µl fluid sample and 89% for *N. pulchra*.

N. pulchra showed antibacterial activity against *Escherichia coli* and *Staphylococcus aureus* while no activity was exhibited in *Klebsiella pneumonia* and *Psuedomonas aeruginosa*. *N. ceciliae* showed inhibition only in *E. coli*. Fluids from *N. pulchra* have higher antibacterial activity than *N. ceciliae* against *E. coli*.

Fluids from the unopened pitchers of *N. ceciliae* and *N. pulchra* do not contain any alkaloids and anthraquinones as revealed by phytochemical screening test using Thin Layer Chromatography. Though TLC the fluid of *N. ceciliae* has two fractions with the R_f values 0.25 and 0.73. *N. pulchra* has only one fraction with the R_f value 0.17. In agar diffusion bioautography only the fraction from *N. ceciliae* R_f value 0.73 exhibited antibacterial activity against *E. coli* and *S. aureus*.

It has been concluded that the fluids from unopened pitchers contain high levels of phytochemicals and possess strong antioxidant and antibacterial activity.

Keywords: Unopened pitcher plant, phytochemicals, anti-oxidant activity

BS - 43

EFFECT OF BIOLOGICAL TREATMENT USING RUMEN FLUID ON THE LIGNOCELLULOSIC COMPOSITION OF RICE (*Oryza sativa*) STRAW

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Rice straw is an attractive lignocellulosic material for bioethanol production since it is one of the most abundant waste biomass in the country. One of the major challenges in developing the technology for bioethanol production from rice straw is selection of an appropriate pretreatment technique to release the cellulose and hemicellulose from lignin. The choice of pretreatment method determines the efficiency of enzymatic saccharification and fermentation of the substrate to ethanol. The present study aimed to evaluate the biodegradation effect of rumen fluid on the lignocellulosic composition of rice straw. Specifically, it was aimed to determine the conversion efficacy of rumen fluid on the deconstruction of cellulosic components of rice straw to its monomeric sugar glucose and the yield of ethanol produced from the hydrolyzed sugar. Four concentrations: 1%, 5%, 10% and 20% of rumen fluid were used in the study to determine the extent of lignocellulosic deconstruction, amount of glucose released and ethanol yield. Results indicate that lignin, hemicellulose and cellulose were reduced to 50%, 52.54%, and 51.76% respectively. Conversion of cellulose to glucose was observed highest (17.2% w/w) in treatment with 1% rumen fluid and declined (11.2% w/w) in treatment with 20% rumen. Ethanol yield, determined using spectrophotometric methods wherein treatments yielded 6.48 mg/ml, 20.54 mg/ml, 22.76 mg/ml and 25.32mg/ml respectively suggesting that treatments with higher rumen concentrations also gave correspondingly higher yield of ethanol. These results indicate the potential of rumen fluid as biological treatment on the lignocellulosic composition of rice straw and cellulosic ethanol production.

Keywords: bioethanol, saccharification, lignocellulosic biomass, biodegradation, pretreatment

BS - 44

PRODUCTION AND EVALUATION OF ALGINATE HYDROGELS AS 3D SCAFFOLD FOR NEURAL PRECURSOR CELLS

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Three-dimensional (3D) cell culture platforms such as hydrogels have been developed to allow cells to grow in an environment that resembles in vivo conditions. Alginate, a polymer consisting of varied ratio of guluronic to mannuronic acid (G/M), is a biomaterial capable of forming into hydrogels. With neural stem cell (NSC) research focusing on development of biomaterials useful for regenerative medicine, alginate hydrogels in this study were produced and evaluated as 3D scaffolds for neural precursor cells (NPC). The G/M ratio of the *Laminaria*-extracted alginate powder used was first identified. Next, hydrogels produced using increasing alginate concentrations and cross-linker solutions (calcium and barium) were characterized based on their pore size and swelling ratio, and evaluated for their suitability as 3D scaffold for NPC differentiation. Based on the FTIR spectroscopy analysis, the G/M ratio of the alginate is computed to be 1.086. Swelling ratios and pore sizes were observed to decrease with increasing concentration of alginate and/or cross-linker solutions. Neurospheres displayed more extensive neurite outgrowth when seeded into the hydrogels prepared at lower concentrations of alginate and/or cross-linkers. With the novel observation that 3D alginate hydrogels support NSC differentiation to neural and glial cells, alginate hydrogels open wide opportunities for development of NSC technologies for neurodegenerative disorders.

Keywords: alginate, neural stem cell, 3D cell culture, hydrogel, biomaterial

BS - 45

**COLOR STABILITY AND APPLICATION OF
ENZYMATICALLY-EXTRACTED CAROTENOIDS
FROM TURMERIC GINGER MEAL**

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Carotenoid, being one of the largest classes of natural pigments extracted from plants, is most available and important source of colorants for use in the food, pharmaceutical and cosmetic industries. This study aimed to assess the stability of enzymatically-extracted carotenoids from turmeric ginger meal, a by-product of turmeric processing industry. The spray-dried carotenoid extracts were monitored for product color stability with the different chromatic properties determined using Minolta colorimeter CM5. Concentration of β -carotene content of the extracted carotenoid products was determined by spectrophotometric analysis and High Performance Liquid Chromatography (HPLC).

The pectinase-treated turmeric ginger gave an increase in the total carotenoid yield of 54.11% and 100.98%, water-soluble and lipid-soluble carotenoids, respectively, as compared with the non-enzymatic (control) treatment. Comparable result for β -carotene content was also obtained with values of 18.11 μ g/ml and 18.26 μ g/ml, using spectrophotometric and HPLC methods, respectively. Physico-chemical and chromatic properties showed varying stability of the spray-dried products at different time interval. Even after 1 year of storage at room temperature and in dark condition, only a slight change in total carotenoid concentration was observed.

Application of spray-dried carotenoids in the preparation of gelatin was done and the color stability of the product was monitored. The change in the CIELab color parameters (L^* , a^* , b^* and ΔE^*_{ab}) was visible after a month of storage. Further investigation will be done to improve the color stability of the product.

Keywords: carotenoids, high performance liquid chromatography, β -carotene, chromatic properties, CIELab color parameters

BS - 46

PHYTOREMEDIATION OF LEAD (Pb^{2+}) IONS USING CARABAO GRASS (*Paspalum conjugatum* L.)

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This study was conducted to measure the ability of carabao grass (*Paspalum conjugatum* L.) to accumulate lead at different concentrations in the soil. Specifically, this study was undertaken to (1) determine the concentration of lead accumulated by carabao grass and (2) to find out if there is a significant difference in the concentration of lead accumulated by carabao grass exposed to different lead concentrations in the soil. The experiment was laid out in Complete Randomized Design (CRD) with treatments namely: T_1 (100 parts per million), T_2 (125 parts per million), T_3 (150 parts per million) and T_0 (0 part per million) being the control; and with three (3) replicates. Thirty (30) days after exposure to lead (II) nitrate, the whole plant parts of carabao grasses were collected and were brought to the laboratory for analysis using the Atomic Absorption Spectrophotometer (AAS). Results of the study show that Treatment 2 has the highest mean concentration of accumulated lead in carabao grass at 5.40 mg/kg, followed by Treatment 3 at 5.28 mg/kg and Treatment 1 at 3.12 mg/kg. Furthermore, one-way Analysis of Variance (ANOVA) of the treatment means yielded no significant difference among the concentrations of lead accumulated by carabao grass.

Keywords: phytoremediation, carabao grass, lead

BS - 47

PREVALENCE AND ANTIBIOTIC RESISTANCE OF *Salmonella* spp. FROM CHICKEN EGGSHELL

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Chicken eggs constitute a big part of Filipino diet. They serve as affordable source of proteins, vitamins and minerals. But they also serve as sources of pathogens like *Salmonella*. This study was conducted to estimate the prevalence of *Salmonella* and determine the antibiotics resistance of the isolated *Salmonella* from eggshell. A total of 100 eggs from retail stores and supermarkets in Quezon province were collected and screened for eggshell contamination from December 2013 to January 2014. Using conventional biochemical detection and identification, 33% of the samples tested were found to be positive for *Salmonella*. Among the chicken eggs from retail stores and supermarkets, 44% and 22% eggshells were positive for *Salmonella*. From the contaminated eggshells, 95 *Salmonella* isolates were obtained and tested for antibiotic resistance using replica plating. Results showed high resistance to cephalexin (74.7%), amoxicillin (71.6%) and cotrimazine (51.6%) but lower level of resistance to co-amoxiclav (14.7%). Resistance to doxycycline was not detected. A total of 52 (55%) isolates were multidrug resistant (resistant to two or more antibiotics) and 6 resistance patterns were found. Our findings demonstrated that the eggs tested were widely contaminated with multidrug-resistant *Salmonella* and such contamination may constitute a major public health concern.

Keywords: chicken eggs, *Salmonella*, antibiotic resistance

BS - 48

CONCHOLOGICAL FEATURES OF FRESHWATER GASTROPOD: *Pomacea canaliculata*

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Taxonomic classification of gastropods has been basically based on its conchological features such as shell height or length and width. These morphological characteristics are important in the identification and classification, hence, it is a rich source of taxonomic information that can be used to interpret evolutionary relationships among taxa. However, the morphology of the shells of gastropods are greatly influenced by the condition of the habitat which prompts up this study to correlate the conchological features of *Pomacea canaliculata* with some physico-chemical parameters. One hundred samples of adult snails were collected in the different areas of Bukidnon and physico-chemical parameters were also taken in each collection site. Analysis of variance showed a significant difference in the conchological features specifically on the quantitative measurements of shell, aperture and band. By using the Pearson correlation test, it was observed that the temperature have a significant effect on the shell height and width, and band width. The result showed that as the temperature increases the height and width of the shell and the band width decreases. This result could be an adaptation towards the certain environment thus signifies to the effects of the ecological characteristics of the habitat towards the morphology of the gastropod species.

Keywords: morphological features, physico-chemical parameters

BS - 49

PHYTOREMEDIATION OF CHROMIUM (VI) ION USING HYDRILLA (*Hydrilla verticillata* Royle)

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This study was conducted in order to assess the ability of hydrilla to phytoremediate chromium from water. Specifically this study was carried out in order to (1) determine the concentration of chromium accumulated by hydrilla from water; and (2) find out if there is a significant difference in the concentration of chromium accumulated by hydrilla plants exposed to different concentration of chromium (VI) solution. This study was conducted with three (3) treatments namely: Treatment 1 (50 mg/L), Treatment 2 (75 mg/L), Treatment 3 (100 mg/L) and with T0 (0 mg/L) as the control. The same was laid out using Complete Randomized Design (CRD) with five (5) replicates. After twenty (20) days of exposure to the chromium (VI) ion solution in different concentrations, all hydrilla plants survived. Whole plant samples were collected and were analyzed at the laboratory for evaluation of accumulation of chromium. Results of the study show that Treatment 3 yielded the highest chromium concentration at 33.90 mg, followed by Treatment 2 at 22.46 mg and Treatment 1 at 15.02 mg. Furthermore, Kruskal-Wallis Test was done to find out if there is significant difference among various treatments in terms of accumulated chromium. The results revealed that indeed there exists a significant difference among treatments in terms of accumulated chromium in hydrilla plants.

Keywords: phytoremediation; hydrilla, chromium

BS - 50

**PROXIMATE NUTRITIVE COMPOSITIONS OF THE
FIVE PHILIPPINE WILD SPECIALTY MUSHROOMS**

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The Philippines being tropical has a diverse wild mushroom species that usually found growing on lignocellulosic substrate. In Central Luzon region, a number of specialty mushrooms with nutraceutical benefits have been successfully rescued and domesticated. Though mushrooms are popular in the country based on their exotic taste, culinary properties and aroma, the important nutrients they contain is not well known which could make a very significant contribution to human nutrition. With this premise, our research team determined the proximate nutritive values of selected mushroom species. Mushrooms were produced following the required production technologies and analyzed according to the official method of analysis of the Association of Official Analytical Chemist. Results of analysis revealed that the five specialty mushrooms are highly nutritive. Crude protein was the highest nutritive composition in *L. tigrinus* (34.96%), *C. comatus* (30.4%), *S. commune* (25.57%) and *P. florida* (25.52%). *C. comatus* contained the richest crude fiber (13.5%) and ash (15.7%), while *L. sajor-caju* recorded the highest moisture content (31.4%) and crude fats (5.2%). It was observed that the crude fat content of the five mushrooms are generally very low in a range of 1.36-5.20%. These significant results indicate that mushrooms hold a great promise of alleviating problem on nutritious food deficit since this mushroom is highly nutritional food sources.

Keywords: specialty mushrooms, nutraceutical, protein, exotic food, nutritious food deficit.

BS - 51

**HYPOGLYCEMIC EFFECT OF *Ficus ulmifolia* Lam.
(MORACEAE) LEAF EXTRACT ON THE BLOOD
AND URINE GLUCOSE LEVELS OF MICE FED
ON A HIGH CARBOHYDRATE DIET**

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The rising rates of diabetes diagnoses worldwide could ultimately impact the availability and costs of medication for this disease. Thus, researches which study plant-derived products for their blood glucose-lowering properties are ongoing. This study tested whether an ethanolic extract from the fig species *Ficus ulmifolia* could have glucose-lowering effects in the blood and urine of test animals. Twenty male Swiss mice which had been fed a diet containing 67% corn syrup for 21 days were divided into four test groups: a negative control group given no treatment; two groups supplemented with 100 mg and with 1000 mg of the fig leaf extract per kg body weight (designated as LE and HE mice, respectively); and a positive control group provided with 150 mg metformin/kg body weight. An oral glucose tolerance test was conducted on each mouse after 14 days of treatment. Measurements with a clinical glucometer revealed that blood glucose levels were lower by 47.5% among the HE group of mice compared to the untreated controls whose levels were about the same as the LE group of mice. There were no significant differences among the blood glucose levels of the metformin-treated mice and the HE mice, indicating that the higher concentration of fig leaf extract had had a hypoglycemic effect. However, urine glucose levels among all test mice did not vary significantly. The findings suggest that supplementing mice fed a high carbohydrate diet with the crude leaf extract of *F. ulmifolia* has lowered their blood glucose levels possibly by promoting glucose absorption of somatic tissues rather than through increased urinary excretion.

Keywords: diabetes, *Ficus ulmifolia*, glucose, hypoglycemic effect

BS - 52

EVALUATION OF CTAB-BASED METHODS FOR THE GENERATION OF HIGH MOLECULAR WEIGHT AND HIGH QUALITY GENOMIC DNA OF *Cocos nucifera* FOR NEXT-GENERATION SEQUENCING

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The coconut industry of the Philippines is a key agricultural sector that employs thousands of coconut farmers whose income from the business on a per hectare basis sadly lags behind vis-à-vis other agronomical crops, despite the fact the said industry contributes significantly to the export earnings of the country. There is much room for growth in this industry, and providing farmers with planting materials that give high yields and are suitable to their geological location will be a good start. To do so, the traditional selective breeding methods and marker-assisted breeding for the generation of hybrids is augmented by the Coconut Genomics Program, which aims to sequence the whole genome of heirloom varieties of coconut which have already been extensively used by the Philippine Coconut Authority. The first step in this project involves the generation of sufficient amounts of highly pure and enriched nuclear genome. The group tested several protocols based on the classical cetyl trimethylammonium bromide (CTAB)-based extraction method. One variation of the protocol, which was CTAB plus various reducing agents such as PVP40, β-mercaptoethanol, and ascorbic acid, generated DNA of *Cocos nucifera* var. Laguna Tall that was used for Illumina LongReads sequencing. A commercial kit from Qiagen was likewise tested, and the resulting DNA sample of *Cocos nucifera* var. Catigan Dwarf was used for genomic sequencing using the Ion Proton System. The results showed that the simple CTAB method was enough to produce relatively pure genomic DNA with low to negligible numbers of contaminating chloroplast and mitochondrial DNA sequences.

Keywords: *Cocos nucifera*, next-generation sequencing, cetyl trimethylammonium bromide (CTAB)

BS - 53

PHYLOGENY OF THE PHILIPPINE COFFEEAE (RUBIACEAE) INFERRED FROM MULTIPLE cpDNA AND MORPHOLOGY

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Recent molecular phylogenetic studies in Coffeeae resulted in its broader circumscription, reinstatement of *Empogona* and inclusion of *Psilanthus* within *Coffea*. As a consequence, assessing the monophyly of other members of the tribe is needed to recognize robust phylogenies and establish major evolutionary trends in Coffeeae. In this study, the monophyly of the Philippine genera of Coffeeae (*Diplospora*, *Discospermum* and *Tricalysia*) were tested utilizing multiple cpDNA (*trnL-F*, *rpl16*, *accD-psaI* and *petD*) markers. A majority-rule consensus tree of the combined cpDNA datasets recovered a highly supported tribe Coffeeae. *Diplospora* is not monophyletic due to the inclusion of the Philippine *Tricalysia negrosensis* and the placement of *Diplospora sessilis* and *D. sorsogonensis* within *Hypobathrum* of Octotropideae. Examination of the type specimens showed that *T. negrosensis* is allied to *Diplospora* while *D. sessilis* and *D. sorsogonensis* approaches the genus *Hypobathrum*. Meanwhile, *Discospermum* is likewise not monophyletic due to the position of *Xantonnea* within the clade (PP=1.00; BS=85%). Since morphological features of our materials strongly support the molecular data we hereby proposed new combinations for the tribe.

