ASM ABSTRACTS

Abstracts of Papers Presented during the 43rd Annual Scientific Meeting of the National Academy of Science and Technology PHL

12-15 July 2021

ABSTRACTS OF PAPERS

Presented during the
43nd NAST Annual Scientific Meeting

COVID-19 Pandemic: Learning from the Past, Coping with the Present, Moving to the Next.

12-15 July 2021

ASM Abstracts
Volume 1 (2021)

43rd NAST ANNUAL SCIENTIFIC MEETING

"COVID-19 Pandemic: Learning from the Past, Coping with the Present, Moving to the Next."

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AS – 01

THE EFFECT OF DIFFERENT FERTILIZER TREATMENTS USING SYNTHETIC AND BIOFERTILIZERS ON THE GROWTH AND YIELD OF SUGARCANE (*SACCHARUM OFFICINARUM* L.*)*

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High cost of synthetic fertilizer is one of the major factors to the country's low sugarcane productivity. Today, the use of bio-fertilizers is gaining attention because of its safeness to the environment and lower cost. This study aimed to analyze the growth and yield of sugarcane under different fertilizer treatments. A strip plot experiment with four replicates was conducted using seven selected local sugarcane varieties subjected to five fertilizer treatments – T1-control/no fertilizer, T2- farmer's practice , T3-SRA's recommended synthetic fertilizer rate (SRA RR), T4- MYKOVAM® + ½ SRA RR, T5- NUTRIO™ + ½ SRA RR. The data on growth parameters (stalk length (SL), number of internodes (NI), internode length (IL) and diameter at top (IT), middle (IM), and bottom (IB)) and yield (potential number of harvestable canes, sugar content (Pol), potential ton canes/ha (pTC/ha) and potential Lkg/ha (pLkg/ha)) were obtained at 12 months after planting (MAP). Multivariate analysis of variance (MANOVA) revealed significant differences on growth for treatment-variety interaction ($P<0.001$), treatment ($P<0.001$), and variety ($P<0.001$) while there were significant differences on yield for treatment ($P=0.0028$) and variety ($P<0.001$) at alpha=5%. ANOVA showed that treatment, variety, and interaction effects were significant for SL, IL, IM, and IB while treatment and variety effects were significant for NI at alpha=5%. T2 had the highest pTC/ha (108,250) followed by T3 (104,045), T4 (101,308) and T5 (94,989). The highest pLkg/ha was obtained from T3 (160,222) followed by T2 (156,148), T4 (147,586) and T5 (139,308). The yield from treatments with biofertilizer are comparable to those with SRA RR thus, it can be a fertilizer alternative which can be more cost-efficient than synthetic fertilizers.

AS – 02

BIOEFFICACY OF PARKER NEEM, BUPRO 25 SC, AND SOAP+ CHLORINE AGAINST MEALYBUG IN GUYABANO FARM AT BRGY. BITIN, BAY, LAGUNA

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The effectiveness of three treatments (Parker Neem, Bupro 25SC and Soap+ chlorine) applied as foliar spray was evaluated against mealybug at Brgy. Bitin, Bay Laguna from September- October 23, 2019. The Parker Neem rate applied was 10ml/L water; 0.4 ml/L water for Bupro 25SC; and 10 mL/L water of detergent + chlorine . The efficacy of the three treatments can be summarized with the pattern Bupro 25SC> Parker Neem> Soap+ chlorine>control. These results showed that all treatments displayed decrease on the mealybug pest population in Guyabano crop.

Keywords: guyabano, mealybug, bioefficacy, insect pest, effectiveness

AS – 03

DEVELOPMENT OF SPIDTECH FOR DIGITAL IDENTIFICATION AND REMOTE MONITORING OF INSECT PESTS AND DISEASES OF MAJOR CROPS IN THE PHILIPPINES

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Correct identification and proper monitoring of insect pests and crop diseases are vital components of integrated pest and disease management. The Android application, Smarter Pest Identification Technology (SPIDTECH), was developed for digital identification and remote monitoring of insect pests and diseases of rice, corn, coffee, cacao, banana, coconut, sugarcane, tomato, and soybean in the Philippines. SPIDTECH has three features: Pest and Disease Identification that uses MobileNet, a convolutional neural network, to digitally identify specimen through the use of smartphone cameras; Pest and Disease Library that contains information such as images, identification signs and symptoms, damage characteristics, management practices, and other pertinent information about a pest or a disease; and Pest and Disease Remote Monitoring that enables real-time mapping of user-contributed images with GPS points for remote monitoring. Collected images are validated and used for model retraining. SPIDTECH was first deployed in Google Play Store in March 2019 recording more than 7,100 device downloads as of May 2021. In the same period, SPIDTECH also recorded more than 5,400 registered users covering 81 provinces in the country with an average of 258 registrations per month. With the current features deployed, the application received more than 8,800 identification requests focusing on rice, corn, coffee, cacao, and banana. For future studies, application usability and acceptability assessments are warranted.

Keywords: pest and disease identification, smart agriculture, crop protection, machine learning, remote monitoring

AS – 04

EFFECTIVE SAMPLING TECHNIQUE FOR ACCURATE DETECTION OF *BANANA BRACT MOSAIC VIRUS* USING ANTIBODY-BASED ASSAY

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Banana bract mosaic virus (BBrMV) is one of the four major viruses infecting banana in the Philippines. The virus causes Banana bract mosaic disease (BBrMD), which affects the pseudostem, midrib, peduncle, bracts of inflorescence, and fingers of the plant. In this study, an effective sampling procedure for rapid and accurate detection of BBrMV was optimized. Results of the study suggested that the optimum sampling time for BBrMV would be in the morning, when relatively cooler temperatures are apparent. BBrMV was only consistently detected from the second (second to the youngest) leaf, and the first (youngest) and second midribs and petioles. Higher concentrations of the virus were observed in both the first and second midribs, and the youngest petiole, suggesting that for routine indexing procedures, samples weighing at least five grams should be obtained from these parts. These findings prevent false negative results and frequent inconsistencies in the outcomes of ELISA against the virus causing BBrMD. The optimized procedure made antibody-based BBrMV detection rapid, reliable, and accurate.

Keywords: BBrMV, BBrMD, detection

AS – 05

SOURCES OF SEEDLING RESISTANCE TO RED SPIDER MITE (*TETRANYCHUS KANZAWAI* KISHIDA) AMONG CULTIVATED EGGPLANT (*SOLANUM MELONGENA* L.), RELATED, AND WILD SPECIES

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Four-week old seedlings of seven eggplant germplasm were evaluated for RSM resistance based on leaf damage and trichome characterization. Both *S. melongena* and *S. aethiopicum* possess Type VIII non-glandular trichomes only with mean density of 2.45 and $3.67/mm^2$, respectively. *S. mammosum* have both glandular and non-glandular trichomes. Type VI glandular trichome $(9.30/mm^2)$ and type V non-glandular trichome $(2.90/mm^2)$ were highest. Mean leaf damage was lowest in *S. mammosum* (8.44%) and is significantly different with *S. aethiopicum* and *S. melongena* with 47.91% and 51.19%, respectively. The results suggest that glandular trichomes in *S. mammosum* is a resistance factor to the feeding damage of RSM, *T. kanzawai* Kishida.

Keywords: red spider mite, trichome, eggplant

AS – 06

SPATIAL PREVALENCE AND RISK FACTORS OF RUMINANT LIVER FLUKE INFECTION IN BAYBAY, LEYTE, PHILIPPINES

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Liver fluke infection or fasciolosis can cause a huge economic impact on Philippine carabao production by increasing animal mortality and reducing milk and meat production. Here, we examined the epidemiologic distribution of *Fasciola* in the intermediate lymnaeid snail host and the definitive carabao host to formulate a targeted disease control and prevention strategy. We performed a cross-sectional study in Baybay Leyte from December 2015 to June 2016, following a one-stage cluster sampling method. A total of 335 carabaos from 138 herds were randomly sampled to detect *Fasciola* eggs, and 1189 snails from 92 sites were collected for lymnaeid snail and *Fasciola* larvae identification. We created Geographic Information System (GIS) maps and analyzed the risk factors of *Fasciola* infection. Fecalysis showed a high prevalence rate of fasciolosis at the animal level (63.58%; 95% CI = 58.15% - 68.70%) and herd level (86.96%; 95% CI = 80.17% - 92.08%). Multivariable logistic regression model revealed that increasing carabao age and drinking from irrigation water increased the odds of fasciolosis by 1.13 times (95% CI = 1.05–1.24; $p = 0.001$) and 10.40 times (95% CI = 1.33–81.65; $p = 0.026$), respectively, while wallowing pond decreased the risk of fasciolosis (OR = 0.13; 95% CI = 0.08–0.23; $p < 0.001$). Lymnaeid snail distribution showed that irrigation system (OR = 20.22; 95% CI = 3.66–111.71; $p = 0.001$) and river (OR = 6.18; 95% CI = 1.24–30.95; $p = 0.027$) were high-risk sites for *Fasciola* infection. The increasing lymnaeid population might be driven by elevation above sea level (3 to 8 meters; $p = 0.03$) and a moderate vegetation index (0.1 to 1 NDVI; $p = 0.015$). Our data suggest that future *Fasciola* control efforts should target the infected irrigation systems and rivers, along with proper deworming programs.

Keywords: carabao, *Fasciola*, lymnaeid snail, risk factors, prevalence

AS – 07

INDUCE SPAWNING OF MUDFISH, *CHANNA STRIATA* USING HUMAN CHORIONIC GONADOTROPIN

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An experiment was conducted to determine the optimum dose of human chorionic gonadotropin (HCG) to induce spawning in mudfish (*Channa striata*). Mature male and female mudfish weighing 180-280 grams were used in this study. The hormone dosage treatments were 500, 1000 and 1,500 IU/kg. The sex ratio of spawners used in the study was 1 female: 1 male and they were injected intramuscularly with hormone treatments. The result of the present study showed no significant difference ($p > 0.05$) in terms of latency period, fertilization rate and incubation period among treatments. However, significantly highest hatching rate was observed in treatment using 1000 IU/kg HCG (82.05%). Thus, optimum spawning success rate of *C. striata* can be attained using 1000 IU/kg of HCG.

Keywords: mudfish, *Channa striata,* HCG, induce spawning

AS – 08

PROFILING OF PHYTOPLANKTON AND HARMFUL MICROALGAE IN EASTERN VISAYAS, PHILIPPINES

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Phytoplankton studies, particularly on harmful algal blooms (HABs), in Eastern Visayas is limited despite year-round HABs outbreak in the region resulting in toxic shellfish poisoning, massive fish kill, and loss to aquatic industries. To understand the dynamics of the phytoplankton population in the area, monthly monitoring of phytoplankton and environmental parameters were carried out in five major bays in Samar and Leyte in 2020. A significant difference in the environmental parameters were recorded between bays in Samar and in Leyte which may have impact on the community structure of phytoplankton present in these sites. Findings recorded a total of 53 genera present in all waters, in which 15 genera were vectors of ASP, PSP, DSP, and fish kill. The chain-forming diatoms of the genera *Skeletonema*, *Chaetoceros,* and *Bacteriastrum* dominated the entire phytoplankton community, whereas the ASP-causing diatom *Pseudo-nitzschia* were the most abundant HABs agent in all bays. The PSP-causing *Pyrodinium bahamense* dominates waters in Samar. Other HABs genera found in small cell densities include *Rhizosolenia*, *Dinophysis*, *Prorocentrum*, and *Ceratium* species found in all sampling sites while *Alexandrium*, *Gymnodinium* species, and *Notiluca scintillians* were only detected in Samar. The abundance of *Pyrodinium* in September to November 2020 coincided with the BFAR red tide alert in Samar. These results provide more information to better understand HABs dynamics in Eastern Visayas, especially in water bodies where HABs are prevalent.

HABs-harmful algal blooms, ASP-amnesic shellfish poisoning
PSP-paralytic shellfish poisoning, DSP-diarrhetic shellfish poisoning

Keywords: Harmful algae, Red tide, Phytoplankton, Eastern Visayas

AS – 09

ASSESSMENT OF THE IMPROVED RANDOM AMPLIFIED POLYMORPHIC DNA (RAPD) AGAINST THE STANDARD PCR FOR SPECIES IDENTIFICATION IN ADULTERATED MEAT

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The use of a simpler, faster and reliable method for identification of species of origin in fresh and processed meat products is required to prevent unethical practices that may occur in the meat industry. The effectiveness of a random amplified polymorphic DNA (RAPD) method for identification of fresh meats from chicken, goat, cattle, sheep, swine, horse, buffalo and dog origin was evaluated using a 20-mer oligonucleotides. Conventional RAPD uses a 10-mer oligos and a very low annealing temperature to amplify PCR products (usually 28–40°C). This study employs a modified RAPD method where DNA markers are designed of 20-mer oligonucleotides and the PCR annealing temperature was more stringent, ramping to 55–60°C. The use of stringent conditions for the modified RAPD could therefore improve the specificity of the primers and the reproducibility of the products. Exhibiting with different DNA band profiles with different species, this study suggests that the modified RAPD PCR method can be a potential tool with the Standard PCR to distinguish the different species genetically. The multilocus character of RAPD markers allows complex DNA profiling using only one PCR and primer, which makes this method effective for routine purposes such as species identification.