Keywords: *Diplospora*, *Discospermum*, molecular data, Phylogenetic analysis, *Tricalysia*

BS - 54

**COMPARISON OF TWO EXTENDERS FOR
CRYOPRESERVATION OF NATIVE CHICKEN
(*Gallus gallus domesticus*) SPERM IN THE PHILIPPINES**

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This paper presents the optimum extender for the cryopreservation of native chicken sperm. Two chicken extenders were compared in this study: Lake's Extender and Extender AU. Semen were collected from six male chickens and mixed with the extenders in a 1:1 ratio and observed for 0 h, 6 h, 12 h, 24 h, 36 h, 48 h, and 72 h. Sperm concentration, morphology, and motility were determined. Results showed that Extender AU was able to produce viable sperms having a sperm motility of >30% after 24 h of storage at 5°C. On the other hand, the Lake's Extender was not able to produce viable sperm after 6 h of storage at 5°C. However, both extenders were able to produce an acceptable range of normal sperm morphology (>70%). The work presented here can be used as basis for the storage of the native chicken sperm in the Philippines.

Keywords: Philippine native chicken, extender, cryopreservation, sperm

BS - 55

**MOLECULAR IDENTIFICATION OF *Anisakis* SPECIES IN
PYGMY SPERM WHALE AND BLAINVILLE'S BEAKED
WHALE FROM PHILIPPINE WATERS
WITH PRELIMINARY EVIDENCES OF LOCAL
VARIANTS OF *A. ziphidarum***

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Cetaceans are definitive hosts of anisakid nematodes, particularly under the genus *Anisakis* Dujardin, 1845. Strandings of Pygmy Sperm Whale and Blainville's Beaked Whale in the Philippine waters made it possible to carry out parasitological study on infecting anisakid nematodes. Briefly, anisakid worms were initially identified morphologically using light and scanning electron microscopy, whereas molecular confirmation of the species level was carried out by PCR-RFLP, followed by sequencing of the three different gene regions (ITS (ITS1–5.8s rRNA–ITS2), mtDNA COI, and mtDNA COII regions). Multiple infections of three different *Anisakis* species (*A. brevispiculata*, *A. paggiae*, and *A. typica*) were morphologically and molecularly identified in Pygmy Sperm Whale. The phylogenetic positions of the present samples on the Neighbor-Joining and Maximum Parsimony trees analyzed using three gene regions confirmed the species identities of these three *Anisakis* species. Moreover, preliminary molecular evidences, based on mtDNA COI and mtDNA COII gene regions revealed presence of local genetic variants of *A. ziphidarum* in Blainville's Beaked Whale. The absence of morphological data on these possible local variants makes it morphologically difficult to compare with *A. ziphidarum*, thereby leaving its taxonomical status as *A. ziphidarum*. Though there is no health related risks involved in the infection of adult *Anisakis* from the definitive hosts, dispersion and infection of its third-stage larvae to marine fishes and cephalopods may pose such threats to humans. However, the identified *Anisakis* species in the present study have never been reported to pose possible health risk problems to seafood consumers.

Keywords: Philippine waters, Pygmy Sperm Whale, Blainville's Beaked Whale, *Anisakis* species

BS - 56

**DNA BARCODING FOR MOLECULAR
AUTHENTICATION OF SELECTED MEDICINAL
PLANTS IN BATANES GROUP OF ISLANDS AND
COMMERCIALY SOLD IN QUIAPO, MANILA**

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The incorrect plant identification and unsustainable extraction of medicinal plants from their natural habitat may result in adulteration and substitution of herbal medicines in the market. This study evaluated the most effective marker using DNA barcodes of three chloroplast regions (matK, rbcL and trnH-psbA) and one nuclear region (ITS) with single primer pair locus for authentication and identification of 68 selected Philippine medicinal plants. It specifically sought to: 1) generate nucleotide sequences of medicinal plant using four barcode loci (matK, rbcL, trnH-psbA, ITS); 2) assess and identify the performance of the four potential barcodes based on universality of the markers and discriminatory power using pairwise sequence divergence analysis; and 3) determine the species resolution. A total of 68 medicinal plants collected in Batan and Sabtang islands, Batanes Province, and purchased in Quiapo, Manila constitute 35 families and 57 genera dominated by Rubiaceae, Rutaceae, Fabaceae, Compositae, and Moraceae. The genomic DNA of the medicinal plants was extracted, amplified, sequenced and analyzed using bioinformatics tools. In this study, matK and trnH-psbA showed the highest PCR and sequencing success rate, exhibited the best species discrimination and may serve as effective barcode marker by resolving 80% with 53 confirmed taxa of medicinal plants composed of 10 from Quiapo and 43 from Batanes group of islands including the 11 identified Philippine alkaloid-containing plants. The present study is the first information on DNA barcoding of medicinal species of Batanes flora, a fact that renders this study a worthwhile contribution to the Philippine medicinal plants.

Keywords: DNA barcode, medicinal plants, Batanes province, nuclear marker, chloroplast markers

BS - 57

OCCURRENCE OF FIREFLIES (COLEOPTERA: LAMPYRIDAE) ON THE DIFFERENT ELEVATIONAL GRADIENTS IN MOUNT MAKILING

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As a center for biodiversity and a forest reserve, Mount Makiling has a diverse array of flora and fauna with approximately 7,000 insects. Fireflies are among the commonly observed fascinating insects due to their bioluminescent flashing. Lampyrids have made a significant remark not only for habitat conservation but also for ecological tourism despite the limited information about these insects particularly in the Philippines. With their significance to the Philippine fauna, these insects have rarely been studied. Firefly specimens from Mt. Makiling were collected and identified using available published keys and literatures. Using GPS, elevations were recorded where fireflies were collected. Data show that the elevations recorded range from 50-1500 m asl. The numbers of fireflies collected and observed were highest at 50-750 m asl while lowest at 751-1500 m asl. Furthermore, the highest number of species were recorded at elevation 50-750 m asl while the lowest at 751-1500 m asl. Nonetheless, a list of fireflies and frequency are provided.

Keywords: Makiling, Lampyridae, fireflies, elevation, identification

BS - 58

**COMPARISON OF DIFFERENT RNA EXTRACTION
PROTOCOLS IN ISOLATING TOTAL RNA FROM
DIFFERENT *Cocos nucifera* TISSUES OPTIMIZED FOR
NEXT-GEN SEQUENCING**

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The Philippines is the second top producer of coconut and is the top exporter of coconut oil in the world. Today it remains as an invaluable economic crop as it contributes 30% of the country's total agricultural export earnings. Availability of Next Generation Sequencing technologies to sequence DNA and RNA of coconut and other plant species facilitate generation of immense amount of information which can be used in fast-tracking varietal improvement regimes. Several extraction procedures have been reported but there is no established protocol for isolating high quality RNA from coconut tissues that can be used for Next Generation Sequencing. In this study, we evaluated 13 RNA extraction protocols including commercially available kits, tested published protocols, as well as manufacturers' recommended protocols to determine the optimal strategy in isolating robust and pure RNA that is compatible with NGS. RNA quality was visualized using Shimadzu MultiNA automated microchip electrophoresis and RNA quantification was performed using Qubit Fluorometer. Among the protocols evaluated, high quality RNA with intact and highly concentrated 18s and 25s bands were obtained from the Agilent Plant RNA Isolation Mini Kit. This kit also yielded the highest A260/A280 and A260/230 ratios as measured using the NanoDrop spectrophotometer. Isolated total RNA from the Agilent kit was then validated by sequencing using Illumina HiSeq 2000 which generated 25.7M high quality reads primed for transcriptome assembly, differential gene expression analysis and gene ontology.

Keywords: coconut, RNA-seq, next generation sequencing, differential expression, agriculture

BS - 59

GROWTH PROMOTING PERFORMANCE OF RHIZOBACTERIAL ISOLATES FROM TWO SPECIES OF MANGROVE PLANT ON RICE (*Oryza sativum*)

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The use of growth promoting rhizobacteria (PGPR) has remained the promising option for sustainable, environment-friendly agriculture. The technology manipulates the crop rhizosphere microbial population by inoculation of beneficial bacteria to increase plant growth and therefore improve plant yield. This study evaluated the growth promoting performance of rhizobacterial isolates from two species of mangrove, *Rhizophora stylosa* Griff and *Sonnerata alba* J. Smith on Rice. Vegetative growth response of rice grown for one month on soil inoculated with the rhizobacteria was evaluated using these parameters: percent germination, number of leaves, plant height and total plant biomass. There were six isolates from *S. Alba*: Isolate A is Gram(-) coccus, D is a Gram(-) bacillus while B,C,E and F are Gram(+) bacilli while there were five isolates in *R. stylosa*: Isolates A,B, and D are Gram(+) bacilli, C and E are Gram(-) bacilli. PGPR activity of all isolates from the two plants showed comparable responses in terms of % germination and number of leaves indicating same effect of the isolates on these parameters. Isolate E of *R. stylosa* gave the highest percent (90%) while control plants had lower % germination of 75% (with inoculants) and 55% (with fertilizer). Similarly, *R. stylosa* isolates induced greater production of leaves than *S. alba* with Isolate E producing 8 leaves at 4 Weeks After Transplant (WAT) while Isolate F of *S. Alba* produced only 6 at 4 WAT. In terms of Plant Height, *S. Alba* isolates produced non-comparably taller plants (43.23cm-50.83 cm) than the control plants (32.10 cm) and *R. stylosa* isolates (40.67-53.07 cm). In terms of Total Biomass, Isolate F of *S. alba* produced non-comparably the greatest biomass of 92.77g while control plants had 63.66g (with fertilizer) and 79.25g (without inoculants). *R. stylosa* isolates produced comparable biomass with the control plants. Results indicate PGPR property of isolates from the two species of mangrove plants implying their potential as biofertilizer.

Keywords: biofertilizer, mangrove, PGPR technology, rhizosphere, rice

BS - 60

**COMPARATIVE PHYTOCHEMICAL ANALYSIS OF
WILD AND *Ex Situ* CULTIVATED MANGROVE FERN
(*Acrostichum aureum* L.)**

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This study was conducted to compare the phytochemical components of wild and *ex situ* cultivated mangrove fern, *Acrostichum aureum* L. To answer such objectives, young and mature fronds of *ex situ* cultivated *A. aureum* L. from Mt. Musuan Zoological and Botanical Garden, Musuan, Bukidnon were collected, while the wild plant frond samples were collected in Opol, Cagayan de Oro, Misamis Oriental. Hexane and methanolic frond extracts were then subjected to phytochemical screening to test for alkaloids, anthraquinones, phenols, tannins, flavonoids, terpenoids, and saponins. The obtained results revealed that *A. aureum* L. had the presence of all these phytochemicals tested. Alkaloids and anthraquinones were present only in the methanolic extracts from mature fronds of both wild and *ex situ* cultivated samples. Highest concentrations for phenols, tannins and flavonoids were found in methanolic extracts of mature fronds from *ex situ* cultivated samples and in young and mature hexane extracts of both wild and *ex situ* cultivated samples. Terpenoids were highest in methanolic extracts of mature fronds from *ex situ* cultivated samples. Highest but moderate amount of saponins were detected in methanolic extracts of mature fronds from *ex situ* cultivated samples. Generally, methanolic extracts gave more positive results than hexane extracts. It is concluded that *A. aureum* L. has phytochemical components responsible for its folkloric remedies; and the methanolic extract of mature fronds from *ex situ* cultivated samples gave the most abundant phytochemicals. Furthermore, mature *A. aureum* L. frond samples had higher amount of phytochemicals than young frond samples. In addition, *ex situ* cultivated samples had high amounts of phytochemicals compared to wild *A. aureum* L.

Keywords: *Acrostichum aureum* L., phytochemical screening, wild and *ex situ* cultivated, young and mature fronds

BS - 61

TAXONOMIC REVIEW OF SOME PHILIPPINE SEED BEETLES (COLEOPTERA: CHRYSOMELIDAE: BRUCHINAE) ASSOCIATED WITH LEGUMINOSAE

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A review on the taxonomy of some Philippine seed beetles associated with Leguminosae was conducted. Collected and preserved specimens from depository facilities were subjected to taxonomic analysis. Four (4) species under the Tribe Bruchini from two (2) genera and a single species from a single genus under the Tribe Pachymerini were determined. Out of the eight (8) species recorded in the Philippines, only three (3) species were retrieved, namely, *Callosobruchus chinensis* (Linnaeus), *C. maculatus* (Fabricius), and *C. pulcher* Pic. Two (2) new records on the Philippine fauna, *Caryedon serratus* (Olivier) and *Borowiecius siamensis* Anton were discovered.

Description and a key to the species are provided.

Keywords: *Caryedon serratus*, *Borowiecius siamensis*, *Callosobruchus maculatus*, *Callosobruchus pulcher*, *Callosobruchus chinensis*

BS - 62

NOVEL ANTITUBERCULOSIS, ANTI-STAPHYLOCOCCAL, CYTOTOXIC, ANTI-TYROSINASE AND ANTI-ACETYLCHOLINESTERASE OXIDIZED C-6 DERIVATIVES FROM PHILIPPINE *Uvaria* SPECIES

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The particularity of the genus *Uvaria* to elaborate a spectrum of unusual metabolites with activity against a wide range of diseases make it a promising source of drugs for therapeutic purposes. Extensive literature search show limited report on the secondary metabolites and biological activity of Philippine *Uvaria* species. In this study, the chemical constituents of *U. grandiflora* and *U. alba* were investigated for their biological activities. Activity testing was carried out using colorimetric Microplate Alamar Blue (MABA), Low-Oxygen Recovery (LORA), CellTiter Blue1, dopachrome and Ellman bioassays. A bioassay-guided isolation of the crude DCM-methanol extract afforded novel oxidized C-6 derivatives namely grandiflorenone, grandinone ether and chloralbanol along with the known compounds zeilenone and grandiuvarone. The structure of the compounds was established through extensive spectroscopic experiments such as IR, HR-ESIMS and NMR (¹H, ¹³C, HSQC, HMBC, COSY and NOESY). Grandiflorenone, zeilenone, chloralbanol and grandiuvarone exhibited profound activity against *Mycobacterium tuberculosis* H₃₇Rv, *Staphylococcus aureus*, mushroom tyrosinase and acetylcholinesterase with low MIC₉₀ and IC₅₀ values. Our results show that *U. grandiflora* and *U. alba* are potential sources of promising antituberculosis, anti-infective, anti-cancer, anti-melanogenesis and anti-Alzheimers compounds.

Keywords: *Uvaria*, anti-infective, cytotoxic, anti-tyrosinase, anti-cholinesterase

BS - 63

A COMPARATIVE STUDY OF TWO ENDEMIC LIMESTONE *Begonia* SPECIES OF NORTHERN PALAWAN

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Begonia of the family Begoniaceae is widely used for ornamentation because of its distinctly patterned leaves and flowers. Currently, there are 104 known Philippine species, 14 of which are located in Palawan thriving on limestone topographies. In this study, we reported a *Begonia* species in El Nido, Palawan which is observed to be very similar to *Begonia wadei* in Coron Island, Palawan. Both species were found to be different from the other members of the *Begonia* section *Baryandra* because of their suffrutescent stem and found in limestone crevices splashed with seawater compared with the other members, which prefer shaded, moist primary forest. Based on comparison of morphological, anatomical and molecular data, *Begonia* sp. of El Nido, Palawan was found to be a different species from *Begonia wadei*. The two species were morphologically different due to the asymmetric, clasping leaves and undulate leaf margin of *Begonia* sp. as compared to the subsymmetric, non-clasping leaves and denticulate leaf margin of *B. wadei*. Anatomical analysis also showed significant differences in terms of length of protective covering, width of interfascicular parenchyma between vascular bundles, length of vascular bundles and length of xylem tissues. Phylogenetic analyses of Philippines species of sect. *Baryandra* based on ITS sequences revealed that *Begonia* sp. is clearly separated from *B. wadei*. These evidences may eventually lead to the identification of *Begonia* sp. as a novel species.

Keywords: *Begonia wadei*, Begoniaceae, El Nido, Coron, internal transcribed spacer

BS - 64

**DNA BARCODING AND MOLECULAR PHYLOGENY
OF PHILIPPINE *Argostemma* WALL. (RUBIACEAE)
INCLUDING AN ACCOUNT OF A NEW ENDEMIC
SPECIES AND VARIETY**

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Argostemma Wall. is the largest paleotropical genus of *Argostemmataceae* (ca. 220 species) with SE Asia as its center of biodiversity. Foreign *Argostemma* species possess highly medicinal attributes and has been a great interest for evolutionary studies. In the Philippines, misidentification of its members has been apparent due to their morphological homogeneity making it difficult and undertreated. In Rubiaceae, the internal transcribed spacer (ITS) region of nuclear DNA, rps16 intron and trnL-F region of chloroplast DNA have been proven useful in delimiting relationships at species level. Hence, the three data sets were used to (1) determine the phylogeny of *Argostemma* species, (2) evaluate the best DNA barcode for the genus, and (3) provide morphological descriptions of a newly discovered endemic *Argostemma* species and a variety. Seven *Argostemma* species were collected and subjected to genomic DNA extraction, amplification, sequencing and genetic analyses. Remarkable performances of ITS as DNA barcode was shown in terms of PCR (100%) and sequencing (83.33%) success rates. ITS marker possessed the highest values in all three parameters namely: resolution of species (80%), variable informative sites (17.88%) and the highest mean interspecific distance ($7.9\% \pm 5.68$) that considered it as the best among the three loci. The generated phylogenetic tree including Philippine *Argostemma* proved its monophyly and endemic status (PP=1.0) and closely related with psychotrichoides group. A novel species and variety from Mt. Halcon, Mindoro, *Argostemma scindum* and *Argostemma solaniflorum* var. *hyacintho*, are proposed in this study. Medicinal benefits of the Philippine *Argostemma* could be explored, as this facilitate correct identification of its species.

Keywords: *Argostemma*, cpDNA, DNA barcoding, nrDNA, Philippine endemic

ENGINEERING SCIENCES AND TECHNOLOGY

EST- 01

**EFFECTS OF CURING TEMPERATURE ON
COMPRESSIVE STRENGTH
OF ORDINARY PORTLAND CEMENT PASTE**

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Different curing temperatures and curing times were done to assess its effect on compressive strength of Ordinary Portland Cement (OPC) paste. OPC from Japan was used in forming the cement paste. This was mixed with deionized water in water/cement ratio (w/c) of 0.40. This was then hardened and cured at 20 and 40°C temperatures in water bath for 3 and 28 days and subjected to compressive strength test.