Keywords: random amplified polymorphic DNA (RAPD); species identification; meat adulteration

AS – 10

NUTRITIOUS RICE BLENDS AS ALTERNATIVE STAPLE FOOD FOR FILIPINOS

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The fondness of Filipinos for rice as staple food has not waned throughout the years. The fast rate of population increase, dwindling agricultural land area, and climate change have undoubtedly contributed to the continuing challenge in rice self-sufficiency. The huge consumption of polished rice with relatively less nutrients and high glycemic index is also causing poorer health status of the population. Thus, this study was conducted to develop and characterize the combinations of rice with other energy-rich and more nutritious crops (*adlai* or corn) as regular and ready-to-eat (RTE) blends. Six rice varieties with different amylose content (NSIC Rc 160, NSIC Rc 218, NSIC Rc 216, NSIC Rc 222, NSIC Rc 282, and PSB Rc 10), three adlai varieties (*Ginampay*, *Gulian*, and *Tapol*), and one corn variety (Quality Protein Maize or QPM) were screened. Different ratios of each crop were evaluated and characterized in terms of cooking quality, Instron hardness, sensory properties, and consumer acceptability. For rice-*adlai* blend at 50:50 ratio, NSIC Rc 160 or NSIC Rc 218, and *Ginampay* were selected due to their softer texture in terms of Instron hardness and highest scores for gloss, cohesiveness, tenderness, and smoothness. For rice:corn blend, soaking and different amounts of cooking water had no significant effect on the texture of the corn grits. Increasing the ratio of corn resulted in increased weight, longer cooking time, and higher Instron values. The acceptability of rice:corn using NSIC Rc 160 and NSIC Rc 218 at 60:40 ratio was comparable with pure rice. For the RTE blends, both transparent polypropylene and aluminum-coated pouches withstood the temperature and pressure during the retort-processing. No residual off-odor and off-taste were detected in the products even with the use of 0.1% malic acid as antimicrobial agent. These rice-*adlai* and rice-corn blends are excellent alternatives to polished rice to help address self-sufficiency and health concerns in the Philippines.

Keywords: rice, adlai, corn, blend, sensory properties

AS – 11

FINGERPRINTING OF PHILIPPINE WALING-WALING (*VANDA SANDERIANA* RCHB.F.*)* ACCESSIONS USING SIMPLE SEQUENCE REPEAT (SSR) MARKERS

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Vanda sanderiana is one of the most popular and highly prized Philippine orchids locally known as "Waling-waling". *This orchid is a commercially important species for it is a frequently selected parent in the hybridization and production of modern vandaceous hybrids.* DNA fingerprinting studies in *V. sanderiana* genotypes using simple sequence repeat (SSR) markers are limited. In this study, 25 *Vanda* accessions mostly originated from Mindanao were evaluated with 52 publicly available orchid SSR markers. Out of these, 23 screened SSR markers produced polymorphic band profiles while 29 were monomorphic. The number of banding patterns observed ranged from 2 to 12 with molecular band sizes ranged from 95bp to 465bp. The polymorphism information content (PIC) varied from 0.365 to 0.884 with an average of 0.705. Fifteen of the polymorphic SSR markers were able to generate a unique banding pattern that could distinguish 20 out of 25 *Vanda sanderiana* genotypes. Fingerprints of the accessions were established based on the BP of the ten highly polymorphic markers with a range of PIC values from 0.75 to 0.88. Dendrogram generated based on 117 alleles detected by the 23 SSR markers clustered the accessions according to flower color and place of origin. Cluster analysis using the UPGMA method separated the pink-maroon types from white apple green forms of *V. sanderiana*. The present investigation suggests the usefulness of the employed SSR markers in DNA fingerprinting for genotype identification to facilitate the selection of suitable parents for future breeding works on this endemic Philippine orchid. Moreover, the generated molecular data are valuable references to test the authenticity of *V. sanderiana* genetic resources in the country.

Keywords: *Vanda*, SSR, polymorphism , banding pattern

AS – 12

ISSR FINGERPRINTING OF ELITE COFFEE SPECIES AND VARIETIES (*COFFEA* SPP.) IN THE PHILIPPINES

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Accurate identification of coffee at any life stage is important for the coffee industry, marketing, and breeding programs. This study aims to determine the DNA fingerprints of registered and those with the potential to be registered coffee species and varieties found at the National Coffee Research, Development and Extension Center (NCRDEC) germplasm collection in the Philippines. Inter-simple sequence repeats (ISSR) technique was used to discriminate the three commercially cultivated coffee species, comprised of 16 coffee local varieties. Results suggest that the unique presence or absence of bands is a potential molecular ID for coffee. No single primer resolved all the varieties. However, the combined primers generated unique banding patterns. ISSR fingerprinting would complement the traditional morphology-based identification and verification of registered coffee species and varieties thereby facilitate the registration of new ones. The inconclusive identification of coffee in the past can now be resolved using ISSR markers.

Keywords: coffee, DNA fingerprinting, ISSR, species identification, varietal identification

AS – 13

DEVELOPMENT AND EVALUATION OF GELATO USING CARABAO'S NON-FAT MILK

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Gelato is a frozen dessert which originated in Italy. It has fewer calories and fat than regular ice cream. Gelato is about 4 - 9% butter fat and is made with milk and slightly less sugar than ice cream. This study was conducted to develop gelato using carabao's non-fat milk and to evaluate its physico-chemical characteristics and sensory properties. Treatments with different levels of fat at 5% (T1), 9% (T2), and 11% (T3 - control) were used to meet the fat requirements of gelato. Physico-chemical properties such as total soluble solids, overrun, viscosity and melting rate were measured as well as its microbial and sensorial qualities. Treatment 1 with 5% fat had the lowest total soluble solids with $34.63^{o}Bx$ while it had the highest overrun with 36.18% but no significant differences were observed among the samples. Treatment 3 was significantly higher in terms of viscosity (85.67 cP) compared to the other treatments. In terms of melting rate, Treatment 3 had the highest melting rate while Treatment 1 was the lowest. Moreover, Treatment 1 obtained the highest overall acceptance rating of 8.18 (Like Very Much) but showed no significant differences among treatments. In terms of microbial quality, all treatments showed acceptable microbial count that coincides with food safety standards.

Keywords: gelato, carabao's milk, non-fat milk, Physico-chemical Analysis, Sensory Evaluation

BIOLOGICAL SCIENCES

BS – 01

AMPHIBIANS AND REPTILES OF LIMESTONE KARST HABITAT OF UNIB ISLAND: ITS DIVERSITY, MICROHABITAT AND CURRENT CONSERVATION STATUS ON DINAGAT PROVINCE, PHILIPPINES

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The limestone karst habitat is one of the most fragile ecosystems in the world. This extraordinary habitat shelters unique and specialized organism that thrives on the extreme microclimatic environment. We hypothesize that different amphibians and reptiles inhabit the limestone karst ecosystem on Unib Island. We surveyed two different habitat gradients in karst ecosystem of Unib Island on 4-14 September 2019 such as mature secondary forest (MSF) and mixed agricultural area (MAA). A total of 1-hectare area was surveyed using a combination of strip transect, audiovisual encounter, and trapping methods. Twenty-seven species of amphibians and reptiles (n=130 individuals) belonging to nine families were recorded of which 12 species (44.44%) are known historical species on mainland Dinagat confirmed to occur on Unib island and 11 species (40.74%) are endemic to Mindanao Pleistocene Aggregate Island Complexes. A new island record of three herpetofaunal species was documented of which one is threatened, one data deficient, and one undescribed species, namely: IUCN Vulnerable Mindanao Bush Frog *Philautus leitensis*, IUCN Data Deficient Botel Gecko *Gekko* cf. *kikuchii,* and undescribed *Platymantis sp.* (limestone bush frog). Nine species are Not Evaluated and 16 species are Least Concern by IUCN. Shannon-Weiner index of diversity showed that mature secondary forest had the higher herpetofaunal diversity (H'=2.489) than mixed agricultural area (H'=2.278). The *Platymantis* sp. (limestone bush frog) is the most abundant (n=35; RA=23.1%) frog species and *Cyrtodactylus mamanwa* is the most abundant reptile (n=26; RA=20.0%). Tree trunk, leaf litter, and rock crevices are dominant microhabitats utilized by limestone karst-dwelling amphibians and reptiles. Unib island is home to diverse, endemic, and undescribed amphibians and reptiles on this biologically important limestone karst habitat. Protection and conservation are highly recommended.

Keywords: *Conservation, ecology, herpetofauna, new records, protection*

BS – 02

BIFLAVONOIDS EXHIBIT *IN SILICO* MULTI-TARGETING EFFECTS TO SARS-COV-2 NON-STRUCTURAL PROTEINS ASSOCIATED WITH VIRAL PATHOGENESIS: PLANT DIETARY NUTRACEUTICALS FOR COVID-19

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Barriers in COVID-19 vaccine procurement and distribution leave populations at risk for infection. Burdened by limited treatment options, one hundred and four anti-HIV phytochemicals were repurposed through molecular docking against SARS-CoV-2 nsps vital in autolytic processing—papain-like protease (nsp3) and 3-chymotrypsin-like protease (nsp5); in viral replication—RNA-dependent RNA polymerase (nsp12) and helicase (nsp13); and in host immunity evasion—SAM-dependent 2'-*O*-methyltransferase (nsp16) and its cofactor (nsp10), and endoribonuclease (nsp15). The druggability, ADME (absorption, digestion, metabolism, and excretion) properties, and toxicity of the compounds were also predicted *in silico.* Among twenty multi-targeting, top-scoring compounds, eight polyphenolic natural products comprised mostly of biflavonoids, an ellagitannin, and an alkaloid had the highest affinities to the nsps (binding energy = -7.7 to -10.8 kcal/mol). Six were druggable and two showed good gastrointestinal absorptive property. Most were predicted to be non-toxic. Thus, plant-derived compounds show potential anti-SARS-CoV-2 properties.

Keywords: SARS-CoV-2 non-structural proteins, viral replication, host immunity evasion, molecular docking, biflavonoids

BS – 03

CHEMICAL COMPOSITION AND *IN VITRO* STUDY OF ANTIOXIDANT AND ANTIBACTERIAL ACTIVITIES OF *SARGASSUM CRISTAEFOLIUM* C. AGARDH (SARGASSACEAE, OCHROPHYTA)

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Seaweeds are capable of producing important biomolecules and bioactive compounds with notable pharmacological uses. Proximate analysis of *S. cristaefolium* showed high ash, carbohydrate and protein content with estimated value of 39.01±0.16%, 21.43±0.37%, and 19.13 ± 0.19% respectively. The seweed has a total phenolic content (TPC) of 30.94 ± 0.06 mg GAE/g. Antioxidant efficiency of *S. cristaefolium* extract exhibited high copper reduction capacity (IC_{50} = 6.97 μg GAE/ml) and potent radical scavenging activity (IC_{50} = 28.5 μg GAE/ml), which is more effective than ascorbic acid (control). In addition, *S. cristaefolium* extract showed broad spectrum of antibacterial activities against Methicillin-Resistant *Staphylococcus aureus* (MRSA) and *Bacillus cereus* with minimum inhibitory concentration (MIC) of 125 μg/ml and 250 μg/ml, respectively. This investigation shows the potential of *S. cristaefolium* as alternative source of bioactive substances that can be use as novel therapeutic agents in disease treatment.

Keywords: biological activity; marine; polyphenols; proximate composition; seaweeds

BS – 04

IN SITU, IN VIVO, AND *EX VIVO* SENSITIVITY ANALYSIS OF A RAPID LAMP-BASED DETECTION METHOD FOR AHPND-CAUSING *VIBRIO* SP.

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Acute Hepatopancreatic Necrosis disease (AHPND) is a newly emerging disease that challenges small-scale and large-scale shrimp farms due to the presence of the *pirAB* toxin in its causative agent *Vibrio* sp. This establishes the paramount importance of early monitoring strategies and advanced shrimp farm management techniques. However, current diagnostic tools are too expensive and require molecular expertise to operate. To address the problem, a rapid loop-mediated isothermal amplification (LAMP)-based protocol specific for AHPND-causing *Vibrio* sp. was evaluated based on its sensitivity in detection. Additionally, the protocol's field applicability was tested by comparing the results of *in situ, in vivo,* and *ex vivo* AHPND detection. In this study, a total of 11 bacteria were isolated from *Litopenaeus vannamei* (whiteleg shrimp) hepatopancreas. Four of these bacteria tested positive for the *pirAB* toxin and were identified as *Vibrio parahaemolyticus* (ZM16-5), *Vibrio campbelii* (ZM17-2), *Vibrio alginolyticus* (ZM17-5), and *Shewanella algae* (ZM16-1). The LAMP protocol detected the toxin in *V. parahaemolyticus* and *V. campbellii* exceeding 2.6 pg/mL sensitivity of the conventional PCR assay, having a bacterial detection and quantification limit of 150 CFU/mL and 0.16255 ng/mL, respectively. These values show the higher sensitivity of LAMP over the conventional PCR detection method. Preliminary field test (*in situ* detection) results show 90% detection of AHPND in live shrimp compared to the conventional PCR method which detects only 70% of the disease. On the other hand, the protocol was also able to detect the toxin in that artificially infected psot-larvae shrimps through the immersion method. This suggests that the protocol can successfully detect the disease in a controlled and uncontrolled environment. Overall, the study suggests that the LAMP protocol is an ideal and efficient tool in the diagnosis of AHPND in a Philippine aquaculture setting as it produced a result comparable to the use of the conventional PCR detection method. Furthermore, the LAMP protocol was also proven to be more sensitive than PCR.

Keywords: Acute Hepatopancreatic Necrosis Disease, Loop-mediated isothermal amplification, *Vibrio parahaemolyticus,*

BS – 05

LIMACUSINE FROM THE PHILIPPINE MEDICINAL PLANT *PHAEANTHUS OPHTHALMICUS* EXHIBITS ANTI-MDR BACTERIA, ANTITUBERCULAR, ANTI-CYCLOOXYGENASE, ANTI-SARS-COV-2 AND CYTOTOXIC PROPERTIES: A NATURAL PRODUCT PROSPECT FOR MANY DISEASES

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The Philippine medicinal plant *Phaeanthus ophthalmicus* (Roxb. ex G.Don) J. Sinclair ("*kalimatas*") is traditionally used to treat conjunctivitis, ulcer and minor wounds. However, a limited report exists on its biological activities. In this study, we explored the biological activities of the tetrahydrobisbenzylisoquinoline alkaloid, limacusine, using *in vitro* and computational approaches. Thus, purification of *P. ophthalmicus* alkaloid extracts yielded the tetrahydrobisbenzylisoquinoline alkaloids (+)-tetrandrine and (+)-limacusine. The more active alkaloid, limacusine, showed antimicrobial activity against *Mycobacterium tuberculosis* $H_{37}Rv$ and multi-drug resistant Gram-negative bacteria, modest and selective inhibition against cyclooxygenase-2 (COX-2), and antiproliferative activity against human myelogenous leukemia cells. Molecular docking and molecular dynamics simulations of limacusine demonstrated strong binding affinities to selected molecular disease targets such as mycobacterial enoyl acyl carrier protein reductase and ATP-dependent MurE ligase, ovine COX-2, and SARS-CoV-2 papain-like protease (nsp3), RNA-dependent RNA polymerase (nsp12), and SAM-dependent 2-*O*-methyltransferase (nsp16). Thus, limacusine is a potential natural product adjuvant for many diseases.