Results showed that cement cured at 40°C developed much stronger compressive strength recorded at an average of 54.43N/mm² compared to 34.43N/mm² strength of cement cured at 20°C at early stage hardening period. However, the compressive strength of cement cured at different temperatures began to equalize when cured for a longer period of 28 days. Cement cured at 40°C had strength of an average of 90.47N/mm², nearly the same strength as that cured at 20°C with strength of 84.70N/mm².

Keywords: ordinary Portland cement, curing temperature, compressive strength

EST - 02

**DEVELOPMENT OF INFORMATION SYSTEM FOR
TSUNAMI-PRONE AREAS IN THE PHILIPPINES:
QUANTIFYING POPULATION AT RISK BASED ON
EXISTING TSUNAMI INUNDATION MAPS**

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A tsunami, although it is rare to happen, has a capability to cause extensive destruction and widespread casualties. Through the DOST-GIA Tsunami Risk Mitigation Program, PHIVOLCS have produced 1:50000 scale tsunami hazard maps for the Philippines. Using these hazard maps, the barangay demographic population information from National Statistics Office, and Geographic Information System (GIS), we have determined the number of population in each barangay that will be affected when a tsunami strikes in a specific area. Quantifying population at risk is important and useful when developing disaster risk reduction strategies such as planning an intervention and resource allocation. The developed information system is composed of an offline web-based visualization tool containing the available tsunami hazard maps of the Philippines, list of affected barangays and demographic data. This is a quick way to access information immediately after a tsunami-generating earthquake. It can be installed to computers as it uses an HTML code. This tool can be used to have initial assessment of the affected areas, and aid responders to effectively manage emergency situations and humanitarian needs.

Keywords: tsunami hazard map, population exposure, tsunami risk

EST- 03

**COMPARATIVE MECHANICAL PROPERTIES OF
SELECTED BAMBOO SPECIES**

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This study aimed to evaluate some basic mechanical properties of selected bamboo species that are applicable to structural applications.

Six bamboo species planted inside the Central Mindanao University Campus were tested, namely: *Dendrocalamus merrillanus*, Elmer; *Gigantochloa atter*, Hassk; *Bambusa vulgaris* Var. Schrad; *Dendrocalamaus asper*, Schultes. F; *Dendrocalamus latiflorus*, Rehm.; and *Bambusa blumeana*, Schultes were subjected to four-point bending test, compression parallel to grain test and shear strength parallel to grain test. Data were taken from bottom, middle and top portion of the bamboos.

Result showed that *Dendrocalamaus asper*, Schultes. has the stronger compressive strength at an average of 104.02 MPa, *Dendrocalamus latiflorus*, Rehm. has the stronger shearing strength at an average value of 12.65 MPa, while *Dendrocalamus latiflorus*, Rehm. has the stronger flexural strength with an average value of 188.39 MPa. All six bamboo species tested is 2-6 times stronger than 80% stress graded *Vitex parviflora* Juss. (Molave) in compressive strength, 1.7-4.4 times stronger in shearing strength and 1.4 – 7.85 times stronger in flexural strength.

Keywords: bamboo culms, four-point load set-up, compression parallel to

EST - 04

THIRD-POINT LOAD EFFECT ON BENDING MOMENT OF SLOTTED FERROCEMENT BEAM

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This study aimed to determine the bending moment of slotted ferrocement beams subjected to four-point loading. The study was conducted using a single-factor experiment with six levels of factors being employed. The experiments used six treatments with six replications. The treatment were as follows: S1 – Four - 10mm deformed bars on each corner of a single wire mesh reinforcements and provided with 3.2 mm diameter galvanized iron wire spaced at 100 mm on centers; S2 – One layer of welded wire mesh reinforcements; S3 – Two layers of wire mesh reinforcements; S4 – Three layers of wire mesh reinforcements; S5 – Four layers of wire mesh reinforcement; and S6 – Five layers of wire mesh reinforcements.

Results of the tests showed that an empirical equation for the determination of bending moment at failure and empirical equation for the flexural strength at failure can be developed, however, the equation still needs to be verified by continuing a research that analyze further the third-point load effect on bending moment for slotted ferrocement beam considering increased number of wire mesh layers. The study found out that: the provision of two or more layers of wire mesh reinforcement will lead to an increase of the flexural strength of the section; the reinforcing bars has a significant contribution to the flexural strength of the section, however, the capacity of the deformed bar reinforced ferrocement beam to carry load is limited to the reinforcement that can be provided and such type of beam has limited cross sectional area; and increasing the number of layers of wire mesh reinforcement could allow the beam to exhibit ductile behavior. The number of cracks in the beam will increase and the distance of such spacing will decrease. This behavior of cracking can effectively delay the occurrence of failure in the specimen.

Keywords: third-point loading, ferrocement, modulus of rupture, ductility, micro cracks

EST - 05

BIOMETHANATION OF KITCHEN WASTE FOR BIOGAS PRODUCTION

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This project focused on the development and optimization of anaerobic reactors for biomethanation of the organic materials from kitchen wastes. Laboratory- and pilot-scale reactors were fabricated and the efficiency of each set-up was examined based on biogas production. Anaerobic reactors for lab-scale batch experiment consisted of five plastic containers (6 liters) with cover. The substrate composed of kitchen waste (40%) mixed with varying inoculum (60%) as follows: reactor 1 - cow dung slurry; reactor 2 - swine waste effluent; and reactor 3 - cow dung slurry and swine waste effluent. Reactors 4 and 5 served as control set-ups and contain solely cow dung slurry or kitchen waste, respectively. Daily biogas production was highest in reactor 2 wherein kitchen waste was mixed with swine waste effluent. Average daily biogas production was 0.84 L of gas per day for reactor 2 while the other set-ups had only 0.30 L, 0.41 L, 0.51 L, and 0.49 L biogas per day for reactors 1, 3, 4, and 5 respectively. For batch pilot-scale experiment, a transparent plastic container (20 L) was used containing a substrate ratio of 40% kitchen waste and 60% swine waste effluent as inoculum. Kitchen waste was collected from canteens within DOST (Department of Science and Technology) compound while the inoculum was obtained from an existing anaerobic digester treating swine waste effluent. Pre-treatment of kitchen waste by sodium hydroxide solution and addition of urea were done to enhance degradation of materials and to optimize biogas production. Accumulated biogas from two trials averaged to 97 L for 32 days. Daily biogas production averaged to 3 L per day and biogas production per kilogram waste was 16.6 L/k. Gas produced was flammable indicating that the methane content is above 50 percent. The biomethanation of biodegradable kitchen waste using the lab- and pilot-scale reactors showed potential benefit for bioenergy and waste management.

Keywords: biomethanation, biogas, biodegradable wastes, kitchen waste polymer

EST - 06

HARNESSING INDIGENOUS FUNGI FROM MMSU FOREST RESERVE IN PAYAO FOR THE BIOPROCESSING OF LIGNOCELLULOSE BIOMASS FOR CELLULOSE ETHANOL PRODUCTION

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This study was conducted to isolate and characterize indigenous fungi obtained from different biomass from the floor of MMSU Forest Reserve in Payao, City of Batac, Ilocos Norte; to test and compare the biodegradation potential of the fungal isolates on sweet sorghum bagasse and rice straw in terms on their saccharification and delignification efficiency prior to the production of cellulose ethanol and other value-added products.

Standard protocol for the isolation and characterization of isolates was followed. Determination of the biomass composition and glucose analysis followed the Technical Association of the Pulp and Paper Industry (TAPPI) and Dinitrosalicylic acid (DNS) standard procedures respectively.

There were nine pure isolates obtained and six were identified as *Trichoderma* (isolate 1), *Gliocladium* (isolate 2), *Aspergillus* (isolate 3), *Phanaerochaete* (isolates 4 and 7) and *Rhizopus* (isolate 9).

Results showed that all the 6 isolates used showed great potential for the bioprocessing of lignocellulosic biomass. Isolate 1 is the most effective in delignifying the sweet sorghum bagasse and saccharification efficiency. Isolate 4 gave the highest delignification and saccharification efficiency on rice straw. Independent used of fungal isolates in this study showed specific lignocellulosic degradation efficiency which is a good focus of study for further evaluation.

Considering the good results, it is recommended that these isolates must be maintained in the laboratory and further explore their other utilization not only for cellulose ethanol production but other value-added products.

Keywords: bioprocessing, lignocellulosic biomass, saccharification, delignification

EST - 07

**DEVELOPMENT OF A LOW COST ANDROID-BASED
HOME SECURITY SYSTEM**

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The study was to develop, implement and evaluate a low cost android based Home Security System (HSS). Specifically, to establish a circuitry that will allow the signal inputs from sensors to be processed through a gizduino micro controller paired with GSM module to a handheld device which operates in android software and vice versa for interfacing of the actual system setup, monitoring and control. Development was at four modules: a) signal processing module comprised of sensors for tilt/direction detector based on Rohm RPI-1031 sensor which detects x-y tilt or motion in 4 quadrants direction, smoke detector MQ2 which was used to detect smoke and gas leakage in homes and PIR motion detector which was used to detect up to 7 meters of movements. The Gizduino ATmega1281 Microcontroller processes the signals detected by these sensors and triggers the communication module for sending notification to the home owner; b) communication module composed of SIM900D GSM shield with SIM card, which was interfaced with the microcontroller, capable of communicating wirelessly via the GSM network by sending or receiving SMS messages; c) alarms module composed of sound alarms which provide sonic disturbance to call the attention of the home owner and; d) application module that provides status updates of the HSS and control capability to the system. Evaluation results showed that the tilt sensor, motion sensor, and smoke sensor operates accurately within 2 minutes, 5 minutes and 9 minutes interval of triggering respectively. Time delay for activation update was 8.49 seconds and for deactivation 9.85 seconds. Notification delay for glass breakage via tilt detection was 10.059 seconds, motion detection was 14.021 seconds, and smoke detection was 9.319 seconds. The notification speed was affected by GSM signal strength and the performance of the MCU in processing every updates through GSM shield. HSS production cost at Php 5800.00 is low cost and comparable to like gadgets.

Keywords: android, home security, gizduino micro controller, sensors

EST - 08

MULTI COMMODITY HEAT PUMP DRYING (MCHPD) OF CACAO BEAN (*Theobroma cacao*) HUSK

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Cacao bean husks are considered environmental waste in the chocolate industry if not managed wisely. Cacao farmers discovered incidentally its use for oral hygiene and other medicinal uses by decoction, however there are no scientific studies done yet, hence this undertaking. Generally, to establish the drying characteristics of cacao bean husk. Specifically, to establish the drying time and moisture reduction per hour (MRH); to determine the initial and final moisture content of the product needed to hygienically dehydrate the material using the MCHPD. Cacao bean husks were gathered; washed; air dried; cut to desired size and dehydrated at 50.0 °C and 10.0% relative humidity using the MCHPD. Dried product were further processed by grinding using a heavy duty grinder; packed in sealed plastic containers and stored in a cool, dry place. Results revealed the following drying characteristics: drying time -12.0 hours; reduction per hour (MRH)-20.04g/h; initial % moisture content (MC) – 80.0% and final MC- 6.7%. Based from the results; cacao bean husk is hygienically dried using the MCHPD at 12.0 hours with least supervision on the drying process; with a final % MC that is within the recommended % MC of > 18.0 % for agricultural products (Adapa, et al, 2002). Based from the results of the study, using the MCHPD in the primary processing of cacao bean husks is doable. Further research on product development, such as a natural mouth rinse using the dried and ground cacao bean husk is recommendatory as the next activity.

Keywords: multi commodity heat pump dryer, cacao bean, cacao bean

EST - 09

**DELIGNIFICATION AND SACCHARIFICATION OF
SWEET SORGHUM BAGASSE USING THE COMBINATION
OF ALKALINE AND FUNGAL TREATMENT**

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Lignocellulose is a promising alternative source of ethanol because of the abundance of renewable and sustainable feedstocks, particularly non-food residual biomass from the agricultural sector. The process of converting lignocellulosic biomass to ethanol involves disrupting the complex of lignin, cellulose, and hemicellulose, liberating cellulose and hemicellulose for hydrolysis to fermentable reducing sugars and subsequent fermentation of the sugars to ethanol. Extensive research in determining the optimal cost-effective technologies and treatments is essential for the success of lignocellulosic energy production. The purpose of this study was to determine the efficiency of the combination of alkaline and fungal treatment evaluated based on delignification and saccharification of sweet sorghum bagasse. Bagasses of mature sweet sorghum were collected as agricultural wastes from the MMSU Sweet Sorghum Project. The samples were first subjected to alkaline treatment: (1) 12%w/w NaOH and (2) 12%w/w NaOH + 10%w/w NaClO. Treated samples were then inoculated with individual conidiospores of *Pleurotus ostreatus* and *Trichoderma harzianum* for the independent culture. For the co-culture, samples were inoculated with both strains' spores at 1:1 ratio. Incubation was carried out at 27°C for 30 days via solid-state fermentation. Initially, analysis of the biomass constituents was conducted thru TAPPI standard laboratory analytical procedures. After the experiment, residual lignin components and glucose released were determined using NREL standard protocols. The results reveal that the combination of alkaline and fungal treatment effectively delignified and hydrolyzed the material. Findings point out that the employment of alkaline treatment was able to substantially remove lignin (72-93%) rendering the substrate more amenable to saccharification (10%-55%) by the lignocellulolytic enzymes secreted by the fungi resulting to a significant release of fermentable glucose (7-40%w/w).

Keywords: ethanol, delignification, saccharification, alkaline, fungi

HEALTH SCIENCES

HS - 01

PROFICIENCY TESTING ON PROXIMATES IN INFANT FORMULA MILK POWDER

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A proficiency testing (PT) Scheme on proximates (moisture, fat, protein, ash) was organized by the Food and Nutrition Research Institute. The Scheme was aimed at evaluating the performance of local and foreign testing laboratories in the analysis of proximates in an infant formula milk powder through an interlaboratory comparison.

A sufficiently homogeneous and stable infant formula milk powder PT material was distributed to thirty-five (35) laboratories registered to the Scheme. The standard deviations for proficiency assessment, σ_p , were derived by perception based on the coefficient of variation (CV) of a Thailand Laboratory Performance Study. The assigned values (i.e., consensus values) were derived as the robust averages using Algorithm A of ISO 13528:2005. Performance of the participant laboratories was evaluated based on z-score.

The assigned values for fat and ash have negligible uncertainties. For moisture and protein, the assigned values were given for information only due to wide variability of results. The assigned values (in g/100g) and the percentage of laboratories that obtained “Satisfactory” performance (i.e., $|z\text{-score}| \leq 2.0$) are: moisture-2.32 (79%), fat-22.09 (80%), protein-9.70 (71%), and ash-2.51(88%).

Laboratories that did not obtain “Satisfactory” performance were encouraged to conduct investigation and perform corrective and preventive actions.

Keywords: assigned value, proficiency testing, standard deviation for proficiency assessment, uncertainty, z-score

HS - 02

PROTECTIVE ROLE AND INFLUENCE ON SEVERITY OF EOTAXIN AND IL5 SNPS AMONG SELECTED ALLERGIC ASTHMA POPULATION

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Eotaxin is an eosinophil- specific chemokine that is found to be directly related to asthma, and inversely related with lung function. IL5 is a hematopoietic growth factor for eosinophils and basophils, effector cells involved in asthma and allergic reactions. Eotaxin-384A>G and IL5-703C>T SNPs were genotyped and characterized for association with asthma and asthma phenotypes among match-paired allergic asthmatic cases and non- asthmatic controls.

Observational- analytical, case-control method was used to examine 250 age- and sex-matched allergic asthma cases and non- asthmatic controls. Genotyping was performed using PCR-RFLP under optimized conditions. Asthma phenotypes such as total serum IgE, HDM-specific IgE, and absolute eosinophil counts were determined for association with Eotaxin-384A>G and IL5-703C>T SNPs. All protocols were approved by the Institutional Ethics Board Committee of the Philippine Children's Medical Center.

The mean total serum IgE, HDM-specific concentration, and absolute eosinophil count of the cases were significantly higher than the controls. Eotaxin-384A>G GG genotype has increased odds of having asthma than AA genotype (OR=2.66; OR=1.60, respectively). Further, Eotaxin-384A>G AA genotype has lower risk of having asthma compared to GG genotype (OR=0.38; OR=0.59, respectively). Homozygous IL5-703 TT genotype has a higher risk to develop asthma than the CC genotype. IL5 -703 CT genotype is less likely to have lesser total IgE as compared to TT genotype, suggesting a protective role against production of increase total IgE in children with allergic asthma.

In conclusion, Eotaxin-384A>G A allele has a protective role on asthma development while IL5-703C>T polymorphism may play a role in increase IgE production among asthmatic patients, indicating that while it may not have direct role in occurrence of asthma, it contributes in the disease severity.