Keywords: *Phaeanthus ophthalmicus*; limacusine; tetrahydrobisbenzylisoquinoline; antimicrobial; cyclooxygenase.

BS – 06

LOOKING BEYOND PCR: BENCHMARK ASSESSMENT OF MODIFIED LOOP-MEDIATED ISOTHERMAL AMPLIFICATION (LAMP) IN DETECTING *LEPTOSPIRA SPP.* AND *SCHISTOSOMA JAPONICUM* CERCARIAE IN ENVIRONMENTAL AND FLOOD WATERS

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Leptospirosis and Schistosomiasis, are important zoonotic parasitic diseases detrimental to humans and animals. Their modes of transmission include wading in contaminated environmental and flood surface waters. The study validated the use of the improved Loop-Mediated Isothermal Amplification (LAMP) molecular technique in targeting *Schistosoma japonicum* cercariae and *Leptospira spp.* bacteria present in the environmental and flood waters. The improved technique involves modification to simplify and more adaptable to temperature storage the use of the standard LAMP. The efficiency of LAMP revealed that the analytical sensitivity of LAMP assay was 10-fold more sensitive than that of the PCR. This cost-effective molecular technique has proven itself a confirmatory test of the target pathogens present in surface water which recommends a tool for the advancement in comprehensive field surveillance-response approach in many developing countries with resource-limited settings.

Keywords: modified loop-mediated isothermal amplification (LAMP); *Schistosoma japonicum*; *Leptospira spp.*; environmental flood waters

BS – 07

METABOLIC FINGERPRINTS AND NUTRIENT MINERALIZATION ACTIVITIES OF VERMICAST BACTERIA FROM INDIGENOUS EARTHWORMS OF LOS BAÑOS, LAGUNA, PHILIPPINES

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Earthworms play an important role in nutrient cycling through the production of vermicasts, providing available nutrients to soil and plants. In this study, the metabolic fingerprints and nutrient mineralization activities of bacteria in vermicasts (FTV) of indigenous earthworms from Los Baños, Laguna were profiled. Among the 25 isolates obtained, highest indication (29 mm of blue colored zone) of nitrogen fixation activity was demonstrated by FTV_{16}. Highest phosphate solubilization index (SI) was yielded by FTV_{20} (2.57) and FTV_{22} (2.50) with the latter also having the highest amount of phosphate solubilized (0.208 $A_{880\,nm}$) at a decreasing pH (7.0 to 4.0). Clearing zones indicative of potassium solubilization were also evident with the highest SI value of 3.3 produced by FTV_4. Richness index confirmed the utilization of all 31 carbon substrates for metabolic activities, mainly amines and phenolic compounds, by FTV bacterial communities as determined through Biolog system. Average well-color development (1.996 $A_{590\,nm}$) and Shannon-Weaver (3.356 $A_{590\,nm}$) indices were higher in indigenous earthworms than the popular vermicompost species African nightcrawler. Overall, diverse bacteria inhabiting the vermicasts of indigenous earthworms exhibit promising nutrient mineralization and metabolic potential that need to be further explored and harnessed for vermicomposting and other applications.

Keywords: Philippine earthworms; vermicast bacteria; metabolic fingerprints; nutrient mineralization

ENGINEERING SCIENCES AND TECHNOLOGY

EST – 01

DESIGN AND DEVELOPMENT OF A SMART WIRELESS IRRIGATION SYSTEM FOR RICE: A SIMULATION MODEL

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Improper monitoring of irrigation water leads to food and financial losses in agricultural countries. The study generally designed and developed a smart wireless irrigation system for rice. Specifically: a) to design a water saving device using the principles of microprocessor and microcontroller, b) to establish the programming codes for the irrigation system through Python and, c) to simulate an irrigation system in a 3m x 3m rice production area. The system was developed using the soil moisture and ultrasonic sensors for soil moisture content and water level monitoring, respectively. WeMos microcontrollers were used to create webservers for the values read by the sensors. Raspberry Pi was used to collect the data from the webservers and monitor the current water level and moisture content. Solenoid valves and relay module controlled the flow of water supply in the field and the GSM module sent text messages to the rice farmer. Simulation results showed that the conveyance and irrigation efficiencies of system is 94.0% and 58.3 %, respectively. This means that the water conservation was evident because the standard conveyance efficiency is at a range of 80-100% while the standard for irrigation efficiency is at 50-60%. Moreover, the GSM module established SMS (Short Message Service) to update the farmer on the water level of the rice field and the system ensured efficient use of water by watering the field as needed. Pilot testing of the developed system using bigger production areas is recommended.

Keywords: *Irrigation system, GSM module, Sensors, Wemos*

EST – 02

A MATHEMATICAL MODEL FOR THE PLANNING OF NEGATIVE-EMISSIONS BIOCHAR SYSTEMS

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Ample research studies in recent years have hailed biochar as a promising carbon sequestration and soil amendment strategy due to its ability to store carbon for several centuries in soil and improve the fertility of the receiving agricultural lands. Other potential benefit includes renewable energy supply in gaseous (biogas) or liquid (bio-oil) form. The proper implementation of biochar as a carbon sequestration and soil amendment strategy can be facilitated with the aid of Process Systems Engineering (PSE). This study develops a model with the aid of mathematical programming that serves as a planning tool to guide the proper deployment of negative-emissions biochar systems. The system extends from the production and transportation of biochar from different sources down to its application to agricultural lands. The mathematical model provides new concepts that fill the research gap in decision-making, planning and implementation of negative-emissions biochar systems. A case study is solved that demonstrates the applicability of the model. The mathematical model can serve as a decision-support tool for the formulation of policy that will benefit the biochar producers and farmers.

Keywords: mathematical optimization; negative-emissions; decision-support tool; biochar systems

EST – 03

BIOCHAR FROM AGRICULTURAL RESIDUES AS ADSORBENTS FOR PHYTOHORMONES EXTRACTED FROM WASTE COCONUT WATER

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This study aims to utilize waste coconut water and other waste agricultural residues and turn them into value-added products. Phytohormones are valuable, naturally-occurring compounds that play essential roles throughout the different stages of plant growth. As an initial attempt to extract phytohormones from coconut waster, agricultural residues were converted into activated biochar for use as adsorbents. Eight agricultural residues were studied: rice straw, bamboo, durian shells, calabash husk, banana peels, sugarcane bagasse, coffee husk, and cacao pods. The residues were analyzed for moisture, volatile matter, fixed carbon and ash content to determine their suitability as raw material for biochar production. The fixed carbon content values were determined to range from 15.80% to 21.98 %. The residues were further characterized using Fourier-transform infrared spectroscopy (FTIR) and thermogravimetric analysis (TGA). The residues were then converted into biochar by pyrolysis at 500°C for 1-hour with a heating rate of 16.67°C/min. Pyrolysis yields ranged from 26.14% to 49.48% with the produced biochar having pore sizes between 134.9 nm and 3415 nm. Further thermo-chemical modification was employed to enhance the surface qualities for better phytohormone adsorption. The biochar was treated with KOH at a 2:1 ratio and pyrolyzed again at 500°C for 1 hour. Yields after surface modification were from 35.59% to 81.29%. Adsorption experiments were also performed on waste coconut water samples for 2 hours at room temperature and a loading rate of 200 g/L. The phytohormone adsorption capacity was measured using UV-Vis Spectroscopy by measuring absorbance at 265 nm.

Keywords: biochar, agricultural residues, surface modification, adsorption ability, phytohormones

EST – 04

CHARACTERIZATION AND STERILIZATION OF PHILIPPINE BENTONITE VIA Γ-IRRADIATION

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Traditionally, clays are used externally or internally, for maintaining body health or treating some diseases. Bentonite is a popular beauty product, specifically as a face mask. Therefore, the treatment of bentonite clay in removing bacteria and fungi without changing its healing or therapeutic properties is necessary. In this study, Philippine natural bentonite is characterized using XRD, SEM-EDX, TG-DSC, and FTIR. Chemical analysis was also done to verify the chemical composition of the clay. FTIR analysis was done to determine if there are significant changes in the structure of the mineral. Finally, the microbial count was done to investigate the sterilization capability of gamma-irradiation on bentonite clay. XRD shows that the mineral is primarily composed of mordenite, hectorite, and montmorillonite. Traces of kaolinite and other non-smectite minerals are also present in the clay mineral. SEM shows the flaky structure of the bentonite powder. EDX analysis reveals that the clay mineral is composed mainly of silica and alumina which comprises around 86.22% of the total mass. Chemical analysis verifies that SiO_2 (47.90 wt%) and Al_2O_3 (14.02 wt%) are the major components of the bentonite clay. Other components of the clay include Fe_2O_3, MgO, CaO, Na_2O, K_2O, and H_2O. TG-DSC shows that the mineral contains 15.55% moisture excluding the tightly bound water which accounts for 3.51% of the total weight of the bentonite. IR transmittance spectra show that there is no significant change in the structure of bentonite except for the higher capacity to hold ambient moisture. The microbial count shows that raw bentonite contains 3.4×10^4 CFU/g. Meanwhile, the bentonite irradiated at 200 and 400 kGy has only <250 CFU/g while the bentonite irradiated at 700kGy has only less than 10 CFU/g.

Keywords: bentonite, montmorillonite, sterilization, gamma-irradiation

EST – 05

DEVELOPMENT AND EVALUATION OF TERRA SIGILLATA SLIP UTILIZING CLAY FROM CAGAYAN AND RICE HULL SILICA-BASED DEFLOCCULANT AS THIN COATING MATERIAL FOR CERAMICS

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TSS is generally made of a well deflocculated fine clay which was used in ancient times to coat thinly bone-dried clay wares instead of glaze. Pottery in the province of Cagayan was established even before war days, however, potters still use the thick brown slip to coat their manufactured clay products after firing. Herein, developed TSS utilizing beneficiated clay (44 µm) from Brgy. Atulo, Iguig, Cagayan, RHS-based deflocculant, and water (1:0.03:2.2 wt. % ratio, respectively) applied as thin coating material for clay test substrates (screened at 40 mesh and 100 mesh) is presented. Physicochemical characteristics of the clay was determined by sedimentation, XRF, and XRD analyses techniques. TSS with specific gravity of 1.17 and viscosity of 44 centipoise were applied by brushing (3, 4, 5 coats) to clay substrates, polished (soft sponge and hard object), then fired in a griller using coal. Sedimentation results revealed that clay from Cagayan is a clay loam type consisting 29.41 wt. % - clay, 25.90 wt. % - silt, and 44.70 wt. – sand. XRF and XRD analyses also revealed that the clay is a vermiculite type $(Mg,Fe^{++},Al)_3(Al,Si)_4O_{10}(OH)_2 \cdot 4(H_2O)$ with quartz (SiO_2) and goethite $(FeO(OH))$. Visual evaluation and microscopic images of the fired test specimens showed that TSS coated substrates polished with sponge and smooth hard object resulted to a velvety and glossy sheen, respectively. TSS coated substrates also showed better resistance to wetting by water droplet. These characteristics exhibited by the developed TSS is very promising as thin coating material for ceramics. Thus, pilot production and utilization of TSS to local ceramic products is suggested.

Acronyms: TSS – terra sigillata slip, RHS – rice hull silica, XRF – x-ray fluorescence, XRD – x-ray diffraction

Keywords: clay, ceramic, coating, deflocculant, rice hull silica

EST – 06

DEVELOPMENT OF BIODEGRADABLE SABA (*MUSA ACUMINATA X BALBISIANA*) STARCH-BASED FOOD FILMS WITH GINGER (*ZINGIBER OFFICINALE*) OIL AS ADDITIVE

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Starch-based films are inherently brittle, and may lack mechanical integrity for conventional packaging. The incorporation of additives may potentially improve the mechanical, antioxidant, and other properties of starch films. The objective of the research is to develop biodegradable saba (*Musa acuminata x balbisiana*) starch-based food films, and evaluate the effect of the addition of ginger (*Zingiber officinale*) essential oil on the moisture content, mechanical, and antioxidant properties of the developed films. Biopolymer films were prepared from a mixture of saba starch, glycerol, and distilled water. Ginger oil was added to the developed films as an additive. An increase in the tensile strength was observed after the incorporation of ginger oil. The addition of ginger oil also increased the rigidity of the films, thus decreasing the elongation of the films. It was also recorded that the addition of ginger oil contributed significantly to the decrease in moisture content of the films. The antioxidant activities of the developed films were also studied. All films containing different amounts of ginger oil proved to contain antioxidant activity. The results suggest that ginger oil may be incorporated into saba starch films to prepare biodegradable films with antioxidant activity for various active food packaging applications.

Keywords: ginger, starch-based films, food films, saba, biopolymer films, packaging
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EST – 07

EFFECT OF PYROLYSIS CONDITIONS ON THE ADSORPTION CAPACITY OF RICE STRAW DERIVED BIOCHAR

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Myriad of environmental problems are being faced by humanity since the dawn of the third millennium. On the rise of emerging solutions, adsorption is known for its effective pollutant treatment mechanism. This research determined the influence of the pyrolysis conditions on the adsorption capacity of the rice straw derived biochar for potential application to carbon dioxide capture and wastewater treatment. Two pyrolysis conditions were varied: pyrolysis temperature and residence time. Under constant residence time of 2 hours, the pyrolysis temperature was varied to 300, 400, 500 and 600°C. Meanwhile, under constant pyrolysis temperature of 600°C, the residence time was varied to 1, 2, 3 and 4 hours. The adsorbents were characterized using Scanning Electron Microscope (SEM), Thermogravimetric Analyzer (TGA) and UV-Vis Spectrophotometer. The SEM images of the rice straw samples showed successful development of pore sites and flaky layers after pyrolysis. Results showed higher CO_2 adsorption capacity for samples pyrolyzed at higher temperature. The highest adsorption capacity of 0.64 mmol/g was observed for the sample pyrolyzed at 600°C for 1 hour. On the other hand, for wastewater application, the percent removal of methylene blue is found to be directly proportional to both the residence time and pyrolysis temperature. The maximum percent removal of 97% was obtained for the sample pyrolyzed at 600°C for 3 hours. Generally, the adsorption capacity of the rice straw-derived biochar is affected by the pyrolysis conditions.