Keywords: eotaxin, IL5, asthma, allergy

HS - 03

**ESTABLISHMENT OF DOSE-RESPONSE CURVE FOR
DICENTRICS IN COBALT-60-IRRADIATED
HUMAN LYMPHOCYTES FOR RADIATION
EMERGENCY PREPAREDNESS**

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In the event of a radiation emergency, there is a need to timely estimate the absorbed dose of exposed individuals that can be used by physicians in the medical management of exposed individuals and in medical triage, in the event of mass casualty. Biological dosimetry has been used as a tool to estimate absorbed radiation dose in cases where physical dosimeters were not available at the time of exposure, in cases of over exposure and for radiological reassurance. Each biological dosimetry laboratory should establish a dose-response curve for chromosome aberrations. An in- vitro irradiation study of human peripheral lymphocytes was conducted in order to establish a dose-response curve for radiation-specific dicentric aberrations. Blood samples were collected from volunteer donors and together with OSL dosimeters, were irradiated at 0, 0.1, 0.25, 0.5, 0.75, 1, 2, 4, & 6 Gy of Co-60 source. Blood samples were cultured for 48 hours and the metaphase were harvested, fixed and stained on glass slides. At least 100 metaphase cells were scored for dicentric aberrations at each dose point. The data were analyzed using R language program. The results indicated that the distribution of dicentric cells followed a Poisson distribution and the dose-response curve was established using the estimated model, $Y_{dic} = 0.0003(\pm 0.0003) + 0.0336(\pm 0.0115) \times D + 0.0236(\pm 0.0054) \times D^2$. The test for goodness of fit of data points showed that this linear quadratic model is appropriate (chi-square p-value = 0.24 with df=6).

Keywords: dosimetry, dicentrics, dose-response, Cobalt-60

HS - 04

**ANTI- HYPERURICEMIC ACTIVITY OF
Antidesma bunius (L.) SPRENG.**

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Gout is a painful inflammatory arthritis caused by elevated concentration of uric acid in the blood stream called hyperuricemia. Cases of hyperuricemia have increased in recent years. This increase is likely due to an aging population, dietary and lifestyle changes, and greater use of medicines such as diuretics.

Colchicine is commonly used in the therapeutic and clinical management of hyperuricemia but exhibits serious adverse effects and is identified as a toxic natural product. The use of botanical extracts as alternative treatment to hyperuricemia and as alternative to colchicine exhibiting lesser side effects is a trend in research and development.

In this study, *Antidesma bunius* (L.) Spreng. (AB), commonly known as bignay was phytochemically analyzed. The fruits and leaves contain carbohydrates, reducing sugars, phytosterols, phenolics, flavonoids and proteins. Spectrophotometric analysis gave higher Total Flavonoid Content (TFC) of 56 QE/g in AB tea leaf compared to 51 QE/g of AB fruit which positively suggested that they are promising sources of potential hyperuricemic agent. Antihyperuricemic potential was evaluated on hydrochlorothiazide-induced male and female mice which were rendered hyperuricemic. AB tea leaf significantly inhibited hyperuricemic activity with 7.67, 6.57 and 6.07 mg/dL in male mice and 14.07, 5.37 and 5.13 mg/dL in female mice at 3rd, 5th and 7th day, respectively. AB fruit also significantly inhibited hyperuricemia with 11.17, 7.37 and 6.5 mg./dL in male mice and 14.93, 9.4 and 7.8 mg/dL in female mice on the 3rd, 5th and 7th day, respectively. Moreover, colchicine reduced the uric acid level to 13.67, 7.2 and 6.3 mg/dL. Statistical analysis revealed that AB tea leaf and fruit are comparable to colchicine in lowering uric acid level giving *A. bunius* leaf and fruit considerable potential for clinical application.

Keywords: *Antidesma buhius*, bignay, hyperuricemia, gout, anti-hyperuricemia

HS - 05

STABILITY OF BIOACTIVE-ENHANCED PEANUT BARS

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Peanuts contain bioactive compounds including resveratrol and phenolic compounds with antioxidant properties which delay aging, and reduce the risk of cancer and cardiovascular and Alzheimer's diseases. Previously, we reported that combined ultrasound (US)-UV processes enhanced *trans*-resveratrol in peanuts, better than US or UV alone, to levels 2.8 times more than red wines. This study used roasted resveratrol enhanced peanuts (REP) in preparing peanut bars to investigate the stability of resveratrol, total phenolics (TP), and trolox equivalent antioxidant capacity (TEAC) during storage, and determine the shelf life of the product.

Bioactive-enhanced peanut bars were prepared by mixing REP (exposed to 70 mW/cm² US power density for 10 min and at 40 cm distance from UV light, 254 nm for 50 min, and incubated for 36h at 25°C) while stirring and heating with syrup up to 170°C, forming into rectangular bars, cooling, and packing in PE bags. Control samples were also prepared. Packaged peanut bars were stored at 25°C and 40°C. At pre-determined intervals, samples were withdrawn from storage, for a total of six sampling times at each temperature, and analyzed for resveratrol, TP, TEAC, hexanal, descriptive sensory properties, and overall acceptance.

Application of REP, previously reported to have shelf life of 52 days at 25°C and 19 days at 40°C, resulted in increased shelf life up to 146 days at 25°C and 46 days at 40°C in peanuts bars. This suggests the protective effect of sugar on each kernel from exposure to oxygen which slowed down the lipid oxidation, and/or masking effect on off-flavors. At the end of shelf life, 71% resveratrol, 82% TP and 89% TEAC were retained in peanut bars. On a per serving basis, about 3½ bioactive-enhanced peanut bars with 30g peanuts/bar would provide as much resveratrol as in a 140 mL serving of red wine. Bioactive-enhanced peanut bars will provide increased value and profitability for the food industry while providing health benefits to consumers.

Keywords: bioactive compounds, peanuts, ultrasound, UV, shelf life

HS - 06

**ANTI-DIABETIC POTENTIAL OF
Glochidion cagayanense LEAF EXTRACT**

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A number of herbal medicines have been discovered for their anti-diabetic activity. This is the first report on the anti-diabetic activity of the *Glochidion cagayanense* leaf extract. This study determined the changes in the hematological and biochemical indices in alloxan-induced diabetic rats and the ability of the plant extract to improve hematological indices. Female Sprague-Dawley rats were divided into nine groups. Diabetes mellitus was induced via intraperitoneal injection of alloxan monohydrate. Induction of diabetes led to increased levels of blood urea nitrogen, creatinine, cholesterol, low-density lipoprotein, triglycerides and decrease level of high-density lipoprotein, hemoglobin and hematocrit. Blood urea nitrogen, cholesterol, triglycerides, high-density lipoprotein, hemoglobin and hematocrit levels were significantly reversed after the treatment with *G. cagayanense* semi-crude extract. Compared to metformin, treatment with the *G. cagayanense* semi-crude extracts lowered significantly ($P < 0.05$) the serum glucose, blood urea nitrogen, creatinine, total cholesterol, low-density lipoprotein, and triglycerides of the diabetic rats. On the other hand, the high-density lipoprotein, hemoglobin and hematocrit were increased significantly ($P < 0.05$) post-treatment with the semi-crude extracts of *G. cagayanense*. Results obtained showed the anti-diabetic potential of *G. cagayanense* leaf extract.

Keywords: *Glochidion cagayanense*, diabetes, alloxan

HS - 07

IODINE STATUS OF FILIPINO SCHOOL-AGED CHILDREN: PHILIPPINES 2013

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Urinary iodine excretion (UIE) is currently the most practical biomarker for iodine nutrition. For this biomarker, international groups have recommended school-aged children (SAC) as useful target group for surveillance and as an acceptable proxy for the iodine status of the general population because of their high vulnerability and easy access. In 2013, the Food and Nutrition Research Institute of the Department of Science and Technology conducted the 8th National Nutrition Survey where one of its aim is to re-assess the prevalence and severity of iodine deficiency disorder (IDD) among 6-12 years old Filipino SAC and to compare the results with the previous surveys. The UIE of 22,588 SAC was measured based on the catalytic effect of iodine on the reaction between cerium and arsenic after sample digestion using ammonium persulfate. Median UIE among Filipino SAC was 168 µg/L with 16.4% having values less than 50 µg/L, indicating “optimal iodine status”. These figures were better than the previous survey of 2008 where median UIE among Filipino SAC was 132 µg/L and 19.7% have values below 50 µg/L. Regions with the highest median UIE were CALABARZON (236 µg/L), Cagayan Valley (223 µg/L) and National Capital Region (220 µg/L) while those with the lowest median UIE were Davao (122 µg/L), Northern Mindanao (121 µg/L) and Zamboanga Peninsula (68 µg/L). Median UIE for Zamboanga Peninsula indicates mild iodine deficiency. Results show that the Philippines’ endeavor in eliminating IDD is positively progressing. However, there are still packets of the deficiency since more than 20% of the surveyed population in some regions had UIE less than 50 µg/L. To achieve optimal iodine nutrition, comprehensive information dissemination and strict implementation of the ASIN (An Act for Salt Iodization Nationwide) Law is encouraged.

Keywords: iodine, urinary excretion, biomarker, school-age children

HS - 08

DEVELOPMENT OF A NUTRITIOUS AND HEALTHY JACKFRUIT (*artocarpusheterophyllus* lam.) SEED' VEGAN COOKIE

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The study was conducted to develop a jackfruit seeds' vegan cookie to increase usage of the seeds. Specifically, (1) to establish the nutritional value of the cookie in terms of: total calorie; carbohydrate; protein; fat; dietary fiber; vitamins A and C, thiamin; riboflavin, niacin; and minerals: phosphorus, calcium and iron; (2) to determine the acceptability of the developed cookie with reference to appearance, texture, flavor and aroma using the sensory evaluation test; (3) to identify the shelf life and the most appropriate packaging material of the newly developed cookie through a shelf life analysis; and to (4) establish the selling price of the product through cost analysis. Jackfruit were gathered, cleaned, boiled and dried using the Multi commodity heat pump dryer. Dried seeds were processed into flour and into cookies, with applesauce as a fat substitute. Nutritional value computation, sensory evaluation test, shelf life analysis were carried out after recipe's standardization. Results showed that the newly developed cookie has the following: high in total calorie (258 kcal/100 g); moderate in carbohydrate (56.2g/100 g); rich in fiber (3.4g/100g); moderate in protein (1.9 g/100g); low in fat (1.9 per 100g); good source of calcium (144.6 mg/100g); rich in phosphorus (109.9 mg/100g) and good source of iron (2.9 mg/100g). It was moderately acceptable based from appearance which was the most preferred attribute while texture as the least. Its expiration date was on the seventh day after baking. The plastic bag preserved its shelf life longer than the plastic container. The selling price per pack (five cookies) is P29.67. Thus, a vegan jackfruit seeds' cookie with loaded nutritional and mineral contents, delicious, affordable and individually packed in a plastic bag was developed and marketed.

Keywords: jackfruit seeds, vegan cookie, nutritious and healthy

HS - 09

**COMPARATIVE IN-VITRO EFFECT OF BEVACIZUMAB,
MITOMYCIN C, 5-FLUOROURACIL AND
TRIAMCINOLONE ACETODINE ON HUMAN TENON'S
FIBROBLAST PRIMARY CULTURE**

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Glaucoma is the second leading cause of irreversible blindness in the world and the leading cause in the Philippines. To manage glaucoma, trabeculectomy is commonly performed. However, development of scar brought by fibroblast proliferation and collagen deposition is a common challenge in trabeculectomy that most ophthalmologists encounter in the clinics. Anti-fibrotic agents such as mitomycin C and 5-fluorouracil have been reported to improve incomplete healing but negative reports on its postoperative complications are also noted. This study wants to compare in-vitro effects of 4 drugs namely: Bevacizumab, Mitomycin C (MMC), 5-Fluorouracil (5-FU) and Triamcinolone Acetodine (TAA) on primary culture of human tenon's fibroblasts. Explants were cultured from human tenon's fibroblasts collected from a patient without previous history of ocular surgery. A 3-fold decrease in concentration was done in each of the drug being tested. The resazurin fluorometric assay showed significant decrease in fibroblasts in the MMC group as compared to 5-FU, Bevacizumab, TAA and control group. The effect of MMC was dose dependent and the half-maximum inhibitory concentration (IC_{50}) computed was at 12.16 μ g. Findings of this study provide further basic evidence supporting the effectiveness of mitomycin c as an anti-fibrotic agent. The generated IC_{50} may be of value as to guide clinicians in the minimum amount of intraoperative exposure required to achieve a significant effect on target cells.

Keywords: glaucoma, trabeculectomy, fibroblast, mitomycin c

HS - 10

EFFECT OF PACKAGING MATERIAL TO THE PHYSICO-CHEMICAL PROPERTIES OF THE RADIATION STERILIZED HONEY ALGINATE WOUND DRESSING FOR EXUDATING WOUNDS

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Honey-alginate wound dressing was developed at PNRI which was suitable for radiation sterilization at 25 kGy in its packaged form. Locally produced honey was incorporated with alginate to obtain a wound dressing with gel-forming properties, slightly acidic pH suitable for good wound-healing and low moisture content ideal for longer shelf-life. In order to obtain the optimum conditions of packaging for the honey alginate wound dressing, two different packaging material i.e. laminated packaging films made from polyethylene terephthalate-polyethylene (PET-PE) and laminated packaging films from polyethylene terephthalate-Foil-polyethylene (PET-foil-PE) are compared as to the different physicochemical properties such as pH, moisture content and colour intensity for a one-year shelf-life study. No significant difference between the packaging materials in terms of pH was observed after one year storage but the Honey-alginate dressing packed in PET-Foil-PE was observed to maintain its moisture content through time and the rate of browning based on colour intensity is higher in PET-PE than in PET-Foil-PE. This reflects the change in the amount of pigments responsible for its antioxidant property. We therefore conclude that PET-Foil-PE provided better packaging environment for Honey-alginate wound dressing than PET-PE after one-year storage.

Keywords: honey, alginate, wound dressing, exudating wounds, packaging

**MATHEMATICAL
AND PHYSICAL SCIENCES**

MPS - 01

FATTY ACID GRAFTED COIR DUST AS OIL SPILL ABSORBENT

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The study is about the modification of coir dust to obtain low cost absorbent for diminishing an oil-products spill in seawater. The efficacy of surface modification of coir dust by fatty acid (stearic acid) and vegetable oil (coconut oil) were evaluated. Prior to modification, the coir dust was obtained by separating the coir from the husk of coconut. It was ground followed by screening and sieving to obtain a uniform size. The desirable grain size of the coir dust was particularly preferred to be in the range of about 0.5-3 mm with moisture content of 12.03% (± 0.06). Alkali treatment was carried out by soaking the coir dust with 0.015% sodium hydroxide overnight. The moisture content of the alkali treated coir dust was determined at 7.0% (± 0.51). The alkali treated coir dust was then analyzed for tannin content. Results showed a decrease of about 61%. Untreated coir dust had 3.64% (± 0.02) of tannin while the treated coir dust had 1.424% (± 0.07) of tannin. The alkali treated coir dust was then coated with stearic acid and coconut oil with a ratio of 1:3:0.1. The fatty acid grafted coir dust was subjected for IR analysis to confirm the presence of stearic acid. There was no difference observed in the spectra even at varying concentrations of stearic acid. The result is also in conformity with the spectra of the pure stearic acid. The surface structure of coir dust treated with alkali and acid were analyzed using a microscope. Untreated coir dust and treated with water gave a more compact structure than the coir dust treated with alkali. The results of the absorbency test by sorption method using seawater contaminated with diesel showed an absorbency of 33.3% for the pelletized form while the powder form is 73.0%. Using seawater contaminated with lube oil showed 63.5% absorbency in pellets and 58.0% for the powder. The pelletized grafted coir dust can absorbed more lube oil than diesel while the powder form can absorbed diesel oil.

Keywords: Coir dust; Fatty acid; Oil-spill; Absorbent; Sorption method

MPS - 02

DEVELOPMENT OF CHITOSAN-CALCIUM CARBONATE COMPOSITE FROM KITCHEN WASTE FOR OIL SPILL REMEDIATION

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Oil spill and solid waste disposal are some of the pressing environmental problems of the country. Thus, utilization of solid waste as high value sorbent material for oil spill is gaining importance. Chitosan and calcium carbonate are among the excellent candidate for the adsorption of oil spill due to their unique properties such as biocompatibility, biodegradability and intrinsic porous structure. In this study, chitosan containing calcium carbonate was synthesized from waste shrimp skin while calcium carbonate was obtained from chicken eggshells. Chitosan was dissolved in acetic acid solution, mixed with powdered calcium carbonate and then dried to produce the composite film. The amount of chitosan and calcium carbonate were varied (50:50; 40:60 and 30:70) to determine the optimum mixture that will offer best results in the removal of oil from water. Surface characterization using optical microscope and scanning electron microscopy (SEM) exhibited the detailed morphology and uniform dispersion of the needle-shaped inorganic mineral (CaCO_3) on the organic matrix (chitosan). XRD analysis showed sharp peaks at $2\theta = 9.40^\circ, 29.7^\circ, 37.3^\circ$ which are the characteristics of crystalline chitosan and calcite polymorph of CaCO_3 . Treatability study of oil spill remediation using chitosan-calcium carbonate composite film was carried out by preparing a simulated diesel oil contaminated water sample which was allowed to pass through the composite film by external pressure. Oil removal efficiency test of different CaCO_3 -chitosan composite films demonstrates that 50:50 composite film is the optimum ratio that yield a highest oil removal efficiency of 99%. The oil adsorption capacity of 50:50 chitosan- CaCO_3 composite film is 4.03g/g which is 4 times of its weight.

Keywords: chitosan, calcium carbonate, SEM, oil removal efficiency, adsorption capacity

MPS - 03

**ANTIBACTERIAL EFFECTIVENESS OF DIFFERENT
BRANDS OF GLUTARALDEHYDE IN
DIFFERENT SOAKING TIME PERIODS AND
ITS EFFECT ON CARBIDE BURS**

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The study analysed the bactericidal property of two different brands of Glutaraldehyde: Cidex and Deconex, in disinfecting and sterilizing dental carbide burs for 10 hours and 20 minutes. It also evaluated the change in surface dimensions of the burs when different brands of Glutaraldehyde were used for the different time periods. Six straight-fissure dental carbide burs of size FG-57 were used in the study all belonging to the same brand SSW. Six burs were evaluated under the Scanning Electron Microscope before and after soaking the bur in Cidex for 20 minutes, and 10 hours, Deconex for 20 minutes and 10 hours, water for 20 minutes and 10 hours. Results showed that Cidex at 20 minutes does not kill all the bacteria when used for dental carbide burs possibly due to the fissures and grooves present on them. Thus it can be used as a disinfectant of dental carbide restorative burs only. Deconex at 20 minutes does not kill all the bacteria when used for dental carbide bur either thus it can be used as a disinfectant of dental carbide burs but not for sterilization. Cidex (2.2-2.7%) at 10 hours can be used as a sterilizing agent for dental carbide burs. Deconex at 10 hours also could not eliminate all the bacteria from the contaminated carbide bur. Thus it can be used as a disinfectant not a sterilant for dental carbide burs. Cidex proved to be effective for sterilization of carbide burs at 10 hours as compared to 20 minutes which was not successful at destroying all the bacteria. Deconex at 10 hours was 2.5 times more effective in disinfecting carbide burs as compared to 20 minutes.