Keywords: adsorption, rice straw, carbon capture, wastewater, pyrolysis conditions

EST – 08

EMERGENCY WATER DISINFECTION SYSTEM

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Floods put people at risk of diseases associated with industrial, commercial, and domestic wastes contamination of water sources. Lack of access to safe drinking water, which consequently affects human health and safety is a profound burden to people living in the affected area. The project is a low-cost and ready to use emergency disinfection system that will address the shortage and unavailability of water during calamities that may cause disruption to the water supply in the affected areas.

The fabricated unit is a batch-type chemical treatment system that has a capacity to produce a one (1) cubic meter per day (m3/day) of potable water for a daily 9-hour operation. The results from the performance testing showed that the treated water meets most of the mandatory parameters except for true color. The true and apparent color and high total dissolved solids may be attributed to excess $FeCl_3$ solution and new activated carbon filter, and thus will be addressed by pre-washing of the filters. The cost for the production of the treated water was computed to be PhP5.80 per 20-liter carboy.

Keywords: emergency, disinfection, drinking, water

EST – 09

ENHANCED ADSORPTION PROPERTY OF GAMMA-IRRADIATED NAOH-MODIFIED PHILIPPINE NATURAL ZEOLITE (PNZ)

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Natural zeolites may be efficient adsorbents for heavy metals depending on the abundance of zeolite components and amount of impurities. A less common method to enhance the sorption capacity of zeolites is through exposure to ionizing radiation. The present study aims to determine the effects of γ-irradiation in the sorption behavior of NaOH-modified Philippine natural zeolites for Cu^{2+} ions. Adsorption kinetic and thermodynamic tests were conducted using non-irradiated and γ-irradiated (400 kGy) NaOH-modified Philippine natural zeolites for the removal of Cu^{2+} ions in aqueous solution. The effects of γ-radiation on zeolites were investigated. Samples were equilibrated with binary systems of $Cu^{2+} \leftrightarrow 2Na^+$ at room temperature. There were no significant changes in the elemental composition of the irradiated zeolite. Irradiation primarily results in the shrinking of the zeolite framework and improvements in the crystallinity. The γ-irradiation increases the sorption uptake according to the kinetic study in which the adsorption kinetics followed a pseudo-second-order model. Thermodynamic tests show that the adsorption isotherms of the two samples are best described by the Langmuir model. The maximum adsorption capacities of the non-irradiated and γ-irradiated NaOH-modified zeolites are 33.00 and 43.22 mg Cu^{2+} g^{-1}, respectively, suggesting that γ-irradiation might enhance the maximum adsorption capacity by up to 30.8%.

Keywords: adsorption; γ-irradiation; heavy metals; natural zeolites

EST – 10

EVACUATION ROUTING ASSESSMENT DURING EARTHQUAKE OCCURRENCE IN BUTUAN CITY USING GEOGRAPHIC INFORMATION SYSTEM (GIS) TECHNIQUES

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Butuan City is being transected by the Philippine Fault: Surigao Segment. As earthquakes occur more recently, the city is more vulnerable to earthquake hazards, especially soil liquefaction. With the city proper situated mostly on areas susceptible to soil liquefaction and with no constructive evacuation plan against this kind of hazard, it puts the city at risk. This problem highlights the importance of vulnerability assessment for the identification of the road networks that would be most optimal to use in occurrence of an earthquake and an earthquake induced liquefaction. With seven parameters to consider for the assessment, it would be easier to assess by using the pairwise comparison technique of the Analytical Hierarchy Process (AHP) and Geographic Information System (GIS). The analysis was performed by using AHP to assign weights to the parameters and using these weights to classify the road networks in to vulnerability classes. The result of the analysis yielded to 34.87% of the road networks with low vulnerability, 65.09% is for medium vulnerability and 0.03% is considered to be highly vulnerable. Majority of the road networks especially in the city proper exhibits medium vulnerability in terms of earthquake occurrences. With unavoidable chances that this kind of disaster would happen, these results would benefit the decision makers involved in disaster risk reduction.

Keywords: Analytical Hierarchy Process (AHP), Earthquakes, Vulnerability assessment

EST – 11

FLEXURAL PERFORMANCE OF BAMBOO REINFORCED CONCRETE BEAMS

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Bamboo has long been used in vernacular construction due to its sustainability, economic value and most importantly, its strength and workability. Owing to its strong mechanical properties, numerous studies have explored the viability of using bamboo as an alternative to steel in the reinforcement of concrete. While studies suggest that the tensile strength of bamboo increases as it ages, there is limited knowledge on the compatibility of different maturities of bamboo in concrete mixes. In this context, this study was pursued to compare the flexural performance of concrete beams reinforced with three- and five-year old locally sourced thorny bamboo (*Bambusa blumeana*). The moisture content, density and tensile strength of strips of bamboo were assessed. Concrete beams were prepared from Class A concrete mix, doubly reinforced with bamboo strips. After 28 days of curing, the specimens were tested to fail under flexural action from third-point loading, in accordance with ASTM C78. Results of the flexural strength test showed an average modulus of rupture of 12.16 MPa and 11.92 MPa for the specimens reinforced with 3- and 5-year old bamboo respectively. The rupture strength in bamboo-reinforced specimens were found to be 1.6 times greater than that of unreinforced concrete. Statistical comparison of the means determined that there is no significant difference ($p<0.05$) between the rupture strengths of bamboo-reinforced concrete. This indicates that the bamboo strips with maturity between 3-5 years will provide equivalent reinforcement against flexural action in concrete.

Keywords: bamboo, *Bambusa blumeana*, reinforced concrete design, flexural strength, modulus of rupture

EST – 12

IMPROVING THE PHYSICO-MECHANICAL PROPERTIES AND POWDERPOST BEETLE RESISTANCE OF BAMBOO THROUGH THERMAL MODIFICATION

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Two commercial bamboo species – namely, "kauayan tinik" (*Bambusa blumeana* J.A. and J.H. Schultes) and giant bamboo [*Dendrocalamus asper* (Schultes et.) Backer ex Heyne] – were thermally modified in a steam environment using 175°C – 30 min and 200°C – 30 min settings. The effect of thermal modification (TM) and the presence of nodes on the physical and mechanical properties of bamboo were studied, as well as the resistance of thermally modified bamboo to the attack of powderpost beetle was investigated. A factorial experiment in a completely randomized design was used to analyze the data. Results showed that TM improved the dimensional stability of bamboo as evidenced by lower moisture content, thickness swelling, and water absorption compared to the control. Except for tensile strength, the flexural and compressive strength of heat-treated bamboo did not significantly change at 175°C – 30 min compared to the control. The presence of nodes, on the other hand, significantly reduced the samples' flexural and tensile strength. Generally, TM improved the physico-mechanical properties as well as the powderpost beetle resistance of bamboo at 175°C – 30 min. At 200°C – 30 min, a slight reduction in strength was observed, especially for *D. asper*.

Keywords: kauayan-tinik, giant bamboo, thermal modification, physico-mechanical properties, powderpost beetle

EST – 13

KAPOK-COTTON CARBON SPONGES FOR OIL RECOVERY

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Commercial sorbents used in recovering oil from bodies of water usually have low sorption capacities, low buoyancy, or high production costs. Renewable, low-cost, efficient, and resilient oil sorbents can be sourced from naturally occurring fibers, such as cellulosic fibers. This study investigates the effect of composition on the sorption capacity of cotton-kapok carbon sponges fabricated using pyrolysis. Different ratios (by weight) of kapok and cotton were mixed before pyrolysis at 400°C for 3 h, ramped at 5°C/min. The oil sorption capacity of the pyrolyzed kapok-cotton fibers was measured using various model oils. Contact angle measurements showed that the pyrolyzed fibers are hydrophobic. Maximum sorption capacities were determined to be about 20-30 times the sorbents' weight.

Keywords: kapok, cotton, pyrolysis, oil recovery, sorption

EST – 14

MUSA TEXTILIS FIBER MAT AS PREVENTION TO SOIL EROSION

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The aim of this study is to evaluate the effectiveness of abaca (*Musa textilis*) fiber geotextile in mitigating soil erosion. The organic fiber of the mat was designed to gradually disintegrate into the soil, and as the mat structure disappears, the vegetative cover will develop. To compare the soil loss rate between a slope with and without the designed abaca fiber mat, a surface run-off analysis was conducted. Geotextiles measuring 4000 mm by 1500 mm were fabricated from 6-mm diameter abaca twine, weaved into a net with mesh openings of 60 x 60 mm. The tensile strength of the twine was assessed according to ASTM D-4268-93 Standard Test Methods for Testing Fiber Ropes. Field tests for surface runoff on three adjacent setups were carried out in Laurel, Batangas over three months. The setups were as follows: (a) a slope without geotextile or vegetative cover, (b) a slope with geotextile but no vegetative cover, and (c) a slope with geotextile and vegetative cover. On the third setup, carabao grass (*Paspalum conjugatum*) was planted in the beginning of the first month and allowed to grow for the duration of the field tests. The rate of soil loss in each of the setups was measured from the sediment mass collected from runoff due to actual precipitation events. The tensile strength test showed that the abaca twine can carry an average load of 1136.70 N, which is 5.68 times greater than the standard tensile strength requirements for Manila hemp. The three-month runoff tests found significant reduction in soil loss due to geotextile and vegetation. The uncovered test slope had the highest sediment yield of 9.68 g/sq-m, while the covered without vegetation test slope had 2.60 g/sq-m, 73.19% lower than the uncovered test slope. The slope with both abaca geotextile and carabao grass provided the lowest sediment yield at 0.11 g/sq-m. The mats installed on the slopes had been left to decompose naturally while promoting plant growth and stabilization of the topsoil.

Keywords: *Musa textilis*, erosion, geotextile, surface runoff, sediment yield

EST – 15

NATURAL PIGMENTS DERIVED FROM TALISAY (*TERMINALIA CATAPPA*) LEAVES, COFFEE (*COFFEA SP.*) PULP, AND MAHOGANY (*SWIETENIA MACROPHYLLA*) TREE BARKS FOR THE RESTORATION OF HISTORICAL PAINTINGS

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Plant-based natural pigments from talisay (*Terminalia catappa*) leaves, coffee (*Coffea sp.*) pulp, and mahogany (*Swietenia macrophylla*) tree barks were explored as alternatives for the imported mineral pigments raw sienna, burnt sienna, and raw umber, respectively. The results show that the selected plant-based pigments can be used in the formulation of paints with water as vehicle upon evaluation of its paint properties. The optimum ratios of the pigment-to-vehicle were found to be 1:1.5, 1:2, and 1:2 for talisay, coffee pulp, and mahogany bark, respectively, using a Hegman-Type Gage. Their color differences against the mineral pigments were 7.78, 29.33, and 17.36 and tinting strengths were $87.03 \pm 12.87\%$, $88.15 \pm 9.00\%$, and $85.74 \pm 8.65\%$ with particle sizes of 35 to 52 µm in diameter. The three plant-derived pigment paints were flat in gloss and have viscosities akin to pseudoplastic and thixotropic fluids. Overall, natural dye sources may be used as a viable source of pigments for paints. Natural pigments can therefore be used as alternative to mineral pigments for historical conservation.

Keywords: natural dyes, pigments, paint, historic preservation

EST – 16

ONE-STEP PREPARATION OF CALCIUM STEARATE-COATED KAPOK FIBERS FOR OIL SORPTION

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Among several approaches in remediating oil-ridden waters, the use of sorbents is considered most efficient and cost-effective. Kapok fiber has been known for its hydrophobic-oleophilic characteristics and exhibits a great potential as oil sorbent. This study investigates the oil sorption performance and hydrophobicity of calcium stearate-coated kapok fibers. The calcium stearate solution was prepared by mixing 0.06 M calcium chloride and 0.06 M stearic acid in an ethanol solution. This was followed by hydrolysis using 0.12 M sodium hydroxide solution. The one-step dipping process involves immersing clean kapok fibers into the solution for 2 min, and drying in an oven at 80 °C for 6 h. The calcium stearate-coated kapok fibers exhibited higher hydrophobicity compared to raw kapok fibers with a water contact angle of ~137°. It achieved the highest oil sorption capacity of 50 g/g for viscous motor oil.

Keywords: kapok fiber, calcium stearate, dip-coating, oil sorption

EST – 17

OPTIMIZATION OF BIOETHANOL YIELD FROM SUGARCANE *(SACCHARUM OFFICINARUM)* PRESS MUD VIA ENZYMATIC SACCHARIFICATION AND FERMENTATION PROCESS

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Production of bioethanol using second generation feedstock from agricultural waste have attracted considerable scientific interest as an alternative to fossil fuel which may resolve problem on environmental pollution. A huge volume of unutilized sugarcane press mud (SPM) generated from sugar industry is one of a potential source of bioethanol. It contains 25.06%(w/w) α-cellulose and 26.36%(w/w) hemicellulose constituting to 51.42% (w/w) carbohydrate content in the biomass which can be a viable feedstock for ethanol production. The hydrolyzed and detoxified SPM undergone simultaneous saccharification and fermentation (SSF) process to produce bioethanol. Enzymatic saccharification of SPM using cellulase enzyme loading has significantly affect the conversion of cellulose into a reducing sugar. Increasing the enzyme loading increases the reducing sugar to up to 55.24% based on the α-cellulose content. Response surface methodology was used to determine the optimum condition in the SSF process of bioethanol conversion. Central composite design using three factors such as yeast-to-SPM ratio (0.5, 0.75, 1.0), pH (3.5, 4.5, 5.5) and temperature (35, 40, 45) is the design of experiment used to evaluate the effect of each parameter in the yield of ethanol. The interaction of all the parameters have significantly affect the yield in which yeast-to-SPM ratio has affected mostly. The optimum yield obtained was 17.9424% bioethanol at pH of 4.5, 1:1 yeast-to-SPM ratio at 40ºC. A quadratic model was generated with an R^2 value of 0.9952 which was confirmed valid after conducting confirmatory runs.

Keywords: *Bioethanol, Saccharum officinarum, saccharification, fermentation*

EST – 18

OPTIMIZATION OF PRETREATMENT AND ENZYMATIC HYDROLYSIS OF SUGARCANE BAGASSE FOR POLYHYDROXYBUTYRATE (PHB) PRODUCTION

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Agricultural residues such as sugarcane bagasse may be used as substrates to lower the production cost and improve the marketability of bioplastics such as polyhydroxybutyrate (PHB). In this study, sequential pretreatment and enzymatic saccharification were successively optimized via response surface methodology (RSM) to effectively convert sugarcane bagasse to reducing sugars. These sugars were essential in producing PHB through bacterial fermentation. Steam explosion at 230°C for 11.2 min, followed by dilute acid pretreatment using 4.76% w/v H_2SO_4 at 136.4°C for 41.63 min was proven to efficiently disrupt the recalcitrance and improve the digestibility of the biomass. Then, reducing sugars were produced from the sequentially pretreated biomass through an optimized enzymatic saccharification at 4.94% w/v solids loading, 102.98 FPU/g dry pretreated biomass, and 70.44 h saccharification time. A maximum reducing sugar yield of 0.44 g reducing sugars/g dry pretreated biomass was obtained from the optimized conditions. Moreover, PHB was successfully biosynthesized by *Bacillus megaterium* PNCM 1890 using sugarcane bagasse hydrolysate, yielding 0.31 g PHB/g reducing sugars after 20 h of fermentation. These results may provide benchmark data for future PHB fermentation optimization studies to further improve the potential of sugarcane bagasse for sustainable commercial-scale PHB production.

Keywords: enzymatic hydrolysis, polyhydroxybutyrate, response surface methodology, pretreatment, sugarcane bagasse

EST – 19

PHYSICOCHEMI- MECHANICAL, THERMAL, AND RHEOLOGICAL PROPERTIES ANALYSIS OF PILI TREE (*CANARIUM OVATUM*) RESIN AS AIRCRAFT INTEGRAL FUEL TANK SEALANT

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Leaks arising from aircraft fuel tanks is a protracted problem for the aircraft manufacturers, operators, and maintenance crews. It principally arises from stress, structural defects, or degraded sealants as the aircraft age. It can be ignited by different sources, which can result in catastrophic flight and consequences, exhibiting a major drain both on time and budget. In order to mitigate and eliminate this kind of problem, the researcher produced an experimental sealant having a base material of natural tree resin, the Pili Tree Resin.

Aside from producing an experimental sealant, the main objective of this research is to analyze its physical, chemical, mechanical, thermal, and rheological properties which is beneficial and effective for specific aircraft parts, particularly the integral fuel tank. Experimental method of research was utilized in this study since it is a product innovation. This study comprises two parts, specifically the Optimization Process and the Characterization Process. In the Optimization Process, the experimental sealant was subjected to the Flammability Test, an important test and consideration according to air laws and regulations specifically the 14 Code of Federal Regulation Appendix N, Part 25 - Fuel Tank Flammability Exposure and Reliability Analysis, to get the most suitable formulation. Followed by the Characterization Process, where the experimental and commercial sealant has undergone twenty different standard testing to determine and analyze the five material properties of the sealant including its physical, chemical, mechanical, thermal, and rheological properties.

Based on the results of the different standard testing conducted, the experimental sealant exceeded all the data results of the commercial sealant used in aircraft integral fuel tank. This result shows that the physicochemi- mechanical, thermal, and rheological properties of the experimental sealant are far more effective as an aircraft integral fuel tank sealant alternative in comparison to the commercial sealant. Therefore, Pili Tree possesses a new role and function: a source of ingredients for sealant production.

Keywords: aircraft, integral fuel tank, pili tree, resin, sealant

EST – 20

PINEAPPLE LEAF (*ANANAS COMOSUS)* FIBER-BLENDED TEXTILES AS ALTERNATIVE FABRIC SUPPORT FOR REMEDIAL CONSERVATION OF HISTORICAL TEXTILES

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The evaluation of natural textile fiber (NTF) blended fabrics for structural reinforcement of easel paintings on canvas in the context of textile conservation was explored using pineapple (*Ananas comosus)* leaf fiber-based textiles. The NTF were processed from yarns into fabrics using an industrial power loom, with the blended yarns used as both warp and weft. The yarn and fabric properties, fabric construction, breaking strength, crimp, and luster were evaluated. The NTF blended textile yielded an average biaxial breaking strength of 528N (warp) and 720N (weft). A crimp ratio (C_{Ratio}=0.77) from the warp and weft of the fabric was obtained and used to indicate the uniformity of the constructed fabric. The NTF blended fabrics showed high gloss coefficients of 2.40 (weft), 2.40 (warp), and 2.33 (bias). The NTF blended textiles compared to the prevailing Belgium linen used for the same purpose revealed a suitable combination of properties for structural reinforcement of easel paintings on canvas for conservation purposes.

Keywords: canvas, textile conservation, natural fibers

EST – 21

POST-TREATMENT OF FOOD PROCESSING WASTEWATER EFFLUENT FOR NUTRIENT REMOVAL

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Elevated nutrient concentrations in water negatively affects the water quality and aquatic biota thru eutrophication. The issuance of DENR Administrative Order No. 08 series of 2016 sets new water quality guidelines and general effluent standards in restricting nutrients, specifically, nitrates (NO_3^--N) and phosphates (PO_4^{3-}-P) concentration in wastewater to 14 ppm and 1 ppm, respectively. The study aimed at assessing the capability of a trickling filter as a post-treatment system in reducing the NO_3^--N and PO_4^{3-}-P concentrations of food processing wastewater. Initial characterization of effluent samples from the plant indicated PO_4^{3-}-P and NO_3^--N concentrations of up to 2.9 ppm and 3.4 ppm, respectively, showing that the wastewater exceeds standard PO_4^{3-}-P concentration. A bench- and pilot-scale bubble cap-type trickling filter systems were designed and fabricated to remove excess nutrients in the collected food processing effluent. Collected activated aerobic sludge from the existing wastewater treatment facility of the plant was acclimatized, recirculated, and immobilized in the packing material within the treatment system for one week without additional supplements. Bench-scale treatability studies show both PO_4^{3-}-P and NO_3^--N removal efficiency of up to 91% at 24-hour retention time. Pilot-scale performance testing indicated 75% PO_4^{3-}-P removal and 43% NO_3^--N reduction operated at 24-hour retention time and batch-wise feed flow rate of 5L/min for 4 hours. Final phosphates and nitrates concentrations as low as 0.09 ppm and 0.3 ppm were achieved, respectively, indicating the viability of the developed treatment system to remove residual nutrients from effluent to achieve standard limits.

Keywords: nitrates, phosphates, nutrient removal, trickling filter,

EST – 22

PRODUCTION AND CHARACTERIZATION OF EPOXIDIZED KRAFT LIGNIN FROM *ACACIA MANGIUM* WOOD

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This study dealt with the potential of producing bio-based plastic from black liquor obtained as a by-product of kraft pulping of *Acacia mangium* wood. Pulping was employed using the following conditions: 25% sulfidity; 18% active alkali; 5 is to 1 liquor to wood ratio; heating temperature of 170 °C for 120 min. Lignin was precipitated using 4% v/v H_2SO_4 until a pH of 2 was attained at two temperature levels (30 and 75°C). Centrifugation, filtration and drying procedures were used to obtain the lignin (KL). Lignin was then epoxidized using various amounts of polyethylene glycol diglycidyl ether (PEGDE) in 20% NaOH solution. The reaction was carried for 3 hours at 30°C followed by the same series stated above to obtain the epoxidized kraft lignin (EKL). Epoxy index was determined with the addition of pyridinium hydrochloride on EKL and titration of the acid excess with NaOH solution. KL and EKL were characterized using fourier transform infrared radiation spectroscopy (FTIR) and thermogravimetric analysis (TGA). Higher yield of KL was obtained with precipitation at lower temperature. The epoxy index was found to be inversely proportional with the temperature. Results of the FTIR proved the epoxidation of lignin. Low PEGDE/KL ratios yielded lower consumption of NaOH but favored the etherification of the hydroxyl groups in lignin. Lignins epoxidized at different degrees showed different thermal degradation profiles. The higher the epoxy index, the higher the amount of char, as a consequence of higher etherification of lignin hydroxyl groups.

Keywords: FTIR, TGA, epoxy index, lignin

EST – 23

PRODUCTION AND EVALUATION OF BIODIESEL FROM RAMBUTAN (*NEPHELIUM LAPPACEUM*) SEED OIL

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This study was conducted to contribute to the search for alternative fuels that can potentially answer the worldwide problem of the gradual depletion of world petroleum reserves and the increasing exhaust emissions leading to environmental hazards. There have been studies that food wastes can be a potential alternative energy source which can be a substitute for petroleum-based diesel fuels and the main focus of this study was to use rambutan seeds as the source. The rambutan seed oil was also compared to Coco Methyl Ester (CME) 100 and CME2 to determine if the extracted oil passes the Philippine National Standard of the Biofuel Act of 2006. The extrication of oil was done using solvent extraction with the aid of n-hexane as a solvent. The extracted crude seed oil was subjected to biodiesel generation through base-catalyzed transesterification using methanol, as the catalyst, with an objective molar proportion of methanol to oil and was thereby tested to confirm the product's conformity to the Philippine National Standards for Biodiesel and its blend, B2. The highest oil yield gathered was a result of variation in soaking time. The application analysis was done through engine emission testing with comparable results to the commercially available diesel. The results of the experiments revealed that the Soaking Extraction for Rambutan Seed Oil could produce a higher yield at its optimum contact time. Qualitative tests of Physico-chemical properties showed that Rambutan Methyl Ester is comparable to the commercial Coco Methyl Ester. The five-day contact time and molar proportion of methanol to oil for transesterification produced the highest % of Methyl Ester that shows and verifies the potentiality of Rambutan Seed Oils as local feedstock for Biodiesel production and as an innovative additive to present diesel available.

Keywords: *Base-catalyzed Transesterification, Biodiesel, Nephelium lappaceum, Rambutan Seed Oil, Solvent Extraction*

EST – 24

PRODUCTION OF CELLULOSE ACETATE FROM PINEAPPLE (*ANANAS COMOSUS*) LEAVES FOR FILTRATION OF SUGAR INDUSTRY WASTEWATER

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Pineapple leaves is one of the agricultural waste which are vastly generated but left rotten and unutilized. This study used waste pineapple leaves for the production of cellulose acetate. Central Composite Design is the design of experiment used in the optimization of the parameters such as acetylation temperature ((30°C, 40°C and 50°C) and acetylation time (4, 6, 8 hrs) on the weight percent gain (WPG) and percent acetyl content (PAC) of cellulose acetate. The interaction of acetylation temperature and acetylation time have significantly affect the WPG and PAC of the produced cellulose acetate with $p < 0.0001$. The optimum condition in the production of cellulose acetate was observed at 60°C and 6.6 hours with 25.93% WPG and 45.15% PAC. A reduced quadratic equation was generated with an R^2 of 0.8917 in WPG and 0.8565 in PAC. The pH and bulk density of the produced cellulose acetate are 4.31 and 1.27 g/cm^3 respectively. Fourier transformed infrared spectroscopy (FTIR) analysis revealed the carbonyl (C=O) group at 1753 cm^{-1} and acetyl (C-O) group at 1236 cm-1 region. Scanning electron microscope (SEM) showed an average of 67nm fiber diameter. The produced cellulose acetate was used in producing cellulose acetate membrane for treatment of sugar industry wastewater. The treatment of the wastewater resulted to a removal of nitrates (56.25%), total suspended solids (30.36%), turbidity (30.88%) and total dissolve solids (4.62%).

Keywords: cellulose acetate, *Ananas comosus*, *weight percent gain, percent acetyl content.*

EST – 25

PRODUCTION OF FOOD PACKAGING BIOPLASTIC FILM FROM RED SEAWEEDS (*GRACILARIA VERRUSCOSA*)

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Plastic food packaging poses a big threat in the environment, bioplastic can be applied for food packaging in order to lessen the plastic wastes. Production of bioplastic films for food packaging from Gracilaria verrucosa, which contains agar had been the focus of the study. The percentage yield of agar extracted from the red seaweed was approximately 15.12%. The produced bioplastic films had varying ratios of agar and plasticizer. For the mechanical properties of the bioplastic films, 4 grams of agar mixed with 1% glycerol solution showed the highest value which was 2.537 MPa. The bioplastic film which has 2 grams of agar mixed with 2% glycerol showed the highest thermal properties with peak temperature of 144.94 °C. For the chemical resistance of the bioplastic films, it was determined the 2 grams of agar mixed with 2% glycerol showed the highest resistance for base and acid, 78.84% and 73.23% respectively. Soil burial method was done in order to determine the biodegradability of the bioplastic films of varying ratios. The most suitable bioplastic film was compared to a commercially available biodegradable plastic For the thermal properties, chemical resistance, and biodegradability, there were no significant difference. The thermal properties of the biodegradable plastic were 118.99 °C, while for the most suitable bioplastic film it was 112.16 °C. The chemical resistance of the biodegradable plastic was tested resulting 61.41% resistance in acid and 43.88% resistance in base which was compared to the acid resistance and base resistance of the most suitable bioplastic film for food packaging which were 63.57% and 45.21% respectively. For 14 days, the biodegradability of the biodegradable plastic and bioplastic films was compared. The most suitable bioplastic film had a biodegradability of 52.99% and the biodegradable plastic was 51.36%.

Keywords: bioplastic film for food packaging, red seaweeds, gracilaria verrucosa, extraction of agar, soil-burial method

EST – 26

PROPULSION REQUIREMENT AND ANALYSIS OF A CANARD PRANDTL – WING UNMANNED AERIAL VEHICLE PLATFORM FOR CIVILIAN ORIENTED MISSIONS

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A performance analysis was conducted in order to establish the propulsion system of a canard Prandtl – wing unmanned aerial vehicle platform intended for civilian oriented missions. Computational methods were performed in order to determine how the vehicle can perform satisfactorily according to its mission.