Keywords: antibacterial, glutaraldehyde, carbide burs

MPS - 04

THE OCCURRENCES OF SMECTITE IN THE DIFFERENT ROCK FORMATIONS UNDERLYING THE MARIKINA WATERSHED AND THEIR IMPLICATIONS TO LANDSLIDE VULNERABILITIES

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Landslides are natural disasters that have affected the Marikina Watershed, threatening the safety of communities and the integrity of the area. One of the causes of this complex event is the nature of the underlying soil and rock formation. The presence of expansive clays that under the Smectite Group have changed the physical properties of the underlying soil and rocks making them unstable because of the shrink and swell behaviour or repeated expansion and contraction of clays with the presence of water. This study looked into the relationship between presence of smectite, rock type and landslide occurrence in the watershed. Landslide-prone and landslide-affected areas were visited and rock, soil and sediment samples were taken for analysis. The rocks that were characterized belong to the Kinabuan, Angat and Guadalupe Formations. The presence of clay was determined through X-Ray Diffraction Analysis through bulk, random, orientation and glycolation tests were done using an X'Pert PRO PANalytical machine. Smectite was found to occur in rocks of andesitic to basaltic composition as well as in sedimentary rock formations dominated by shale-clay layers. The areas underlain by these types of rocks have experienced landslides in the past thus are vulnerable to future landslide events. It is therefore important that in the study of landslides, the various occurrences of smectite should be determined and they could either be as weathering products of volcanic rocks or as significant clay components in sedimentary layers. With the presence of smectite and with other landslide inducing factors like climate, fractures, slope angle and others coming into play, mass movements would eventually happen.

Keywords: Smectite, Marikina watershed, landslides

MPS - 05

**ARSENIC ACCUMULATOR *Pityrogramma calomelanos*
IN THE LEPANTO ENARGITE MINE,
BENGUET, PHILIPPINES**

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The Lepanto Enargite Mine is a major copper-gold mine in northern Luzon with an ore deposit characterized by copper-arsenic-gold assemblage. With arsenic (As) enriched Cu-Au ores, it is expected by natural dispersion and disposal of processed ores that certain areas around the mine are contaminated with As. This study looks into the existence of certain pioneering plants that thrive in these contaminated areas. There are a number of fern species distinctively occurring within the abandoned old tailings ponds and around the Japanese Tunnel. Most common are *Nephrolepis hirsutula*, *Histiopteris incise*, *Pteris sp.*, and *Pityrogramma calomelanos*. The study focused on *P. calomelanos*, being the most abundant species, determining the As accumulation capabilities of the plant. Both soil and plant samples were prepared for arsenic analysis using flame atomic absorption spectroscopy (FAAS) and protocols adopted from the Association of Analytical Communities (AOAC). Plant samples of *P. calomelanos* and the soils they thrive in were collected and analyzed for As content. The average As content in the soil samples collected from the Japanese Tunnel area is about 6.40ppm. The As content of the above ground and below ground components of *P. calomelanos* is about 1,050ppm and 1,165ppm respectively. The translocation factor (TF) is 0.90 and the phytoextraction coefficient (PC) is 177.34. With the computed TF and PC values *P. calomelanos* is identified to be an As accumulator that can tolerate (and absorb) As in the soil thus making it a potential plant species for mine remediation and rehabilitation.

Keywords: *Pityrogramma calomelanos*, arsenic, Lepanto enargite mine

MPS - 06

PREPARATION, CHARACTERIZATION, AND PERFORMANCE EVALUATION OF PULSE ELECTRODEPOSITED PtSn ELECTROCATALYST ON PEDOT/GRAPHENE-BASED ELECTRODE FOR DIRECT ETHANOL FUEL CELL

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Fuel cell technology is one of the most remarkable fields of research due to its promising developments in the area of alternative energy sources. Improvement of the catalyst is one of the major difficulties faced in the feasibility of fuel cells. In this research, a method was optimized for the synthesis of PtSn nanocatalyst on PEDOT-modified graphene-based electrodes for direct ethanol fuel cells. Pulse electrodeposited PtSn nanocatalyst on PEDOT-modified electrochemically exfoliated graphene was performed. The preparation of electrode was done in three steps. First, a 20 μL electrochemically exfoliated graphene (0.5 mg/mL) was drop-casted on the surface of glassy carbon electrode and the electrode was dried at 60°C. Second, potentiodynamic electropolymerization of 3,4-ethylenedioxythiophene (EDOT) was done using 0.01 M EDOT and 0.10 M HClO_4 on a graphene-based electrode at a potential range from 0 to 1.10 V (vs. Ag/AgCl) for 20 cycles at a scan rate of 50 mV•s⁻¹. Lastly, pulse deposition of PtSn on the PEDOT/graphene electrode was done using 10 mM $\text{H}_2\text{PtCl}_6 \cdot 6\text{H}_2\text{O}$ in 0.10 M H_2SO_4 solution and 10 mM $\text{SnCl}_2 \cdot 2\text{H}_2\text{O}$ in 0.10 M HCl. Pulse deposition of PtSn nanoparticles was carried out using the following optimized parameters: -1.235 V of pulse potential for Pt and 0.362 V of pulse potential for Sn, with 0.1 s on-time and 5 s off-time at 700 pulses. Electrocatalytic activity of the prepared nanocomposites was evaluated and compared towards ethanol oxidation using 1.0 M ethanol in 0.10 M H_2SO_4 electrolyte solution from $E = 0.0$ V to $E = 0.90$ V (vs. Ag/AgCl) at a scan rate of 100 mV•s⁻¹.

Keywords: graphene, electropolymerization, pulse deposition, direct ethanol fuel cell, PtSn electrocatalyst

MPS – 07

**ASSESSMENT OF MERCURY EXPOSURE AMONG
RESIDENTS OF A MINING COMMUNITY IN
ITOGON, BENGUET THROUGH HAIR ANALYSIS**

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Mercury (Hg) exposure from the processing of gold in small-scale mining has been given minimal attention despite numerous studies showing its significant threat to the environment and human health. Unfortunately, except for occupation, little is known about the determinants of Hg exposure with sources of samples mostly limited to blood and urine. This study aimed to measure the extent and nature of mercury contamination through analysis of hair samples among the residents of a mining community in Itogon, Benguet.

A structured questionnaire was administered to the volunteers prior to hair sampling. The analytical methods included: Cold Vapor Atomic Absorption Spectroscopy (CVAAS) for analysis of Total mercury (% recovery = 98.35% - 101.38%); Gas Chromatography – Electron Capture Detector (GC-ECD) for methyl mercury (% recovery = 105%). For inorganic mercury determination, Toluene Extraction Method for removing organic mercury was used before using CVAAS (% recovery = 36%) using a certified hair reference material from the National Institute for Environmental Studies of Japan.

Results showed that age and sex are the most significant determinant of Total mercury exposure. Males (1.277 ± 0.446 ng/μg) were found to have significantly higher mercury concentration than women (0.6501 ± 0.163 ng/μg). Those who belong to the 41-50 age group (3.129 ± 2.33 ng/μg) contained a significantly higher mercury concentration in their hair. The total mercury concentration in hair samples was mostly inorganic in nature compared to methyl mercury. The presence of mercury, albeit within the safe limits, highlights the need for strict implementation of policies to stop its use in the processing of gold ores to prevent further deterioration in the health of the community and their environment.

Keywords: Total-, methyl-, and inorganic mercury; small-scale mining; hair analysis

MPS – 08

PREPARATION AND CHARACTERIZATION OF A NOVEL WOUND DRESSING BASED ON SILVER NANOPARTICLE- IMPREGNATED BACTERIAL CELLULOSE-ALOE VERA

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Ideal wound dressings stimulate wound healing, control unpleasant odors, and provide antimicrobial action in wounds. However, most traditional wound dressings exhibit exudate leaking which increases the risk of infection and delayed wound healing of tissues. This study aims to develop and characterize a bio-composite of bacterial cellulose and aloe vera having the ideal features of a wound dressing from *Acetobacter xylinum*-activated culture medium supplemented with various aloe vera concentrations and the film which exhibits the most uniform results is used for the incorporation of silver nanoparticle as an antibacterial agent.

The biopolymer composites of bacterial cellulose and aloe vera were developed by adding 0-50% aloe vera in the *A. xylinum*-activated coconut water during biosynthesis in static cultivation for 7 days. The films obtained after drying the membranes were named as bacterial cellulose-aloe vera (BC-A) films. The moisture content of the films reached 99% which indicates that the films may be suitable for providing a moist environment to facilitate wound healing fast. With the addition of aloe vera up to 30% (v/v) during BC synthesis, it resulted in a significant improvement in the water absorption capacity of the films showing a WAC ratio of 36.46 (r.s.d.= 12.17%, n=3) compared to the unmodified film having a ratio of 9.03 (r.s.d.= 13.95%, n=3). However, the addition of aloe vera at a concentration greater than 30% (v/v) resulted in a decrease in pellicle formation which can be observed from the very weak properties of the films.

The BC-A (30%) displayed significantly improved properties in comparison to the unmodified BC film. Also, it is capable of absorbing high amount of water than its weight and can act as a potential wound dressing which reduces irritation and inflammation.

Keywords: bacterial cellulose, aloe vera, biopolymer composite

MPS – 09

**FORMULATION OF FACIAL SERUM USING
SEMI-PURIFIED EXTRACT OF *Premna odorata*
BLANCO (ALAGAW) LEAVES**

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Facial serum was formulated using partially purified verbascoside from *Premna odorata* Blanco leaves as active component. Extraction was carried out using 80% ethanol with a yield of 46.20%. The presence of verbascoside as active component was confirmed through TLC, HPLC and FTIR. Further, the anti-oxidant activity of the semipurified extract was tested using the DPPH assay. The serum was formulated using 10% w/w of the semipurified extract. The efficacy of the formulation was evaluated using animal model (32 Sprague Dawley rats) and using 30 human volunteers as subjects (ages 25-65 years old). The human subjects applied the formulation onto their face at night time for a period of one month. Stability and safety of the product were also evaluated. The product was found to possess anti-oxidant property as shown by the 78.45% inhibition in the DPPH assay as compared to the 77.17% inhibition of the Vitamin C standard. The formulated facial serum was also found to be stable for 2 years at room temperature and did not produce any signs of skin irritation when applied as confirmed in the dermal patch test. Over-all the formulated facial serum was evaluated extremely effective (mean= 4.99) by the 30 human subjects using a self-made assessment tool. The tightening of the skin as reported by the participants was confirmed by the enhanced collagen production in the dermal layer of the skin section stained with Masson's Trichrome stain for collagen.

Keywords: *Premna odorata*, verbascoside, semi-purified, collagen-enhancing, anti-oxidant

MPS – 10

HIGH ACCURACY QUANTIFICATION OF FOOD ADDITIVE BY EXACT MATCHING ISOTOPE DILUTION LIQUID CHROMATOGRAPHY MASS SPECTROMETRY

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Analytical challenges in obtaining accurate, reliable and sensitive method was approached using Exact Matching Isotope Dilution Liquid Chromatography Mass Spectrometry (ID-LC/MS/MS) in this study. The method was developed, optimized and validated for the quantification of additive like benzoic acid in mango juice. Benzoic acid is a common additive in foodstuffs and has been regulated internationally for food safety issues. Benzoic acid standard and isotope-labeled internal standard benzoic acid (Ring D5) in approximately 1:1 ratio was used in the quantitation. The chromatographic separation used Agilent Zorbax Eclipse Plus C18 (100 mm × 4.6 mm, 3.5 μ m). An isocratic program was used at a flow rate of 0.3 mL·min⁻¹ with acetic acid - ammonium buffer (pH 4.5). The Triple Quadruple Mass Spectrometer was operated with electrospray ionization in the negative mode. Benzoic acid and its isotope analogue were detected by selectively monitoring the collisionally-induced dissociation channels of [M-H]⁻ → [M-CO₂H]⁻ at m/z 121.1 → 77.2 and m/z 126.1 → 82., respectively. Repeatability studies showed that the ID-LC/MS/MS for benzoic acid is a reliable and precise technique which can provide less than 1.5 % relative standard deviation (rsd). The limit of detection (LOD) obtained for this method was 0.151 mg/kg. A good linearity over a range of 0.0555 – 13.795 mg/kg was demonstrated. This method is a candidate primary method and it can be a reference method that can be used in the assignment of reference value of proficiency test samples and reference materials. The analysis of certified reference materials further support the establishment of traceability of measurement to international standards (SI).

Keywords: isotope dilution, liquid chromatography mass spectrometry, benzoic acid, traceability, reference method

MPS – 11

**CONTRASTING PATTERNS OF CHANGES IN ROOT
BIOMASS AND ORGANIC MATTER CONTENT IN
MANGROVES DAMAGED BY SUPER TYPHOON HAIYAN**

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We investigated the relationships of post-typhoon changes in both vegetation and soil characteristics with root biomass and carbon content in mangroves damaged by Super Typhoon Haiyan. Both sites (located in Isabel and Ormoc, Leyte) are within the 20-km radius of the typhoon path. Three replicate transects were randomly assessed in each site. Three plots were assessed per transect representing different tidal inundation (low vs. mid vs. high). The vegetation and soil pore water physico-chemical parameters from each plot at low tide. In each plot, core samples were collected at 20-cm depth and were sectioned every 5-cm for the analyses of root biomass and organic matter (OM) content. Results showed significant difference between sites, with zones and soil depths and are correlated with the canopy cover (in the vegetation) and with temperature and redox (in the soil). Isabel has higher OM content and higher root biomass than Ormoc. Plots that are highly inundated and are within the upper 0-10cm depths have at least 30-50% higher OM and root biomass than that of highly inundated and deeper depths. Our findings showed a contrasting pattern of post-typhoon regeneration (with habitat conditions) that will be important in evaluating potential recovery trajectory from a catastrophic disturbance.

Keywords: mangroves, vegetation, soil, Super Typhoon, Haiyan, regeneration, trajectory

MPS – 12

EFFECTS OF ACTIVATED AND UNACTIVATED CARBONIZED RICE HULL (ACRH & UCRH) IN ORGANIC FERTILIZER PRODUCTION

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Carbonized Rice Hull (CRH) is an agricultural biomass that is used as an additive for organic fertilizer production. Activation of CRH enhances its natural gas and odor absorbent properties. This study evaluated the effect of applying activated and unactivated CRH in organic fertilizer production and compares it with the conventional method (control) with regards to gas (i.e. carbon dioxide, carbon monoxide, total volatile organic compounds, nitrogen dioxide and ammonia) and odor emissions, duration of decomposition, nutrient composition and recovery rate.

Results showed that during decomposition, ACRH is more effective than UCRH and the control in limiting gas and odor emissions. ACRH has faster decomposition period (32 days) than UCRH (45 days) and the control (55 days). The highest recovery rate (or amount of harvested compost) was observed in ACRH (65.16%), followed by UCRH (59.92%). The control has the lowest (45.81%). However, the nutrient composition of the compost, expressed in total percent Nitrogen, Phosphorous and Potassium (NPK) content, was observed to be highest in the control (8.82%). This content passes the standard (5 to 7%) of the Fertilizer and Pesticide Authority (FPA) in order to be categorized as organic fertilizer. The total NPK content of the ACRH and UCRH did not pass the FPA standard (3.47% and 3.85%, respectively). The results indicated that ACRH and UCRH significantly regulate gas and odor emission but does not improve the nutrient content of the organic fertilizer. Appropriate amount of CRH that does not significantly affect the nutrient content must be further explored.

Keywords: activated carbonized rice hull, organic fertilizer, gas, odor

MPS – 13

**ASSESSING MERCURY AND ARSENIC CONTAMINATION
IN BLOOD AND URINE OF RESIDENTS OF A SMALL-
SCALE GOLD MINING COMMUNITY IN BENGUET**

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Small-scale mining in the Philippines is considered a major income opportunity in rural communities but is a risky venture due to environmental and health repercussions. A major health effect is the entry of toxic heavy metals, such as mercury (Hg) and arsenic (As), inside the body. This study was conducted in a small-scale mining community in Benguet to determine human arsenic and mercury contamination in blood and urine samples from residents and to evaluate the extent of possible negative health effects. Eighty-one volunteers (30 miners, 35 non-miners, 16 control) were examined using a standardized questionnaire and clinical exam. Blood and urine samples were taken from participants and analysed for total Hg and As using atomic absorption spectrometry (AAS). Chemical analyses reveal the following results: 16 out of 30 miners positive for urine Hg (mean = 0.049 ug/l, SD= \pm 0.069 ug/l) and 1 out of 30 miners positive for blood Hg; 8 out of 35 non-miners positive for urine Hg (mean=0.018 ug/ml, SD= \pm 0.017 ug/ml) and 2 out of 35 non-miners positive for blood Hg (mean = 0.025 ug/ml, SD = \pm 0.007 ug/ml); 4 miners out of 30 positive for blood As (mean= 0.082 ug/ml, SD = \pm 0.0025 ug/ml). All participants tested negative for As in urine. Positive results indicate heavy metal presence with little or no toxic effect but may manifest significant symptoms if exposure is sustained.