The UAV design specifications included a take-off gross weight of 7 kgf, a cruising speed of 20 m/s, and endurance of at least 1 hour. Moreover, the mission profile included taxi, takeoff, climb, cruise, loiter, cruise, landing, and taxi. The design iterative processes were conducted using established aircraft design methodology and tools. Computational fluid dynamics (CFD) was utilized to evaluate the flight performance.

CFD results showed that the maximum power consumption and thrust occurred during the takeoff stage at 14 m/s velocity. The electric motor consumed 175 watts of power after 2 minutes and had 73.97 N maximum thrust while the minimum power consumption of 60 W occurred during loiter phase at 16 m/s sustained velocity. The aircraft started to descent at 11.5 minutes and had 3.5-minute duration for descent and landing. Power consumption at this point started to decrease and completed the flight mission after 15 minutes. Consequently, the 15-minute sample flight plan for a 2.5 km range was re-scaled to a 1 hour flight plan with a 10 km range and showed that the electric propulsion system was able to achieve the design requirement.

Results showed that the propulsion system of the canard prandtl-wing configuration aircraft has capable features during flight and can be pushed to the next phases of development for future studies.

Keywords: UAV, propulsion, cfd, canard, prandtl-wing

EST – 27

RETENTION AND CONCENTRATION OF EMBEDDED NUTRITIONAL CONTENTS IN AMCHPD DRIED SALUYOT (*CORCHURUS OLITORIOUS* L)

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Retention and concentration of embedded nutritional contents in dried commodities is unusual. The study determined the effects of an ideal temperature and % relative humidity on the retention of the nutritional contents of dried and fresh saluyot using proximate analysis, and, to confirm the retained nutritional contents of the AMCHPD dried saluyot through comparison with the initial nutritional contents embedded in fresh saluyot leaves. Samples were gathered from the field, washed with potable water, pat to dry and loaded it to the AMCHPD using stainless trays. After 5 hours drying time, the dried saluyot was unloaded, ground, packed to 300g and was submitted to the Service Laboratory, Food and Nutrition Research Institute for proximate analysis. Results revealed that the AMCHPD dried saluyot has the following: 8.9% moisture content(%MC), 10.5 g ash content, 65.0 kcal energy content, 7.5 g total fat, 43.7g in total carbohydrate. Comparing it with the fresh saluyot leaves: 83.0 %MC, 3.5g ash, 118.0 kcal energy content, 0.17g total fat, 27.89g total carbohydrate, 4.1g total dietary fat, 1.53g protein and 9.0 mg sodium. Further, analysis showed that the nutritional contents of the dried saluyot were concentrated. These results indicated that the ideal drying temperature of 35.0 to 50.0 ^{0}C and 10.0% relative humidity of the AMCHPD was able to retain and concentrate the nutritional contents embedded in fresh to dried saluyot.

Keywords: saluyot, nutrition contents, drying, AMCHPD

EST – 28

SELECTED PROPERTIES OF PAPER EMBEDDED ZINC OXIDE AND COPPER OXIDE PARTICLES

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Commercial filter paper was embedded with zinc oxide (ZnO) and copper oxide (CuO) either singly or in combination via microwave-assisted hydrothermal method. Different molar ratios of ZnO and CuO precursors were used. Embedment was determined using X-ray Diffraction (XRD) Analysis, Fourier Transform Infrared (FTIR) Spectroscopy and Scanning Electron Microscopy (SEM). The energy-band structure was characterized using UV-Vis Spectroscopy. The conductivity was measured using Impedance Spectroscopy. Antibacterial property was tested against *Staphylococcus aureus* and *Escherichia coli* using disk diffusion assay. XRD analysis revealed the presence of ZnO and CuO with hexagonal wurtzite and crystalline structures, respectively. FT-IR spectra confirmed the presence of ZnO and CuO at peaks 428.13 cm^{-1} and 534.13 cm^{-1}, respectively. SEM analysis verified the presence of the nanoparticles. UV-Vis analysis measured that ZnO, CuO and combination of ZnO and CuO have band gaps of 3.3 eV, 1.5 eV, and 2.28 eV, respectively. Oxide embedment enhanced the conductive property of paper. Increased concentrations of ZnO and CuO has a positive effect on the electrical conductivity of the paper. The oxide-embedded paper inhibited the growth of *S. aureus* and *E. coli.* Increased concentration of ZnO and CuO has a positive effect on the antibacterial property of paper. ZnO was better at inhibiting the growth of *S. aureus* while CuO was better at inhibiting the growth of *E. coli*. The antibacterial property of paper was more effective when ZnO or CuO acted alone than when used in combination for the target organism.

Keywords: XRD, FTIR, SEM, UV-Vis, conductivity, antibacterial property

EST – 29

SELECTION OF A SANITARY LANDFILL SITE IN LIPA CITY, BATANGAS USING GIS AND ANALYTIC HIERARCHY PROCESS

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This study determined the candidate sites for a sanitary landfill that will serve as a final disposal facility of municipal solid wastes in Lipa City, Batangas using an integration of geospatial tools and analytical hierarchy process (AHP). Suitable sites were selected by multi criteria decision analysis, in consideration of environmental factors such as topography, hydrology, geology and geo-hazard, land use and accessibility, and prioritized with pairwise comparison and weighted sum analysis. Greater importance values were designated to natural factors such as static groundwater depth, infiltration capacity and rivers and creeks to minimize the exposure of the hydrogeological environment. The level of site suitability was indexed and visualized through thematic geo-referenced maps generated in ArcGIS. The results of GIS and AHP showed an aggregated area of 17,203.75 ha classified as "not suitable", covering 82.16% of the total land area of Lipa City, while "suitable" sites covered around 15.08%, equivalent to 3,158.05 ha. The remaining 2.76% of the total land area, equivalent to 578.20 hectares, was assessed as "most suitable". From this composite, the locations of the most suitable candidate sites and their respective land areas were identified as follows: Barangay Tanguay, 62.72 ha; Barangay San Salvador, 38.71 ha; Barangay Sto. Toribio, 111.23 ha; and Barangay San Francisco, 107.80 ha. For further refinement of the suitability maps, field investigation and detailed hydrogeological characterization are highly recommended.

Keywords: sanitary landfill, analytic hierarchy process, geographic information system, multi criteria decision analysis, Batangas

EST – 30

SYNTHESIS OF IRON OXIDE NANOPARTICLES USING *COFFEA LIBERICA* PERICARP EXTRACTS OBTAINED USING MICROWAVE ASSISTED METHOD

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Green synthesis of metal oxide nanoparticles is now becoming a promising area of research. Microwave assisted method being was employed for a rapid and homogenous heating of the solution. Iron oxide nanoparticles (IONPs) were successfully synthesized using *Coffea liberica* pericarp extracts via microwave assisted method. Central composite design is the design of experiment use to investigate the effect of irradiation time (5, 10, 15 mins) and microwave power (210, 350, 490 W) on the total phenolic content (TPC) and total soluble carbohydrates (TSC) of *Coffea liberica* extracts. The optimum TPC and TSC obtained were 22.3542 mg-GAE/g-sample and 4.3876 mg-GE/g-sample respectively at 10 minutes irradiation time and 350 W microwave power and used for synthesis of IOPs. The effects of varying metal-to-extract ratio (1:1, 3:1, 5:1) and temperature (45, 65, 85 °C) on the yield and particle size of IONPs were investigated. The metal-to-extract ratio and temperature have significantly affect the yield and particle size of IONPs with p<0.0001. The optimum condition was observed at 3.296 metal-to-extract ratio and 85 °C which resulted to 1.04 g iron oxide nanoparticle having a particle size of 65.23nm analyzed with scanning electron microscope (SEM). A reduced linear equation was generated with an R^2 of 0.9070 and 0.9680 in yield and particle size of IONPs which was proven valid after confirmatory runs. Energy dispersive X-ray (EDX) showed characteristic peaks of iron (Fe), oxygen (O) and carbon (C) with composition of 88.42%, 8.13% and 3.44% respectively which confirmed the presence of IONPs containing *Coffee liberica* pericarp extracts.

Keywords: *Iron oxide nanoparticle, microwave-assisted method, Coffea*

EST – 31

SYNTHESIS OF POLYHYDROXYBUTYRATE / STARCH / TRIETHYL CITRATE FILAMENTS FOR 3D PRINTING APPLICATIONS

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The emerging popularity of additive manufacturing of polymer widens the opportunity in the application of biodegradable plastics. Several bioplastic materials have been developed using polylactic acid (PLA) in 3D printing processes. However, pure PLA is not totally biodegradable as it needs special conditions to fully disintegrate. Polyhydroxybutyrate (PHB), a biopolymer of bacterial origin, was highly regarded as a promising alternative to PLA. However, its low processability led to PHB being combined with PLA for advanced applications such as 3D printing. Therefore, the research focuses on fabricating PHA filaments without polymerizing with other bioplastics such as PLA. In this study, PHB/starch (S)/triethyl citrate (TEC) was synthesized to produce a 3D printing filament using melt extrusion process at varying composition and operating conditions. PHB/S/TEC filaments were optimally synthesized at a composition of 64/16/20 w/w. Moreover, it was found that the optimal extruder operating speed and temperature range to achieve a stable filament are at 40 rpm and 156-159°C, respectively. This study shows the successful fabrication of pure PHB-based filament for 3D printing applications. The produced filament will then be further characterized based on its thermal and mechanical properties, 3D printing performance, and biodegradability.

Keywords: bioplastic, polyhydroxybutyrate, starch, filament extrusion, composite, 3D printing

EST – 32

A SIMPLE METHOD OF GROWING ZNO NANOSTRUCTURES

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Zinc oxide (ZnO) is a widely used semiconducting material in many industrial products, including paints, cosmetics, and pharmaceuticals. It has been prepared in a variety of nanostructures, including nanowires, nanorods, nanotubes, and hierarchical using common synthesis routes, such as hydrothermal method, thermal evaporation, chemical vapor deposition, and sol-gel process. These methods, though effective in producing different ZnO nanostructures, often require expensive equipment and harsh conditions. In this work, we report the preparation of various ZnO nanostructures by simple oxidation of Zn foil using hot water. Hierarchical structures of pointed nanorods, flat-topped nanorods, and nanotubes were obtained at increasing oxidation time. The surface of these nanostructures can be easily modified using stearic acid and 1-hexadecene to produce a superhydrophobic coating.

Keywords: Wet oxidation, ZnO, Nanostructures, Surface modification

EST – 33

UTILIZATION OF ADSORBENT DERIVED FROM CHICKEN FEATHERS FOR CADMIUM METAL (CD $^{2+}$) ADSORPTION IN SIMULATED WASTEWATER

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This study described the adsorption characteristics of heavy metal-Cadmium (Cd^{2+}) from simulated wastewater onto activated carbon utilized from Chicken Feathers. The produced activated carbon was characterized using Scanning Electron Microscopy, Energy Dispersive X-ray, and Fourier Transform Infrared Spectroscopy. Based on the results, the sample utilized had the qualities that an adsorbent should have. The adsorption behavior of chicken feather for cadmium ions from simulated wastewater had been investigated as a function of appropriate contact time and adsorbent dose. Results demonstrated that the removal rate of cadmium decreased rapidly with the increase of adsorption time and adsorbent dose. The optimal removal efficiency was 85.19% and was reached at 1-hour Contact Time and 1-gram Adsorbent dose. Both parameters had decreasing effect in the percent removal. Final Concentrations were measured using Atomic Absorption Spectrometer. The mathematical model that best described the results was Quadratic. It was shown that the adsorption of cadmium could be described by the pseudo-second order equation ($R^2 = 0.9992$), suggesting that the adsorption process is presumably a chemisorption. The chicken feather investigated in this study showed good potential for the removal of cadmium from aqueous solutions.

Keywords: activated carbon, adsorption, cadmium metal, chicken feathers

EST – 34

UTILIZING RICE HUSK-DERIVED MESOPOROUS SILICA AS SUPPORT MATERIAL FOR CATALYTIC BIMETALLIC PARTICLES

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Rice husks (RH) are agricultural waste products imposing significant environmental challenges such that its typical end-of-life and disposal methods often lead to energy loss and pollution. However, an interesting feature of RH is its high silica content (up to ~20% of its composition) which can be extracted through subsequent acid treatment followed by combustion. In this study, we feature a strategy entailing RH-derived silica particles (RH-SiO$_2$) as porous support material for catalysts such as Cobalt-Copper bimetallic nanoparticles (referred to as CoCu/RH-SiO$_2$), deposited through oxalate precipitation followed by thermal decomposition. The obtained RH-SiO$_2$ exhibits high-purity (~99 %), high surface area (~246 m^2 g^{-1}), and mesoporous structures (diameter ~3.7 nm). Interestingly, the synthesized CoCu/RH-SiO$_2$ particles, possess higher metallic content (Cu^0 in particular) compared to those deposited onto commercially available SiO$_2$ particles (CoCu/SG-SiO$_2$), which is a property preferred for catalytic applications (e.g. Fischer-Tropsch reaction). Moreover, this work provides critical outlooks towards facile and cost-effective valorization of agricultural waste products and low-cost production of high-performance catalytic materials.

Keywords: valorization, bimetallic particles, composite, surface properties

EST – 35

WATER REPELLENT-ANTIMICROBIAL FINISHING OF PINEAPPLE-COTTON BLENDED FABRIC: A PILOT SCALE APPROACH

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A facile method of pilot-scale water repellent-antimicrobial finishing in a natural fiber blended fabric was developed and verified. The water repellent and antimicrobial functionalities were imparted on *Ananas comosus* (pineapple leaf fiber)-cotton blended fabric via the pad-dry-cure method. Hydrophobic silica sol was prepared through the hydrolysis and condensation of alkylsilane precursors tetraethoxysilane (TEOS) and octyltriethoxysilane (OTES) while Ag NPs were prepared from Ag+ and polymethacrylic acid precursor via UV-assisted reduction reaction. The prepared silica sol and Ag NPs were mixed to obtain Ag-silica finishing sol. The pineapple-cotton blended fabrics were soaked in the finishing sol and dried-cured in an industrial stenter to obtain the water repellent-antimicrobial fabric. The water repellency test (AATCC TM 22-2005: Spray Test Method) of the finished fabric (including contact angle and wetting time measurements) confirm the water-repellent property of the finished fabric. Antimicrobial testing of the finished fabric indicates a good antimicrobial activity against E. coli and S. aureus. The Scanning Electron Microscopy-Energy Dispersive Spectroscopy (SEM-EDS) and Fourier Transform Infrared (FTIR) analyses confirm the presence of Ag and alkylsilanes on the finished fabrics that confirm the successful functionalization of fabrics. The finished fabrics were subjected to repeated simulated laundering to assess the durability of the finishing. The method presented will serve as a guide for the textile industries for water repellent-antimicrobial finishing of fabric most especially in natural fiber blended fabrics.

Keywords: water repellent, antimicrobial, natural fiber-blende

HEALTH SCIENCES

HSD – 01

MODULATION OF OXIDATIVE STRESS AND BIOLOGICAL MARKERS OF OSTEOARTHRITIS BY THE PHILIPPINE ENDEMIC PLANT
ALPINIA ELEGANS (C. PRESL) K. SCHUM LEAF EXTRACTS

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Osteoarthritis (OA) is the most common musculoskeletal disease and the leading cause of disability worldwide. To date, medications available for OA can only treat symptoms. *Alpinia elegans K. Schum,* locally known as "Tagbak" as a Philippine endemic plant, is traditionally used as a medicine for musculoskeletal diseases. This study aims to evaluate the chondroprotective activity of *A. elegans* leaf extracts in MIA-induced osteoarthritis rat model by targeting multiple pathways. The crude ethanolic and sub-extracts of *A.elegans* leaves were subjected to in vitro tests hydrogen peroxide, hydroxyl radical and nitric oxide scavenging assays. Chondroprotective activity was assessed in vivo by measuring the expression of SOD, Catalase, MMP13, MMP3, TNF- α and IL-1β in the serum using ELISA. Furthermore, histological analysis was conducted to determine cellular abnormalities and proteoglycan loss in rat cartilages. Both the crude ethanolic and ethyl acetate sub-extract exhibited the highest antioxidant and chondroprotective effects by inhibiting oxidative stress, reducing the expression of cartilage degrading enzymes and pro-inflammatory cytokines. In addition, cellular abnormalities and proteoglycan loss were significantly decreased on rat cartilages. This is attributed to the presence of putative compounds which are known to be highly effective in the attenuation of OA disease. Therefore, the *A. elegans* crude ethanolic and ethyl acetate leaf extracts can be a promising therapeutic option for the development of novel treatment for OA.

Keywords: *Alpinia*; chondroprotection; MIA; osteoarthtiris

HSD – 02

PROFILING AND FUNCTIONAL CHARACTERIZATION OF THE BREASTMILK METABOLOME OF FILIPINO LACTATING WOMEN.

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Breastmilk (BM) is considered as the gold standard food in providing optimal nutrition for newborns and developing infants. Understanding the biochemical composition of BM is essential in developing effective nutritional programs that promote positive maternal and infant health outcomes. This study aims to investigate the BM metabolome of Filipino lactating women using two analytical platforms.

Metabolites from BM samples obtained from 50 Filipino lactating women were profiled using gas chromatography-mass spectrometry (GC-MS) and proton nuclear magnetic resonance (^{1}H-NMR) spectroscopy. Metabolite-set enrichment analysis (MSEA) and pathway analysis were performed to explore the functional significance of the identified metabolites in their respective pathways.

A total of 60 metabolites were identified. GC-MS analysis identified lipid metabolites. ^{1}H-NMR analysis identified amino acids, organic acids, sugars, and lipid hydrolysis intermediates. MSEA highlighted three pathways related to fatty acid (FA) metabolism. Pathway analysis revealed four overrepresented pathways related to free amino acid (FAA) metabolism.

To our knowledge, this is the first study that provides preliminary insights into the BM metabolome of Filipino lactating women. Data from this study may serve as a focal point for the development of effective nutritional intervention strategies targeting vulnerable pediatric population groups.

Keywords: breastmilk, metabolomics, metabolites, gas chromatography-mass spectrometry, nuclear magnetic resonance

HSD – 03

HEALTH RISK ASSESSMENT OF SELECTED HEAVY METALS ASSOCIATED WITH THE CONSUMPTION OF RICE HARVESTED FROM MINE-CONTAMINATED LANDS IN ZAMBALES, PHILIPPINES

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Mining of elements such as gold and copper is one of the major causes of heavy metal (HM) contamination of soil globally. HMs can also bioaccumulate in various food crops and pose various health risks to the human population. When ingested, HMs may affect the central nervous tissues, kidneys, other vital organs of humans, potentially causing serious disabilities. It was therefore of interest to investigate the presence and health risk of selected HMs (Cu, Fe, Mn, and Zn) associated with consumption of rice harvested from mine-tailing lowland (LL) and upland (UL) sites in Barangay Buhawen, San Marcelino, Zambales, Philippines.

Detection of HMs in the sampled rice grains was conducted through atomic absorption spectrophotometry following standard protocols. Meanwhile, national reference data on rice consumption, population frequencies, and vital statistics (i.e. body weight (BW)) values from published sources were fitted in statistical distributions and combined to determine Estimated Daily Intakes (EDIs). The Margin of Exposure (MoE) health risk approach was followed by dividing established No Adverse Effect Level (NOAEL) values by the EDIs for each HM. Probabilistic estimation was employed using the *mc2d* (Monte Carlo) package in R software v.4.0.1 with 10,001 iterations.

The mean levels found in grains of rice planted in LL were as follows: 13.37 mg Cu/kg, 6.00 mg Fe/kg, 7.53 mg Mn/kg, and 20.97 mg Zn/kg, while for UL: 22.50 mg Cu/kg, 8.37 mg Fe/kg, 5.13 mg Mn/kg, and 22.40 mg Zn/kg. The 97.5th percentile mean EDIs of Cu, Fe, Mn and Zn were 1.01 mg/kg BW, 0.43 mg/kg BW, 0.53 mg/kg BW and 1.49 mg/kg BW in LL rice and 1.56 mg/kg BW, 0.61 mg/kg BW, 0.39 mg/kg BW and 1.53 mg/kg BW in UL rice.

The median MoE risk index levels for all HMs were less than 100, indicating a moderate concern for possible occurrence of chronic adverse effects due to consumption of HM contaminated rice in the area. Thus, it is recommended that control measures for soil contamination and HM exposure be considered to protect the health of the residents of Zambales.

Keywords: heavy metals, rice, Zambales mining, health risk, assessment

HSD – 04

FORMULATION OF "NIPAHOL" SANITIZER GEL AND EVALUATION OF IT'S ANTIBACTERIAL EFFICACY AGAINST *STAPHYLOCOCCUS AUREUS*

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"Nipahol" is a high-grade bioethanol produced from nipa sap using the proprietary fermentation and distillation technologies developed by a group of researchers at the MMSU-NBERIC. Formulation of 70% sanitizing gel from nipahol and evaluation for its organoleptic properties and antibacterial efficacy were conducted amid COVID 19 pandemic. Preparation of the sanitizer gel was done in three formulations: Formulation A (0.3% carbomer and moisturizer), Formulation B (0.5% carbomer and moisturizer). and Formulation C (with 0.3% carbomer only). Organoleptic properties (pH, viscosity, and physical stability) were evaluated from day 0, day 7, and day 30 of storage. Agar-well diffusion method was done to evaluate the antibacterial efficacy *in vitro* of the formulated sanitizing gels using an available test organism, *Staphylococcus aureus*. Statistical analysis was done in Completely Randomized Design (CRD) using Statistical Tool for Agricultural Research (STAR). Formulations A and C changes pH level from 6.4 to 6.8 at day 30 of storage while Formulation B gradually decreased to nearly acidic (from 6.3 to 6.0). Viscosity test using Zahn method reveals that Formulation B falls under specification standard for hand sanitizer in the range of 2,381cP to 16,893cP compared to a commercial hand sanitizer gel. All formulations had good stability (no significant change in color) after 30 days of storage at different temperatures (25ºC, 37ºC, and 40ºC). Antibacterial test showed that all formulations gave significant differences against *S. aureus* in comparison with the control. The formulated sanitizer gel from Nipahol is a potential alternative alcohol sanitizing gel amid COVID-19 pandemic crisis.

Keywords: nipa bioethanol, nipahol, sanitizer gel, agar well diffusion method, antibacterial efficacy

HSD – 05

PLACENTAL IMMUNOLOCALIZATION OF MTOR AND PMTOR IN PREGNANCIES COMPLICATED BY GESTATIONAL DIABETES MELLITUS

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Placental mammalian target of rapamycin (mTOR) facilitates nutrient sensing and transfer to fetus. Studies have shown that its dysregulation is involved in the onset of diseases like diabetes, cancer and ageing. We aim to characterize expression and cellular localization of mTOR and p-mTOR (phosphorylated) in syncytiotrophoblast and stromal cells between normal and GDM placenta.

With ethical approval, we gathered 138 consented pregnant women; and 56 (nGDM=36; GDM=20) were accepted following inclusion and exclusion criteria. Placenta was collected and prepared for tissue processing. Immunohistochemistry was performed with antibodies against mTOR, and p-mTOR. Protein expressions were evaluated and quantitated using Image J analysis. Parameters such as glucose, body mass index (BMI), age, fetal weight and placental weight were correlated with protein expression.

IHC analysis showed high chromogen intensity of mTOR, and p-mTOR localized in syncytiotrophoblast and stromal cells of GDM placenta compared to nGDM. Quantification analysis showed that GDM placentas exhibited significant high expression of mTOR ($p<0.0001$), and pmTOR ($p<0.0001$) in the syncytiotrophoblast but not in stromal cells. A positive correlation was found between syncytiotrophoblast mTOR and p-mTOR expression and maternal fasting glucose, BMI, and age, and no correlation with fetal weight and placental weight ($p>0.01$).

The high placental expression levels of mTOR and p-mTOR may indicate its involvement in GDM development. Understanding mTOR and p-mTOR dysregulation may potentially be useful in protecting pregnant women and their babies from GDM.

Keywords: mammalian target of rapamycin (mTOR), gestational diabetes mellitus, placenta, immunohistochemistry

HSD – 06

'SABA' BANANA (*MUSA ACUMINATA X BALBISIANA* BBB) PEEL PECTIN IMPROVES BIOMARKERS OF OBESITY AND ASSOCIATED BLOOD LIPID DISORDERS IN OBESE HYPERCHOLESTEROLEMIC MICE

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Given the alarming prevalence of overweight and obesity among Filipinos and the limited use of huge amounts of 'saba' peel wastes produced by banana processing industry, the study investigated the effect of 'saba' banana peel pectin (SPP) on obesity and associated blood lipid disorders *in vivo*. ICR male mice were first induced with obesity and hypercholesterolemia using 45% high fat diet (HFD) for three weeks. The mice were then randomly allocated to four groups (n=10 each) fed various diets *ad libitum* for nine weeks as follows: (1) normal diet (ND), (2) HFD, (3) HFD with 10% w/w commercial citrus pectin (HFD-CCP), and (4) HFD with 10% w/w SPP (HFD-SPP). Data were analyzed using t-test and ANOVA with *post-hoc* Tukey test. Throughout the experiment, results showed that the HFD-CCP and HFD-SPP groups had 9.6-19.4% lower mean body weight and 17.4-33.0% lower blood total cholesterol than the HFD group despite having comparable feed intake (p<0.05). Pectin-supplemented groups also had 55.4-70.3% lower adiposity index (p<0.05) and lesser increase in adipocyte diameter than the HFD group. There was also mild necrosis and infiltration of fat deposits in the hepatocytes of the HFD group which were barely found in other mice groups. On the other hand, the ND, HFD-CCP, and HFD-SPP groups had comparable values for weight, blood lipids, organ and adipose tissue weights, and adiposity index (p>0.05), suggesting that SPP may be a potential functional ingredient. These findings hoped to benefit small and medium scale banana processors by creating value-added products to their waste materials and help solve problems concerning its disposal.

Keywords: adiposity, blood lipids, mice, pectin, 'saba' banana peel

HSD – 07

PEDICULICIDAL SHAMPOO FROM METHANOLIC CRUDE EXTRACT OF GUYABANO *ANNONA MURICATA* L., (ANNONACEAE) LEAVES: A PREFORMULATION AND FORMULATION STUDY

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Previous studies revealed that guyabano leaves yielded tannins, steroids and cardiac glycosides as major phytochemical compounds and folkloric use as decoction against head lice and bedbugs. Therefore, this study aims to formulate a pediculicidal shampoo from the methanolic crude extract of guyabano leaves. Experimental research was employed in this study. Methodologies include the Soxhlet extraction, simple mixing method and the formulations were composed of quyabano leaves methanolic crude extract (active ingredient), gugo extract (surfactant), xanthan gum (thickener), sodium chloride (preservative), tween 80 (extract solubilizer) and water (vehicle). Physico and chemical analysis includes the organoleptic evaluation, digital pH meter, Brookfield Viscometer and Differential Scanning Calorimetry (DSC). Pediculicidal activity of the extract was determined in-vitro using the petri dish method. A total of four (4) formulations were compounded on a trial-and-error method whereas water as negative control and Permethrin as positive control. Results revealed that the formulated shampoo has the following characteristics: black in color, minty odor, pH of 6.12, viscosity of 1378 mpa/sec, wetting time of 144.57 secs, compatible with inactive ingredients as revealed in thermographs of DSC and non-irritating to the skin as tested using the human repeat insult patch test (HRIPT). In conclusion, the formulated shampoo passed all the test quality control tests. However, further studies are needed to determine the long-term stability of the formulation as it was not included in the study.