Keywords: small-scale mining, mercury, arsenic, urine, blood

MPS – 14

DISCRIMINATION OF SEVERAL PHILIPPINE *Pandanus* SPECIES USING GAS PHASE FTIR

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A chemometric discrimination techniques for several Philippine *Pandanus* species, using gas phase Fourier Transform Infrared Spectroscopy (FTIR), was explored in this paper. Headspace volatiles were generated from each *Pandanus* sample after 40 minutes of incubation in a tightly sealed sample chamber. The static headspace generation parameters were optimized to increase the volatile metabolites generated from the *Pandanus* samples. FTIR studies revealed alcohols and carbonyls as dominant functional groups present in the said volatiles. Principal component analysis (PCA) of FTIR data, showed clustering of the different *Pandanus* species.

Keywords: Gas Phase FTIR, Headspace, *Pandanus*, PCA, Chemometrics

MPS – 15

**ISOLATION AND SCREENING FOR CELLULOSE
DEGRADING BACTERIA FROM FOREST
PLANT LITTERS**

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Cellulose is the most abundant renewable energy and material resource. The production of biobased products and bioenergy from less costly renewable lignocellulosic materials is important. Bioconversion of these lignocellulosic materials involves microorganisms with the ability to decompose cellulose thru the action of their enzyme. This study was conducted to isolate cellulose-degrading bacteria (CDB) from forest plant litter and to quantify and qualify their cellulolytic activity. From a total of 51 bacterial isolates, 13 exhibited cellulolytic activity in Mineral Salt Medium with carboxymethyl cellulose (MSM-CMC) as shown by the zone of clearing when flooded with Lugol's solution. The cell-free supernatant of the 13 isolates were tested for cellulose-degrading activity in varying concentration (0.10%, 0.15%, 0.20%, 0.30%) of CMC. Nine (9) out of the 13 supernatants produced clear zone in all concentrations of CMC, with diameter ranging from 1.27cm to 2.33cm. Statistically, there was no significant difference in the cellulose-degrading activity of isolates' supernatants across CMC concentrations at $p = 0.05$ except for the supernatant of isolate OC26 and isolate OC27 with $p =$ values of 0.0039 and 0.0002. The ability of the CDB to utilize sawdust as alternative source of carbon was determined. The rate of cellulose conversion was calculated using difference method. Isolate OC25 was able to degrade sawdust at rate of 32% followed by OC12 with 30% and OC10 with 28%. Morphological and physiological tests revealed that all the CDB isolates were Gram negative, non-spore forming, uncapsulated, catalase positive, motile, facultative anaerobic short to long rods which are capable of growing at temperature between 5°C and 30°C and at slightly acidic (pH 4.0) to slightly alkaline (pH 8.0) environment but with optimum growth at 20°C and pH 7.0.

Keywords: Cellulose, Cellulase, Cellulose-degrading bacteria, Forest Plant Litter

MPS – 16

FRACTIONATION OF ENZYMATIC *Citrofortunella microcarpa* EXTRACT THROUGH SUPERCRITICAL CARBON DIOXIDE (SC-CO₂)

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Calamansi, *Citrofortunella microcarpa* extract are commonly used for sauce mix together with any kind of vinegar or soy sauce in any Filipino dishes. In this study, an enzymatic extract from DA-PIU was subjected for supercritical carbon dioxide (SC-CO₂) fractionation and identifies volatile component together with fatty acid profile in different fractions. There are three fractions obtained from extraction, 10 Megapascal (MPa), 20MPa and 30MPa respectively. Ten Megapascal obtains the highest oil yield at 29.83%, followed by 20MPa at 13.13% and the least 30MPa with 7.85%, these are done in triplicates. Ten Megapascal sample was subjected for gas chromatography-mass spectrometry and obtained eleven compounds in which (+)-alpha-terpineol and geranyl acetate as major compounds. For fatty acid profiling, pure crude enzymatic, 20MPa and 30MPa sample was subjected to gas chromatography (GC) and was compared. Essential fatty acid Linoleic (C18:2) was highest in 30MPa sample followed by pure crude and 20MPa in terms of weight by weight. Linolenic (C18:3), also an essential fatty acid was highest at 20MPa and 30MPa compared from the original sample which is the pure crude enzymatic. There are other fatty acid which was found in 20 and 30MPa sample that was not found in pure crude enzymatic sample and vice versa.

Keywords: supercritical carbon dioxide fractionation, enzymatic calamansi, gas chromatography, mass spectrometry, fatty acid profiling

MPS – 17

HIGHLY CONVERGENT SYNTHESIS OF CHLOROBENZYLATED CHALCONE-AZOLE HYBRIDS WITH ANTI-STAPHYLOCOCCAL, ANTI-TYROSINASE AND ANTI-ACETYLCHOLINESTERASE ACTIVITY

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Many biologically active natural products and pharmaceuticals prominently contain the chalcone substructure. The Michael system taking the form of an α,β -unsaturated carbonyl motif make it an excellent acceptor functionality to irreversibly bind to cellular nucleophiles, leading to successful inhibition of enzymes involved in biochemical pathways underlying a number of diseases. A series of chlorobenzylated chalcone - azole derivatives were prepared and probed for their inhibitory activities versus *Staphylococcus aureus*, tyrosinase and acetylcholinesterase. The compounds were obtained through a convergent approach involving Williamson etherification, iodine-promoted oxidative azole synthesis and Claisen-Schmidt reactions. Azole substructures include simple to substituted imidazolines and 2-oxazoline. All compounds were obtained in moderate to good yields and characterized using IR, MS and NMR spectroscopy. Microplate broth dilution inhibitory assays of the compounds versus *S. aureus* revealed MIC₅₀'s ranging from 8.98 to 24.04 $\mu\text{g/mL}$. Using the dopachrome colorimetric method to assess inhibitory activity against tyrosinase, IC₅₀ values ranging from 0.087 to 0.229 mg/mL were observed. For comparison, the standard drugs streptomycin (MIC₅₀ = 6.86 $\mu\text{g/mL}$) and kojic acid (IC₅₀ = 0.074 mg/mL) were used. Against acetylcholinesterase, IC₅₀ values ranging from 0.20 to 0.84 mg/mL were noted for all derivatives using the modified Elman assay (galanthamine IC₅₀ = 0.18 mg/mL). Our results indicate the potential of chalcone-azole hybrids as anti-cancer, anti-infective and anti-Alzheimer's agents.

Keywords: chalcone-azole, convergent synthesis, anti-*Staphylococcus*, anti-tyrosinase, anti-cholinesterase

MPS – 18

EFFICACY OF CLOVE ESSENTIAL OIL (*Syzygium aromaticum*) INFUSED IN GELATIN-BASED FILMS EXTRACTED FROM GOAT (*Capra hircus*) SKIN AS AN ACTIVE COMPONENT FOR PACKAGING

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A study which focused on the efficacy of clove essential oil as an active component in gelatin-based films extracted from goat skin for the production of an active packaging was conducted. The film forming solutions (FFS) were formulated at 6% (stable state), infused with varying concentrations (0.5%, 1.0%, and 1.5%) of Clove essential oil (CEO) and subjected to various analyses which were all made with three replications. The antibacterial property of the film solutions was tested against *Staphylococcus aureus* and showed negative results on all concentrations. The antifungal effect of the films against *Aspergillus sp.* was also tested and showed inhibitory effects. Treatments 2 and 3 showed ++, weak inhibitions revealing a significant difference from treatment 1 on all test runs. DPPH Radical scavenging test revealed that the films are capable of protecting the food system from oxidation. The results on the light permeability test suggested that upon the addition of the extract, regardless of the assigned concentrations, the penetration of UV light has been significantly decreased compared to that of a film without the extract. The films were also subjected to a water vapor permeability test and showed that the films were significantly capable of retarding moisture migration into and from the system. Based on the results, FFS from goat skin collagen has a potential to be an effective active packaging.

Keywords: clove essential oil; goat skin collagen; active packaging

MPS – 19

ANALYSIS OF SELENIUM IN BLOOD USING GRAPHITE FURNACE ATOMIC ABSORPTION SPECTROSCOPY (GFAAS)

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Selenium (Se) is a trace element with nutritional significance as shown in studies on patients of Keshan disease, cardiovascular diseases, viral infections, diabetes and neurological disorders; who have benefited from Se supplementation. On the other hand, excessive intake of Se may result to skin discoloration, hair loss and deformation of nails. On this account, selenium analysis of human blood is necessary for physicians who wish to monitor selenium levels of their patients. Flame AAS (FAAS) analysis of Se usually results in poor sensitivity and recovery. In this study, we demonstrate that GFAAS with deuterium background correction can circumvent the problems encountered in FAAS analysis of Se in human blood.

Good linearity was obtained for Se standards over the concentration range of 0-5.0 ng/mL. Results were repeatable with % CV below 10 %. Limit of detection (LOD) and limit of quantitation (LOQ) were determined to be 0.08 ng/mL and 0.27 ng/mL, respectively.

Wet acid digestion was done, using 3:1 nitric acid/sulphuric acid, for sample pre-treatment. Known amounts of Se standards were spiked in blood samples and analysed for Se. Obtained % recovery ranged from 84.7-98.7 %. Blood samples from healthy volunteers were also analysed for Se and values obtained ranged from 2.08-11.7 µg/mL, which were comparable to selenium blood levels of subjects in other studies.

This study shows that GFAAS with deuterium background determination is a sensitive method for analysis of Se in human blood.

Keywords: GFAAS, selenium, whole blood, deuterium background correction

MPS – 20

**PHYTOCHEMICAL SCREENING AND PRELIMINARY
ANALYSIS OF THE ANTI-OXIDANT ACTIVITY OF
Sargassum crassifolium J.G. AGARDH**

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Healthy diet is often associated with lower risks of dreadful diseases. This principle has been attributed to the presence of various forms of phytochemicals and antioxidants present in the foods. The present investigation deals with the characterization of the phytoconstituents and evaluation of the antioxidant activity of *S. crassifolium*. There were five different extractants used in the phytochemical screening i.e. ethanol, methanol, hexane, ether and 1% hydrochloric acid and three different solvents i.e. aqueous, ethanol and methanol were used for the antioxidant assays. Forty five tests were conducted for the presence or absence of phytoconstituents in the seaweed extracts. Thus, out of 45 tests, 19 gave positive results and the other extracts gave negative results. The 19 positive results showed the presence of varying degrees of alkaloids, coumarins, flavonoids, tannins and terpenoids. The antioxidant activity of *S. crassifolium* extracts was evaluated by using DPPH (2, 2-diphenyl-1-picrylhydrazyl) assay and Total phenolic content assay. The tested extracts exhibited a dose-dependent free radical scavenging action against DPPH radical. The decreasing of purplish visible color of DPPH compound when mixed with the different concentrations of the seaweed extracts was evident. This reaction indicates that *S. crassifolium* contains free radical chain formation mechanism making it possible as antioxidant agent. Total phenolic content was evaluated following Folin-Ciocalteu method. Result suggests that phenolic content and antioxidant activity are highly correlated with a correlation coefficient (R²) of 0.963. The antioxidant activity of *S. crassifolium* might be related to its phenolic substrates. The results of the present study indicate that *S. crassifolium* has the potential as ingredient for functional food or medicinal agent in pharmaceutical industry.

Keywords: Sargassum, phytochemical screening, anti-oxidant activity, DPPH assay, Total phenolic content assay

MPS – 21

SENSORY QUALITIES OF COCONUT WATER-BASED MARINATED MULLET *Mugil cephalus* CHUNKS

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Coconut water is often discarded in any industrial activities like virgin coconut oil production, hence can be considered be waste materials. This material can be a good source of food ingredient for some oil/fat extraction. Mullet is considered low cost fishes due to its taste which can be enhanced through pickling process. The study aimed to determine the sensory qualities of mullet chunks treated with marinade solution containing coconut water as basic ingredient as a substitute to vinegar, the traditional basic ingredient in marinated solution. This utilized the experimental method of research employing the three treatment formulations; that is: Treatment 1, marinated solution containing 100% vinegar with seasonings; Treatment 2, marinated solution containing 50% vinegar and 50% coconut water with seasonings; and Treatment 3, marinated solution containing 100% coconut water with seasonings, based on sensory evaluation using descriptive and preference testing on color, taste and texture. Based on the Analysis of Variance at 5% level of significance, all attributes of marinated mullet chunks significantly differs. Marinated mullet chunks with marinade solution containing 100% coconut water had general acceptability rating of **“like very much”** with weighted mean score of 8.48 with flesh-like color, very tasty and firm in texture. Hence, the sensory qualities of marinated mullet chunks using coconut water as basic ingredient of marinade solution are very much preferable pickled product. Adoption of proposed recipe of coconut water-based marinated mullet chunks is recommended.

Keywords: coconut water, mullet, chunks, pickled product

MPS – 22

DEVELOPMENT OF PRINTER INK FROM CEPHALOPODS

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The production of the squid ink developed by the Cebu Technological (CTU), Main Campus-Technology Research Center (TRC) researchers, promote the utilization of ink from sac of Cephalopods particularly Squid, Diamondback Squid and cuttlefish that may influence the decrease in the actual cost of commercial ink. The squid ink using different species of cephalopods is superimposed with water, acid, glycerin, thinner and varnish. This is a liquid containing black pigment used for coloring a surface to render an image or text, drawing or writing with a pen and now as printer ink. The developed printer squid ink from *Thysanoteuthis rhombus*, cuttlefish and squid were enhanced with virgin coconut oil and resulted to **light black** color, **moderately desirable** solvent-like odor, **sharp regular line, thin and dry** ink consistency as perceived by the Bachelor of Science in Graphics and Design students. All attributes significantly differ among ink sac from different species of Cephalopods based on Analysis of Variance and Duncan Multiple Range Tests at 5% level of significance. The printer ink from squid had a density (0.98 g/ml) closer to commercial ink and is safe for use, since the lead content was less than 3.00 ppm. The squid ink were tested as printer ink and found comparable with commercialized printer ink using different mode of printing. The researchers are on their way to refining the ink density towards wider application of the newly formulated ink from a natural source.

Keywords: ink sac, sepia, cephalopods, printer ink

MPS – 23

**ANTIMICROBIAL ACTIVITY AND PRELIMINARY
PHYTOCHEMISTRY OF *Greeniopsis multiflora* ELMER
(MERR.)(RUBIACEAE) CRUDE LEAF EXTRACT**

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The coffee family (Rubiaceae), although the fourth largest flowering plant family in the world, is understudied in the Philippines in terms of both basic and applied research. Of particular interest is *Greeniopsis multiflora*, an endemic, uncharismatic and cryptic taxon with high pharmacological potential as revealed by recent, molecular phylogeny-based classifications. This study evaluates the antibacterial and antifungal activities of the methanolic crude leaf extract using disc diffusion (against bacteria and yeast), mycelial expansion and spore germination (filamentous fungi) methods including the influence of pH and temperature. Minimum inhibitory and bactericidal concentrations were determined by microtiter plate method. In vitro time-kill study was assessed against *Methicillin-Resistant Staphylococcus aureus* ATCC 43300 (MRSA) through plate count technique. The anti-oxidant activity was also assayed by DPPH (2,2-diphenyl-1-picrylhydrazyl) test and the chemical constituents of the crude extract were analyzed through thin layer chromatography (TLC) and bio-autography. Results showed that *G. multiflora* methanolic crude leaf extract was active against *Staphylococcus aureus* ATCC 29213, MRSA, *Staphylococcus aureus* CMS 1090 and partially active against *Enterococcus faecalis* ATCC 29212. MBC value against MRSA and *S. aureus* was 62.5 mg/mL while time-kill test against MRSA showed an instant kill and with zero colony count at 1000 mg/mL (0 h interaction) and 500 mg/mL (4 h interaction). DPPH test showed positive anti-oxidant activity. TLC results exhibited the presence of alkaloids, phenols, tannins, flavonoids, essential oils, sugar, higher alcohol and steroids.

Keywords: *Greeniopsis multiflora*, antimicrobial activity

MPS – 24

**PURIFICATION AND CHEMICAL AND SPECTROSCOPIC
PROPERTIES OF SOIL HYDROPHILIC FULVIC ACID**

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Despite the perceived view that the dynamics of soil hydrophilic fulvic acid (HiFA) regulate the fate of plant nutrients, movement and transport of metals and hydrophobic organic chemicals in soils, HiFA have been largely overlooked in biogeochemical studies. The lack of research interest on HiFA can be attributed to the complexity in its purification because FA is soluble in alkaline and in acidic conditions and that the obtained HiFA solution is contaminated by salts that is extremely difficult to remove in solution. I address this purification problem by purifying HiFA by tangential flow ultrafiltration (TFU), which is versatile in any ligands used in extracting FA in soils. This present paper is intended as an initial step with the aim to characterize soil HiFA by elemental (C, H, O, N, S) and isotope (^{13}C , ^{15}N) analyses, Fourier transform infrared (FT-IR), fluorescence spectroscopy and neutral sugars analysis. To obtain supplementary information, characteristics of soil HiFA were then compared to soil hydrophobic FA (HoFA). Results revealed marked differences between HiFA and HoFA in terms of chemical (elemental, isotopic and neutral sugar compositions) and spectroscopic properties (FT-IR, fluorescence spectra). The HiFA carbon accounted for 46 to 80% of the total FA carbon. Neutral sugar contents in HiFA is 2-fold larger than in HoFA and are mostly dominated by rhamnose, galactose and fucose, whereas in HoFA, mannose was the most abundant neutral sugars, indicating that not only the quantity, but also quality of neutral sugars varies between HiFA and HoFA. To further enhance the understanding of the characteristics and composition of soil HiFA, it is indispensable to isolate and purify HiFA. Thus, purification of soil HiFA by TFU is satisfactory for such purpose.

Keywords: elemental analysis; ultrafiltration; ^{13}C ; neutral sugars

MPS – 25

CONSTRUCTION OF AN INFINITE FAMILY OF 2-DESIGNS OVER THE INTEGERS MODULO A PRIME-POWER

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Let $\mathbb{Z}_p = \{0, 1, \dots, p-1\}$ and $\mathbb{Z}_{p^{m+1}} = \{0, 1, \dots, p^{m+1}-1\}$, be the sets of integers modulo prime and prime-power, p^{m+1} , respectively. Define the set $V = \{p^i(p+1)^j \pmod{p^{m+1}} : 0 \leq i \leq m, 0 \leq j \leq p^{m-i}\}$, of cardinality, $s = \frac{p^{m+1}-1}{p-1}$. Form the row vector, $\mathbf{u}_{p-1} = (1, 2, \dots, p-1)$, of length $p-1$ and let \mathbf{e}_{p-1} be the all-ones vector of the same length.

If we form the set of vectors, $U_h = \{v_h \mathbf{u}_{p-1} + l \mathbf{e}_{p-1} : l \in \mathbb{Z}_{p^{m+1}}\}$ for each $v_h \in V$, where addition and multiplication are done modulo p^{m+1} , then, with $\mathbb{Z}_{p^{m+1}}$ as the point-set and the collection, $U = \cup_{h=1}^s U_h$, as the block-set, a 2-design or balanced incomplete block design (BIBD) with (v, b, r, k, λ) parameters $(p^{m+1}, sp^{m+1}, p^{m+1}-1, p-1, p-2)$ can be constructed. Moreover, with $l = 0, 1, \dots, p^{m+1}-1$, we can partition the block-set U into p^{m+1} near-parallel classes C_l , each containing s blocks and missing the point $l \in \mathbb{Z}_{p^{m+1}}$, where $C_l = \{v_h \mathbf{u} + l \mathbf{e}_{p-1} : h = 1, \dots, s\}$.

For each prime number, $p \geq 3$, and positive integer, $m \geq 1$, a balanced incomplete block design of this type always exists. Thus, its totality constitutes an infinite family of 2-designs.

Keywords: 2-design or balanced incomplete block design, integers modulo n , near-parallel class, partition, prime-power

MPS – 26

SUM OF THE GENERALIZED PADOVAN SEQUENCE

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Let $n \geq 0$ and let A and B be nonzero integers with $27B^2 - 4A^3 \neq 0$ and $A + B \neq 1$. The generalized Padovan sequence $\{p_n\}$ has the recurrence relation $p_{n+2} = Ap_n + Bp_{n-1}$, where $p_0 = p_1 = p_2 = 1$. The sum of the sequence $\{p_n\}$ is denoted and given by $S_n = \sum_{i=0}^n p_i$. In this paper, we give the Binet's formula for the n -th term of the generalized Padovan sequence $\{p_n\}$ and the explicit formula for the sum of this sequence by matrix methods. To obtain these objectives, we shall consider the matrix M that will generate S_n , which is given by

$$M = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 1 & 0 & A & B \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}.$$

Using matrix methods, we show in this paper that for every $n \geq 0$,

$$p_n = \sum_{j=2}^4 \frac{\lambda_j^n (\lambda_{c_j} - 1)(\lambda_{d_j} - 1)}{(\lambda_{c_j} - \lambda_j)(\lambda_{d_j} - \lambda_j)} \text{ and } S_n = \frac{3 - A}{1 - A - B} + \sum_{j=2}^4 \frac{\lambda_j^{n+1} (\lambda_{c_j} - 1)(\lambda_{d_j} - 1)(A - 1 - \lambda_j - \lambda_j^2)}{(\lambda_{c_j} - \lambda_j)(\lambda_{d_j} - \lambda_j)(1 - A - B)},$$

where λ_2, λ_3 , and λ_4 are the eigenvalues of the matrix M which are not equal to 1, and $c_j < d_j$, $j \neq c_j, d_j$, and $c_j, d_j \in \{2, 3, 4\}$. The method used in this study is not a routine as other matrix methods since both the Binet's formula of $\{p_n\}$ and the sum S_n can be obtained from the equivalent matrix of the n -th power of the generating matrix M .

Keywords: padovan sequence, generalized padovan sequence

MPS – 27

THE SEQUENTIAL GEODETIC NUMBERS OF GRAPHS

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Given two vertices u and v of a connected graph G , the closed interval $I_G[u, v]$ is the set of all vertices lying in some u - v geodesic in G . If $S \subseteq V(G)$, then $I_G[S] = \cup \{ I_G[u, v] : u, v \in S \}$. Let $v_i \in V(G)$ for $i=1, 2, \dots, n$. We select vertices of G as follows: select v_1 and let $S_1 = \{v_1\}$. Select another vertex $v_2 \neq v_1$ and let $S_2 = \{v_1, v_2\}$. Then successively select vertex $v_k \notin S'_{k-1}$ and let $S_k = S'_{k-1} \cup \{v_k\} \cup \{u \in V(G) : u \in I_G[v_k, w] \text{ for some } w \in S'_{k-1}\}$. The sequential geodetic number of G , denoted by $\text{sgn}(G)$ is the smallest k such that there is a sequence $\langle v_1, v_2, \dots, v_k \rangle$ for which $S_k = V(G)$. The set $S = S'_k = \{v_1, v_2, \dots, v_k\}$ with $v_1, v_2, \dots, v_k \in S'_k$ for which $S_k = V(G)$ is a sequential geodetic cover of G . The sequential geodetic number is again inspired by the achievement and avoidance games. In this paper, the graphs $G = K_l + \cup K_n$ with $\text{sgn}(G)$ equals $|V(G)| - 1$ and those graphs $G = K_n$ with $\text{sgn}(G)$ equal to $|V(G)|$ are characterized. It is shown that the geodetic number (gn), closed geodetic number (cgn) and the sequential geodetic number (sgn) coincide for some particular graphs. Further, for the complete bipartite graph $K_{m,n}$ these three graph invariants are determined. Furthermore, the sequential geodetic numbers of graphs obtained from the join and corona of graphs are determined.

Keywords: geodesic, sequential geodetic sequence, sequential geodetic cover, and sequential geodetic number

MPS – 28

**THE FIRST AND SECOND-ORDER SHAPE DERIVATIVES
OF AN OBJECTIVE FUNCTIONAL
USING NON-AUTONOMOUS VELOCITY FIELDS**

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The exterior Bernoulli free boundary problem studied in this paper is formulated as follows: Given a bounded and connected domain A that is a subset of the plane \mathbb{R}^2 with a fixed boundary Γ , one needs to find a bounded connected domain B with a free boundary Σ and contains the closure of A . Also, one needs to find an associated real-valued function u defined on Ω , where Ω is the annulus formed by B and A , and satisfies the following: $-\Delta u = 0$ in Ω ; $u = 1$ on Γ ; and on Σ , $u = 0$ and the normal derivative of u is $\lambda < 0$.

In this paper, we study this problem via shape optimization technique. We focus on minimizing the Kohn–Vogelius-type cost functional over a class of admissible domains subject to two boundary value problems. To minimize, we compute the first-and second-order shape derivatives of the cost functional by using velocity method, wherein we use non-autonomous velocity fields. The results will be compared to the ones obtained using the perturbation of identity technique.

Keywords: Bernoulli problem, boundary value problem; shape derivative, velocity method

MPS – 29

**WORKING MEMORY COMPONENTS AS PREDICTOR
OF MATHEMATICAL WORD PROBLEM SOLVING
ACCURACY AMONG SCHOOL-AGE CHILDREN**

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This study was conducted to determine what working memory components (central executive, phonological loop, visuospatial sketchpad) are uniquely related to mathematical word problem solving accuracy among fourth, fifth, and sixth-grade ($N=120$). It also aimed to examine what working memory component(s) best predict the mathematical word problem solving accuracy performance among the three age groups.

A battery of tests was individually administered to assess word problem solving accuracy and working memory capacity. Pearson Moment Correlation Coefficient indicated that the three working memory components were related to children's mathematical word problem solving accuracy, central executive ($r=.224$, $p=.014$), phonological loop ($r=.421$, $p=.000$) and visuospatial sketchpad ($r=.405$, $p=.000$). However, using Linear Regression Analysis, only two working memory components played significant roles in predicting the children's ability to solve mathematical word problem solving. These components were the phonological loop and visuospatial sketchpad. In addition, the three age groups differed in terms of employing the working memory components. For fourth-grader, phonological loop and visuospatial sketchpad were the best predictor, however, visuospatial sketchpad appeared for fifth-grade and phonological loop for sixth-grade. The results do not support the notion that all components of working memory play a major role in predicting the problem solving accuracy among school age children. The result also suggested that increases in the chronological age were related to increase in working memory performance except for visuospatial sketchpad.

This study provides applications to theory. The findings were able to establish that working memory components uniquely contributed independent variance to problem-solving accuracy among Filipino school-age children. It may aid teachers and parents to enhance the performance of the children in the area of word problem solving on which students find it hard.

Keywords: Working Memory, Problem Solving Accuracy

MPS – 30

PERIODICITY AND SOLUTIONS OF HIGHER ORDER RECURSIVE SEQUENCES

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Rational difference equations appear simple in form but the difficulty in dealing with these types of equations lies entirely in the global behavior of its solutions. So we believe that the study of these equations is quite challenging and rewarding. Recently, there has been a growing interest in the study of qualitative analysis of nonlinear difference equations. This growing interest is due to the fact that these equations have a lot of applications in life sciences, natural sciences, physical sciences, and many other various fields.

In this study, we generalize a recent result of T. F. Ibrahim on nonlinear recursive sequences, i.e., given a positive even integer k , we investigate in this work the solution of the difference equation

$$x_{n+1} = (a + A x_n x_{n-2} \cdots x_{n-(k-2)}) / (b + B x_{n-1} x_{n-3} \cdots x_{n-(k-1)}),$$

where $A, B, x_{-(k-1)}, x_{-(k-2)}, \dots, x_{-1}$, and x_0 are arbitrary real numbers with $b + B x_{-(k-1)} x_{-(k-3)} \cdots x_{-1} \neq 0$. In particular, we study the periodicity and local stability of its solutions. We also consider several special cases and derive an explicit form of solutions for the case $a = b = 0$. Furthermore, we provide numerical examples for illustrations and validation of our results.

Keywords: recursive sequences, solutions of difference equations, periodicity, stability, and boundedness of solutions

MPS – 31

SPECTROPHOTOMETRIC DETERMINATION OF COENZYME Q10 USING POLYANILINE FILM AS OPTICAL SENSOR

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Coenzyme Q10 (CoQ₁₀) is an antioxidant which protects the body from damage caused by harmful molecules and has a vital role in cellular energy production. Low CoQ₁₀ levels have been linked to a number of cardiac disorders and other diseases.

In this study, the spectrophotometric analysis of CoQ₁₀ was done by monitoring the change in absorbance of fabricated polyaniline (PANI) film. PANI was chemically synthesized and physically added into acetate film. The change in absorbance (ΔA) that accompanies the switching of PANI from emeraldine form to pernigraniline form was utilized in the quantitative determination of CoQ₁₀ in pharmaceutical formulations and human plasma.

Results showed that ΔA is linear over both low concentrations (0.30-2.00 ppm) and high concentrations of CoQ₁₀ (25.0-150 ppm) studied. The limit of detection (LOD) and limit of quantification (LOQ) were 0.10 ppm and 0.33 ppm. The measurements were found to have acceptable repeatability with coefficient of variation ranging from 7.3-13.2% for intrabatch and 12.7-14.6% for interbatch repeatability. Percent recoveries of spiked standard solutions ranged from 87.3-104.2 %.

CoQ₁₀ was analyzed in pharmaceutical formulations containing 30 mg CoQ₁₀/capsule using the fabricated PANI films. Average values ranged from 25.7 to 30.5 mg CoQ₁₀/capsule which are 85.7-101.8% of the label claim suggesting good agreement. Human plasma samples were analyzed and were found to be within normal range of 0.6-1.0 ppm.

The fabricated PANI film was found useful as an optical sensor for CoQ₁₀ in pharmaceutical formulations and human plasma.

Keywords: CoQ₁₀, polyaniline, PANI films, optical sensor, pharmaceutical formulation

MPS – 32

**OPTIMAL SOLUTION VISCOSITY IN
ELECTROSPINNING POLYANILINE (PANI)
ELASTOMERIC ADHESIVE FIBERS**

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This work details the investigation on the effects of optimized polymeric solution viscosity on the mean fiber diameters of electrospun polyaniline (PANI)-elastomeric adhesive fibers. Five solutions of PANI (dissolved in dimethyl sulphoxide [DMSO]) were mixed with different volumes (25%, 37.5%, 50%, 62.5%, and 75%) of elastomeric adhesive. Viscosity measurements on the solutions carried out in room temperature showed a relative increase in viscosity (in centipoise) as the volume of elastomeric adhesive in the solution was increased.

The solution with 50% elastomeric adhesive was chosen to be used in subsequent electrospinning in the study owing to its relative ease of preparation and intermediate viscosity compared to other solutions. Mean fiber diameter measurements from captured scanning electron microscope (SEM) images of electrospun fibers using solutions with 50%, 62.5%, and 75% elastomeric adhesive were 0.763 μm , 2.819 μm , and 1.027 μm , respectively. Smaller mean fiber diameter was obtained from the chosen optimum polymeric solution for electrospinning.

Keywords: conducting polymer, elastomeric adhesive, electrospinning, polyaniline

MPS – 33

**ANALYSIS OF DAMAGE REPORTS FROM DIFFERENT
INFORMATION AND DATA SOURCES OF THE
2013 M_w 7.2 BOHOL EARTHQUAKE**

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Succeeding the M_w 7.2 Bohol Earthquake that affected the Visayas region on 15 October 2013, media coverage on the earthquake damage in Bohol province and Metro Cebu was abundant. Television and radio stations broadcasted significant effects including the collapse of century-old churches. National and local newspapers published 427 articles up to March 2014. Situational report of the National Disaster Risk Reduction and Management Council (NDRRMC) indicated number of casualties, affected population and cost of damages. Damage assessment reports of local government units summarized affected sectors in the provincial and municipal levels. PHIVOLCS Quick Response Team (QRT) documented geologic impacts. Lastly, we gathered and evaluated 732 macroseismic intensity survey forms. Available damage reports from different information and data sources are compiled and analyzed to determine the intensity distribution per municipality and city in Bohol province and Metro Cebu using the PHIVOLCS Earthquake Intensity Scale (PEIS). An isoseismal map is generated to display the spatial distribution and further relate it to the local geology of the area. The map may be utilized by engineers for earthquake-resilient structural design; serve as tool for planners to mainstream disaster risk reduction and management (DRRM) in land use and development plans; and as support to enact DRRM-related laws, policies and ordinances.

Keywords: 2013 Bohol Earthquake, earthquake intensity survey, isoseismal map, PHIVOLCS Earthquake Intensity Scale (PEIS), disaster risk reduction and management (DRRM)

MPS – 34

**A REVISIT TO THE 1879 M_w 7.4 SURIGAO
EARTHQUAKE, ITS IMPACTS AND FUTURE
EARTHQUAKE SCENARIO IN
NORTHEASTERN MINDANAO**

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The 1879 M_w 7.4 Surigao earthquake affected northeastern Mindanao and was considered as one of the largest and damaging earthquake in the area. Based on written historical records, this earthquake generated strong ground shaking causing significant damages to infrastructures such as churches and buildings near the epicentral area. Widespread liquefaction and landslides were also described. An important account of this earthquake is a detailed description of the surface rupture. Aerial photograph interpretation, field mapping and paleoseismic studies conducted in the area revealed a 100-km-long surface rupture during the 1879 Surigao earthquake. The source of this earthquake is the Surigao segment of the Philippine fault, capable of generating a magnitude higher than 7 in the future. The structural damages and geologic impacts by this earthquake have been evaluated to come up with future earthquake scenario for northeastern Mindanao. Result of this evaluation can be used for medium to long term earthquake risk assesment and mitigation plans for the local government units and other stakeholders.

Keywords: Philippine fault, 1879 Surigao earthquake, earthquake scenario, disaster risk reduction and mitigation (DRRM)

MPS – 35

**FABRICATION, TESTING, AND UTILITY-
ACCEPTABILITY ASSESSMENT AND EVALUATION
OF AN IMPROVISED MAGNETIC FORCE GAUGER:
BENCHMARKING A POTENTIAL PHYSICS
LABORATORY TOOL**

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Campus, Lakewood, ZDS

Improvised magnetic force gaugers were fabricated and were used to verify and to validate the distance-dependent magnetic force in a system of two vertically-aligned and repulsively-orientated disk-shaped radio magnets. Testing and validation were done using well- defined experimental set-up and procedures. Data organization, testing, analysis, and validation were computer-aided using basic equations and regression analysis. The interplay of Newton's third law was also explored using the inventive set-up.

Magnetic force strengths dramatically increase with decreasing separation distance and decrease with increasing separation distance. The linearized plots of the natural logarithms of magnetic force and separation distance revealed a slope of 2.0, denoting the inverse power law exponent n value. The interplay of Newton's third law was also very evident in the set-up, with error of difference just within the range of 0.05%-1.45%. Teacher-users' responses on the utility assessment revealed a t -stat value of -1.89737; with no significant difference. That is, teacher-users' pre-and-post-test results were significantly just the same at 95% degree of significance. On acceptability, 99-100% of the nine (9) teacher-users answered yes on the design and engineering, utility, technicality, functionality, practicality and applicability of the improvised apparatus. Hence, teacher-training period is recommended to be increased, and a substantial exploration of the limiting distance must be explored within the context of an improved magnetic force gauger.

Keywords: fabrication, utility-acceptability assessment and evaluation, improvised magnetic force gauger, distance-dependent magnetic force, Newton's third law

SOCIAL SCIENCES

SS – 01

SELF-RATED POVERTY AND SUBJECTIVE WELLBEING OF SELECTED RICE FARMERS IN THE SCIENCE CITY OF MUNOZ, NUEVA ECIJA

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This study was conducted to determine the relationship between self-rated poverty (SrP) and subjective wellbeing (SWB) of farmers measured at three different periods within a cropping season (land preparation, growing period, and harvesting period). Participants ($n=63$) were conveniently selected from two barangays in the Science City of Munoz, Nueva Ecija. We developed a 10-item Likert-type questionnaire for SrP and we used Diner's Satisfaction With Life Scale (SWLS) in measuring SWB.

As expected, there seems to be a pattern in the SrP and SWB of the respondents throughout one cropping season. During land preparation, SrP is moderately high ($M=4.61$), becomes very high during the growing season ($M=5.4$), and shifts to moderately low during the harvesting season ($M=3.81$). For SWB, moderately low during land preparation ($M=2.47$), very low during growing period ($M=1.67$), and moderately high during the harvesting period ($M=3.42$). It should be noted that majority of the respondents have no other means of livelihood other than that of rice farming. Hence, the results indicate that they consider themselves very poor and feel unhappy during "income-less" (or *gawat* in local vernacular) months. This is supported with the significant negative relationship between SrP and SWB particularly during the growing period ($r=.37$, $p=.018$). Decrease in SrP and increase in SWB begin to be observed during the harvesting period.

Overall, findings show the need to help farmers create other sources of income that could serve as financial buffer across the cropping season and in a way, helping them experience a more meaningful and happier life.

Keywords: self-rated poverty, subjective wellbeing, farmers

SS – 02

EMERGING TRENDS AND THE CHANGING CONFLICT LANDSCAPE IN LANAO

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This paper presents the results of a three-year (2011-2013) longitudinal study aimed at determining patterns of violent conflict incidents in the two Lanao provinces of Mindanao. This was done by establishing a database that can be used to disaggregate incidents, causes or triggers, and impacts of violence based on data collected from newspapers and blotter reports from the Philippine National Police. The results of the study showed emerging conflict typologies and revealed a changing conflict landscape in Lanao. A notable observation is the pervasiveness of extra-judicial crimes and shadow economy activities in the region dwarfing the number of incidents resulting from threats of Moro rebellion, Muslim-Christian squabbles and *Rido*. There is also the prevalence of horizontal conflict as evidenced by the high involvement of civilians in the violent incidents compared to the number of Moro separatists (Moro Islamic Liberation Front and Moro National Liberation Front) and other armed combatants involved. Finally, the results showed a higher concentration of crime and conflict incidents in many coastal areas of Lanao del Norte compared to Lanao del Sur. If this is to be taken only in its face value, this data would project a more dangerous Lanao del Norte compared to Lanao del Sur. However, based on the results of the focus group discussion conducted, the “hot spots” in Lanao del Norte could also be viewed as manifestations of better crime recording, police trustworthiness and the culture of reporting on the part of the community. In general, the result of this study is taken as a contribution to foster evidence-based peace and development initiatives in Lanao.

Keywords: Bangsamoro, conflict monitoring, conflict landscape

SS – 03

EDUCATION AND INTERNALLY DISPLACED PERSONS: DO SCHOOLS IN LANAOS HAVE SUPPORT MECHANISMS FOR *Rido*-AFFECTED STUDENTS?

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Rido or Clan Feuding is a form of horizontal conflict that has entailed large asset losses for some cultural communities in Mindanao. In the advent of *rido*, members of warring families become targets of revenge, retaliation, and extrajudicial killings causing the displacement of vulnerable individuals including the youth. In general, *rido* causes substantial losses in physical, financial, social and human capital. As a result, *rido* leaves a legacy of structural violence that is difficult to overcome.

Amongst the most vulnerable victims of clan feuding are students who are forced to take indefinite absences from their classes, transfer to far-away schools, or continue attending classes in absolute fear. This study therefore sought to determine the existence of support structures for *rido*-affected students in six schools in Iligan City. In achieving this objective, both quantitative and qualitative approaches were adopted by: (i) documenting narratives about the special needs of these students (ii) analyzing quantitative evidence so as to understand the attitude of teachers and students towards them; and (iii) determining existing support mechanism based on interviews of school administrators. Results indicate the lack of institutionalized support mechanisms for the students among the schools surveyed. However, there is hope as data shows many of the teachers and school mates of affected students registered high scores when their willingness to help and empathy were measured. In this paper, we posit that unless a positive intervention in the form of an institutionalized support structure is implemented in schools, *rido*-affected students will remain trapped in the cycle of violence.

Keywords: *Rido*, clan feuding, students, education, support

SS – 04

STAKEHOLDER ANALYSIS OF THE QUAIOIT RIVER WATERSHED (QRW), BATAK CITY, ILOCOS NORTE

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Involvement of stakeholders is a one of the keys for better project planning and implementation. This study tried to assess the stakeholders in the QRW with regards to their composition, interests, conflicts and alliances, and the key people to be most likely affected and those with high influence. Data on these were gathered through a focused group discussion (FGD) with 50 key people from the watershed. Results showed that half of the respondents (50%) agreed that farmers have the greatest stake in the watershed, followed by Kaingineros (20%), wildlife collectors (18%), community, fisherfolks, furniture makers, and charcoal makers. These were mainly considered for economic and subsistence. Local government units, together with the Department of Environment and Natural Resources, military, Department of Agriculture, Bureau of Fisheries and Aquatic Resources, Department of Health and Department of Agrarian Reform were considered as mediating institutions in the watershed because of their mandated roles in law enforcement and environmental protection. Sources of conflicts among stakeholders can be economic, social or attitudinal in nature such as issues on violations of laws, production shares, disputes of tenural rights, and competition for resource use. Categories of stakeholders relative to the degree of importance and influence are perceived by respondent to be diverse.

Stakeholder analysis is very instrumental because this serves as source of more ideas/insights, and varied perspectives from all sectors and help us recognizes the issues and concerns of people that can be bases in designing appropriate watershed management schemes or for any development endeavor.

Keywords: watershed, stakeholders, focused group discussion

SS – 05

REVISITING PAST ERUPTIONS OF MAYON VOLCANO: NEW INSIGHTS FROM RESIDENTS' NARRATIVES

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Mayon Volcano, in Albay Province is one volcano wherein several major eruptive events have taken place in the last 50 years. However, with limited available equipment to record interviews prior to the 1990s, events in the past have sparse documentation in terms of descriptions of people's experiences and responses. Revisiting past major volcanic eruptions by searching for people who experienced these events and using video cameras to record interviews with them is a valuable process and tool to reconstruct these significant events. This work looked at comparisons of the following major eruptive events: 1968, 1978, 1984, 1993, 2000-2001, 2006 and 2009 from the perspectives of people who experienced specific events. We searched for and interviewed people who can still recall and narrate their experiences- from observations of natural signs if any, how a specific event had impacted their lives, notable impacts to the environment, and how they and others have responded to the crisis. The interviews with 30 people were transcribed and analyzed. Vivid descriptions of local observations can support and explain scientific data and would help better understand volcano eruptive behaviors. The narratives of people based on transcribed interviews gave us valuable perspectives of not only how, but also of why affected people have behaved the way they did- and which factors influenced their behavior. Some possible influencing factors identified that can affect behavior and response are: prior knowledge as learned from experience, information learned as taught by others, access to information during ongoing crisis, trust in authority, influence of others such as prominent figures and leaders in the community.

Keywords: Mayon volcano eruptions, narratives, behaviors, interviews, perceptions

SS – 06

PET ATTACHMENT AND PSYCHOLOGICAL BENEFITS OF PET OWNERSHIP AMONG COLLEGE STUDENTS

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Important psychological benefits of pet ownership have been shown in several researches. To further understand what factor influence the psychological benefits that pet ownership brings, this paper examined the relationship of level of pet attachment and psychological benefits of pet ownership among college students of Central Luzon State University.

Data came from five hundred (500) college student pet owners from five (5) different colleges in the university. Levels of pet attachment and psychological benefits were measured using a self-developed questionnaire. Data were analyzed using Means, Chi square and Pearson r correlation.

Results of the correlation analysis showed that there is a significant positive relationship between pet attachment and psychological benefits of pet ownership. This suggests that pet owners with higher level of pet attachment derived more psychological benefits from pet ownership. As the level of pet attachment increases, the more pets act as social support, stress buffer and source of relaxation among pet owners.

Furthermore, highly attached pet owners are found to be those who are the main provider of their pet's needs, those who have more pets, and those students who are taking animal related courses.

Moreover, results showed that pets serve as source of social support, stress buffer, relaxation and helpful in developing empathy.

Keywords: Pet attachment, Psychological benefits, Pet ownership

SS – 07

HAPPINESS OF WORKING AND NON-WORKING WIVES IN URBAN AND RURAL AREAS OF SAN JOSE CITY, NUEVA ECIJA

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The primary goal of this study was to find out the general level of happiness among working and non-working wives in the urban and rural areas of San Jose City, Nueva Ecija. This study is both qualitative and quantitative. There are eight respondents for the qualitative part. Sample size for the quantitative part is ninety two (92); twenty-three wives for each category, urban working wives, urban housewives, rural working wives and rural housewives.

Data were gathered through in-depth interviews and with the use of researcher-developed survey questionnaire. Data were analyzed using descriptive statistics such as frequency counts, percentages, means and standard deviations, Pearson Moment Correlation and T-test computations.

Findings showed that both qualitative and quantitative parts of this study revealed that family, specifically children, serves as a major source of happiness for the wives. In general, working and non-working wives in the urban and rural areas of San Jose City of Nueva Ecija are happy with their lives. Working wives and non-working wives tend to have similar level of happiness. However, significant difference in the level of happiness is observed when the wives are grouped according to locale. Urban wives were found to be the happier group.

Furthermore, results showed that the socio-demographic characteristics such as age, number of children, length of marriage and monthly income have no significant relationship with their happiness.

Keywords: happiness, working and non-working wives, urban and rural areas

SS – 08

MEDIA HABITS AND EXPOSURE TO MODERN MUSIC: THEIR RELATION TO SUICIDE POTENTIAL OF HIGH SCHOOL STUDENTS

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The study focused on the relationship of media habits and exposure to modern music to suicide potential of high school students. There were 381 respondents in the study. The respondents experienced *moderate* degree of hopelessness, negative self-evaluation, suicide ideation, helplessness, and hostility implying that the respondents showed potentiality to suicide but not clinically significant. Two-hundred twenty (220) respondents spent 1-7 hours per week surfing the internet and with the reason to chat with friends (78.95%). There were 231 respondents that spent 1-7 hours per week playing video games such as puzzle video games (57.37%). Media habits are positively correlated to suicide potential which suggests that the lower exposure to media habits, the lower suicide potential such as hopelessness, hostility, and helplessness. On the other hand, the more time spent surfing the internet, the higher the level of hopelessness ($r=.126$; $p=.014$) and hostility ($r=.142$; $p=.005$). Moreover, high exposure to heavy metal music and popular music predicts helplessness. The study concludes that media habits and higher exposure to modern music leads to higher tendency for committing suicide. It is recommended for the parents, guardians and teachers to monitor and guide students with their media habits and type of music to lessen suicide potentiality.

Keywords: Suicide potential, music, media habits

SS – 09

MEDIATING ROLE OF COPING STRATEGIES TO WORK-RELATED PSYCHOSOCIAL RISK FACTORS AND QUALITY OF LIFE OF POLICE OFFICERS: BASIS FOR A PROGRAM

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The responsibilities of police work are both wide-range and challenging. In doing so an understanding of police officers' quality of life at work and in the family; and factors affecting such is of paramount importance. This study used the descriptive-correlational research design to understand the mediating role of coping strategies to work-related psychosocial risk factors and quality of life among selected police officers. A total of 526 selected police officers participated in this study. Findings showed that avoidant coping strategies, poor leadership mechanisms, poor relationships in the organization, advances in age and rank, *decreased* the levels of compassion satisfaction and *increased* the levels of compassion fatigue. When these happened, levels of family satisfaction increased. Further, coping strategies showed a partial effect as it mediated between work-related psychosocial risk factors and quality of life of police officers. Finally, based on the results of this study a program entitled, "*Police C.A.R.E*" was created as a basis to help improve the quality of life of police officers.

Keywords: Coping strategies, work-related psychosocial risk factors, quality of life, police officers

SS – 10

RICE, JOB MISERY, HUNGER INCIDENCE: AN ECONOMETRIC ANALYSIS

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The Social Weather Stations (SWS) quarterly surveys show a relatively high level of hunger incidence in the country through the years, averaging at 19.5 percent of families experiencing involuntary hunger in the year 2013. This paper looks at the factors that influence the dynamic nature of hunger incidence in the Philippines using the data from the SWS quarterly surveys on hunger, from the 1st quarter of 2000 up to the 4th quarter of 2013. Variables identified as potential determinants of hunger incidence are, among others, changes in the price of rice and job misery index (sum of the employment and unemployment rates). A Vector AutoRegressive (VAR) model is used to determine the effect of a shock to the possible determinants on total hunger. Results show that a shock (increase) in the price of rice at the current quarter tends to increase hunger incidence in the succeeding quarter. A shock (increase) in job misery index at the current quarter also increases the hunger incidence in the next quarter. Further analysis using the time-varying parameter (TVP) model shows a higher effect of changes in the price of rice to hunger incidence after the global rice crisis in 2008. This means that hunger incidence is becoming very sensitive to changes in the price of rice.

Keywords: Hunger Incidence, Vector AutoRegressive (VAR) model, State Space, Time-Varying Parameters (TVP) model

SS – 11

EFFECTS OF BREASTFEEDING PROMOTION ON AWARENESS, EFFICACY EXPECTATIONS, PERCEIVED BARRIERS AND INTENTIONS

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This study is a quasi-experimental design, with the purpose of determining the effects of breastfeeding promotion on awareness, efficacy expectations, perceived barriers and intentions among the study group. At baseline, participants from both the experimental and control groups had *average* level on breastfeeding awareness, high-self efficacy, high-outcome efficacy, and *low* perceived barriers to breastfeeding. In regards to breastfeeding intentions for the groups, 78.1% of the participants from the experimental group, and 93.8% from the control group intended to breastfeed their babies. The experimental group participants had *very high* level of awareness, *high* self-efficacy, *very high* outcome-efficacy, *very low* barriers and *very high* intentions to breastfeed and exclusively breastfeed their babies. The control group participants on the other hand showed no significant difference, except for perceived barriers ($t=2.06$, $p<.05$). The gain scores of the experimental and control groups in terms of all the variables were also found to be statistically different ($p<.01$) with the gain scores found to be constantly higher in the experimental group, except intentions to exclusively breastfeed which was not found to be statistically significant ($p>.05$). It was concluded that breastfeeding promotion program was considered effective in enhancing the level of all the variables as well as reducing the perceived barriers to breastfeeding among those exposed to this program, as manifested by significant increase in the level of all the variables, and decrease in perceived barriers to breastfeeding of the experimental group at endline.

Keywords: breastfeeding promotion, breastfeed, babies

SS – 12

**EFFECTS OF PATIENT EDUCATION ON KNOWLEDGE,
BELIEFS, ATTITUDES, AND PRACTICES AMONG
PULMONARY TUBERCULOSIS PATIENTS**

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This study determined effect of patient education on knowledge, beliefs, attitude, and practices (KBAP) of Pulmonary Tuberculosis (PTB) patients. The researcher chose quasi-experimental design, and utilized purposive sampling to obtain sample. Experimental group, composed of 40 patients, was from Caingin, Santa Rosa, while control group, composed also of 40 patients, was from Aplaya, Santa Rosa. Pretest was given to both groups, and then three weeks lectures were given to the experimental group, followed by home visitations for seven weeks. Afterwards, a posttest was given to both groups. Difference between pretest and posttest was significant in knowledge and practice of control group and KBAP of experimental group. Furthermore, increase in knowledge in experimental group from category of high to ‘very high’, while control group remained in category of ‘high’, indicated that, PTB program can have effect of increasing PTB patient’s knowledge on PTB. There was also significant difference in gain scores of KBAP between both groups, also rejecting null hypothesis. There were no significant gain scores in KBAP of both groups when age, gender and marital status were considered, approving null hypothesis. When educational attainment was considered, there were no significant gain scores in KBAP of control group, also approving null hypothesis, but there was a significant gain score in practice of experimental group, rejecting null hypothesis. Therefore, patient education should be tailored to accommodate educational attainment of PTB patients’.

Keywords: Pulmonary tuberculosis, patient education

SS – 13

**REPORTING NATURAL DISASTERS: A CONTENT
ANALYSIS OF THE LOCAL PRINT MEDIA COVERAGE
OF THE 2013 BOHOL EARTHQUAKE**

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After the occurrence of the 2013 magnitude-7.2 Bohol Earthquake that devastated the islands of Bohol and Cebu, the media reported the event with earthquake information gathered from disaster-related agencies. To look into the accuracy of the local media presentation of the 2013 Bohol Earthquake, a content analysis was conducted. This method is used for studying a type of communication or news articles in the case of this study, to make inferences about the authors' biases and the correctness of their reporting. Identifying the evolution of subjects discussed in media reports for the first month after the event, the researcher gathered published articles from October 16 to November 10, 2013 from four local newspapers. A total of 225 articles from *Sun Star Cebu*, *The Freeman*, *The Bohol Chronicle* and *Bohol Sunday Post* were examined and broken down into manageable categories and levels. The study found that most of the reporters from the local media of Bohol and Cebu did not have sufficient understanding on earthquakes considering the instances that important terminologies were misused and other misconceptions reflected in the articles. Interviews with some authors of the collated articles were also conducted to further evaluate the reporting process. With this, it was deduced that some lapses in their coverage were due to lack of prior information about earthquakes.

Keywords: 2013 Bohol Earthquake, content analysis, print media

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