Keywords: Pediculicidal shampoo, guyabano, preformulation, formulation

HSD – 08

ANGIOTENSIN I-CONVERTING ENZYME (ACE) INHIBITORY ACTIVITY OF PEPTIDES ISOLATED FROM CARABAO MANGO (*MANGIFERA INDICA*) FLESH

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Hypertension has been reported as the second major cause of morbidity in the Philippines. One of the mechanisms to control blood pressure is through the inhibition of the angiotensin I-converting enzyme (ACE). This study specifically focused on the determination of ACE inhibitory activities of peptides from 'Carabao' mango flesh of three shell colors (SC1, SC3, SC5). The bioactive peptides were obtained upon a series of extraction, purification, and enzymatic hydrolysis steps. Among the undigested and digested crude and purified samples, the highest in vitro ACE inhibition was exhibited by the three-hour digest of SC3 (83.28 ± 0.83%). The most prominent peak from the fractionation of the mixture of peptides in SC3 digest was evaluated for ACE inhibition, and the decrease in activity inferred the synergistic effect of the peptides in exhibiting the inhibitory function. This selected bioactive peptide was identified to have alanine (A) and phenylalanine (F) as the components, which can possibly be AF – an ACE inhibitory peptide determined from *in silico* analyses. Overall, the measured activity of the ACE inhibitory peptides revealed the potential of mango as a functional food in dealing with hypertension but can be subject to further research to improve its characterization and bioavailability.

Keywords: angiotensin I-converting enzyme; Carabao mango; bioactive peptides

MATHEMATICAL AND
PHYSICAL SCIENCES

MPS – 01

ADOPTING BLUEPRINTS OF NATURE: MARINE WASTE-DERIVED SELF-HEALING HYDROGELS FOR WOUND HEALING

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Wound care is rather a significant concern of the health care system, affecting the medical, social, and economic sectors of the global community, but remains to be an undervalued concern as to advancing innovations, and probable solutions. Hydrogels have long been used for wound care therapies, owing to their ECM-like properties, but their remarkable properties are compromised by external damage, bringing their intended functions to an end. To address this, hydrogels can be functionalized with self-healing property to enable them to restore themselves after damage. Herein, β-chitin was first extracted from squid pen waste, and then modified with acrylamide (Am-β-Chn). Fabrication of the hydrogels was then carried out by subsequent crosslinking of Am-β-Chn with oxidized alginate (OA). Characterization studies showed that the hydrogels manifested biocompatibility, biodegradability, and injectability. Continuous step strain rheology demonstrated the self-healing property of the hydrogels after multiple cycles, owing to the presence of dynamic Schiff base and H-bond crosslinks. Moreover, *in vivo* study of the wound healing property of the hydrogels on laser-ablated zebrafish full-thickness wounds revealed notable contraction of ~87. This suggests that indirect application of the fabricated hydrogels is effective in accelerating healing. To the best of our knowledge, this is the first study that lived up to the concept of biorefinery of squid pen wastes to its full extent, by developing novel double crosslinked Am-β-Chn/OA hydrogels equipped with both self-healing and wound-healing properties.

Keywords: biorefinery, β-chitin, functionalization, self-healing

MPS – 02

ANTIOXIDANT ACTIVITY OF TOTAL CAROTENOIDS EXTRACTED FROM LEMON PEELS VIA DUAL ENZYME-ASSISTED EXTRACTION USING MICROBIAL XYLANASE AND CELLULASE

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Parameters involved in dual enzyme-assisted extraction of total carotenoids from lemon peels were optimized in an attempt to achieve the highest yield of total carotenoids and antioxidant activity of the extracts was determined. Microbial enzymes, xylanase and cellulase, were solubilised together in a buffered medium (pH 5.0) for use in the extraction of carotenoids from lemon peels disposed as food scraps in selected lemonade juice stalls in Dasmariñas City, Cavite. Combinations of varying incubation time (30, 60, and 90 min) and enzyme concentration (50, 65, and 80 U/mL) were employed at constant temperature (60ºC). Total carotenoids (TC) content measured via UV-Vis spectrophotometer showed that the use of xylanase alone would yield the highest TC at 21.4 µg phytofluene equivalent per g of lemon peels as compared with the yield obtained from using a mixture of xylanase and cellulase (4.4–20.5 µg/g). The optimum enzyme concentration was noted to be 80 U/mL along with 90 min incubation time. Carotenoid extracts with the highest and lowest TC were then partially characterized using FTIR and the DPPH radical scavenging activity ranged from 21-3–31.5% relative to ascorbic acid (used as standard). Antioxidant activity of crude carotenoids from xylanase-assisted extraction was 21.3% while that from xylanase + cellulase-assisted extraction was 31.5%, significantly higher than the rest of the treatments including solvent extraction. This may imply that the antioxidant activity of crude carotenoid extracts may be preserved with the use of dual enzyme-assisted extraction procedures, though TC yield may not be very high.

Keywords: antioxidant activity; cellulase-assisted extraction; lemon peels; total carotenoids; xylanase-assisted extraction

MPS – 03

AROMATIC ETHER BOND CLEAVAGE OF LIGNIN MODEL COMPOUND (BENZYL PHENYL ETHER) UTILIZING COBALT-PDI COMPLEXES

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Breaking of C–O ether bonds and C–C bonds between lignin monomer units is required to convert lignin into valuable aromatic compounds. Theses linkages are considerably hard to cleave and would require much energy in the process. Fractionation, biocatalysis, and photocatalysis are just some of the numerous methods being explored for lignin valorization. In this study, we report the potential of Cobalt-PDI complexes as homogeneous catalysts in the cleavage of aromatic ether bonds without adding hydrogen gas and without unwanted hydrogenation of the aromatic ring. The cobalt complexes were generated from bench-stable anhydrous $CoCl_2$ and pyridine-2,6-diimine (PDI) ligands with $-H_2$, $-Me_2$, $-i$Pr$_2$, and $-Cl_2$ as substituents in both pendant aryl groups. From these ligands, crystal structure of the Me_2PDI-CoCl$_2$ in dichloromethane was also obtained. The cleavage of the C–O ether bonds in benzyl phenyl ether was achieved using Me_2PDI-CoCl-H as catalyst yielding 1.6% phenol as the product. Use of this method may greatly promote the conversion of lignin into valuable aromatic compounds.

Keywords: cobalt-PDI complexes, catalysis, lignin

MPS – 04

BIOCOMPATIBLE AND ANTIMICROBIAL CELLULOSE ACETATE NANOFIBER MEMBRANE FROM BANANA (*MUSA ACUMINATA X BALBISIANA*) PSEUDOSTEM FIBERS

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Electrospun nanofiber membrane plays a vital role in biomedical/healthcare field ranging from wound healing, tissue engineering and even in biosensing applications. This study explored the development of biocompatible and antibacterial cellulose acetate electrospun nanofiber membrane prepared from banana (*Musa acuminata x balbisiana*) pseudostem fibers, a by-product of the banana fruit industry. High dissolving pulp material from the fiber was produced through alkaline treatment. Cellulose acetate (CA) was derived via esterification reaction. The synthesized cellulose acetate and chlorhexidine (CHX), an antimicrobial drug were dissolved in acetone:dimethylacetamide binary solvent system and subsequently electrospun. FT-IR analysis of the nanofiber membrane revealed the presence of characteristic peaks associated with the CHX and the CA components. SEM image analysis showed that the fiber diameter of the nanofiber ranges from 200 nm to 300 nm. The antimicrobial assay of the CHX-loaded nanofiber membrane showed potent antimicrobial activity against Gram (-) *E.coli* and Gram (+) *S.aureus* bacteria. The 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazoliumbromide cytotoxicity assay (MTT assay) of the CA-CHX nanofiber membrane showed low cytotoxicity on human intestinal epithelial cell line, having an IC_{50}: >100 µg/mL. These results indicate the successful preparation of a nanofiber membrane from banana pseudostem fiber that is antimicrobial and biocompatible with potential application in biomedical engineering.

Keywords: banana fiber, cellulose acetate, nanofiber, biocompatible, antimicrobial

MPS – 05

EVALUATION OF THE PHYSICOCHEMICAL AND FUNCTIONAL PROPERTIES OF PECTINASE-TREATED CARABAO MANGO (*MANGIFERA INDICA* CV. CARABAO) PEEL POWDER

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Locally, good sources of dietary fiber had been limited to whole grains which are expensive. Mango peel, which comprises 10-20% of the fruit weight and discarded as waste, had been found to be a rich source of dietary fiber and polyphenols. In this present study, the *Carabao* mango peel was treated with pectinase to improve its total dietary fiber content and functional properties. Results show that the pectinase treated *Carabao* mango peel powder (PCMPP) was richer in total dietary fiber content (65.2g/100g), protein 10.86 g/100g), fat (3.94 g/100g) and in minerals calcium (434.0mg/100g), magnesium (35.3 mg/100g) and iron (8.7 mg/100g) compared to the untreated *Carabao* mango peel powder (CMPP). Its functional properties were also improved wherein its water-holding (2.2mL/g) and swelling (3.82 mL/g) capacities were favorably lower while its glucose-lowering properties were better and were even comparable to psyllium and metformin. Moreover, the extract from PCMPP have better free-radical scavenging and copper reducing capacities than the commercial antioxidants ascorbic acid, butylated hydroxyanisole and butylated hydoxytoluene. The results demonstrated that the pectinase treatment improved the properties of the mango peel powder and affirmed the potential of PCMPP as an inexpensive high-fiber source with glucose-lowering and antioxidant benefits.

Keywords: mango peel, enzymatic treatment, dietary fiber, functional food, glucose-lowering

MPS – 06

FERROUS-BASED COLOR MODIFICATION IN SILK USING AQUEOUS TERMINALIA CATAPPA LEAF EXTRACT

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Aqueous extract of *Terminalia catappa* leaves were applied to 21 denier silk yarns and the effects of the addition of $FeSO_4$ mordant were evaluated. The meta-mordant ($FeSO_4$ at $0 - 50\%$ w/w) concentration and dyeing time ($5 - 30$ mins) were varied and its effect on the silk yarn color and the tensile property was investigated. Colorimetric analysis of the naturally dyed silk yarns revealed that color is mainly affected by the addition of $FeSO_4$ as meta-mordant. Fourier-transform infrared spectroscopy (FTIR) was employed to characterize control (degummed) and naturally dyed silk yarns. A decrease in the transmittance signal was observed for *T. catappa* dyed silk yarns with increasing $FeSO_4$ concentration due to the increased number of metal ions that can complex with the silk fibroin protein. Morphological assessment of the control and naturally dyed silk yarns showed liberation of fibroin strand on the silk fiber as the $FeSO_4$ concentration and dyeing time is increased. The silk yarn strength was also evaluated using ASTM D2256 and the result revealed that the yarn tenacity was increased by 15.91% upon increasing $FeSO_4$ mordant concentration. Both the color and yarn properties of the naturally dyed silk yarns is affected by the variation of ferrous sulfate concentration and dyeing time.

Keywords: natural dyes, pigments, paint, historic preservation

MPS – 07

FLUORESCEIN FUNCTIONALIZED CELLULOSE NANOCRYSTAL (CNC-FA) DERIVED FROM BANANA (*MUSA ACUMINATA CAVENDISH*) FIBER AS FLUORESCENT TEXTILE MARKING

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In this work, a new covert technology based on the click reaction between fluorescein azide (FA) and alkyne-bearing cellulose nanocrystal derivative (CNC-PR) derived from Banana fiber was coated on poly/abaca (60/40) fabrics and pineapple/lyocell (60/40) yarns using the sol-gel process and the conventional pad-dry-cure method. Attenuated total reflectance-Fourier transform infrared (ATR-FTIR) spectroscopy and Carbon-13 nuclear magnetic resonance (^{13}CNMR) confirmed the azide-alkyne cycloaddition reaction to produced fluorescein functionalized cellulose Nanocrystal (CNC-FA) which emits yellowish color under Ultraviolet (UV) light illumination. The fluorescence property of the CNC-FA in solution was investigated using Fluorescence spectroscopy while the chemical stability of CNC-FA in different polyethylene glycol (PEG) concentrations was evaluated using Ultraviolet-visible (UV-vis) spectroscopy. Also, the ATR-FTIR spectra and colorimetric analyses confirm the presence of CNC-FA on the fabrics and yarns surfaces. This new fluorescent textile marking finds use in immediate verification of the genuineness and authenticity of any textile material among others.

Keywords: banana fiber, click reaction, fluorescent marking, textile

MPS – 08

IN SILICO STUDIES ON ENHANCING THERMOSTABILITY AND ACTIVITY OF FRUCTAN: FRUCTAN 1-FRUCTOSYLTRANSFERASE (1-FFT) FROM JERUSALEM ARTICHOKE *(HELIANTHUS TUBEROSUS* L.*)* THROUGH TWO-POINT CYSTEINE MUTATIONS

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Fructans have been increasingly popular for its industrial, food, and medicinal applications. The enzyme fructan:fructan 1-fructosyltransferase (1-FFT, EC 2.4.1.100) is responsible for the elongation of 1-kestose through trans-fructosylation reaction between two fructans forming ☐2-1 glycosidic linkages. The high demanding conditions of industrial processes however, limit the applicability of this enzyme. Thus, in order to achieve maximum inulin production on an industrial level, a more thermostable and active 1-FFT is required. In this study, we aimed to develop a more thermostable and active 1-FFT from Jerusalem artichoke (*Helianthus tuberosus* L.) through two-point cysteine mutations. 5µs Martini Coarse-grained Molecular Dynamics (CGMD) simulations and biophysical analyses were carried out on wild-type and mutant 1-FFTs at 303K and 334K. Molecular docking simulations were performed to examine the activity of these mutants towards sugars (i.e., sucrose and fructans) with Glucose to Fructose units (GF_n) ranging from GF_1 to GF_5. At 334K, improved thermostability was achieved on three (3) mutations, F93C-Y390C, P193C-L201C, and H12C-D277C. Interestingly, one (1) mutant, H12C-D277C, located at the catalytic-carrying blade of the catalytic domain, had improved thermostability at both temperatures. In terms of activity, two (2) mutants, F485C-N589C and P193C-L201C, achieved improvement by increased gorge opening, and by enhanced binding affinities at both temperatures. Our results suggest that mutations P193C-L201C, F485C-N589C, and F93C-Y390C are promising mutants and that introduction of mutations in specific regions of *Helianthus tuberosus* 1-FFT could be utilized to design the thermostability and activity of this enzyme.

Keywords: protein engineering, molecular dynamics, 1-fft, fructans, helianthus tuberosus

MPS – 09

MANGIFERA INDICA AS A POTENTIAL BIOINDICATOR OF ATMOSPHERIC MERCURY POLLUTION IN A HEAVILY INDUSTRIALIZED REGION IN PAGBILAO, QUEZON, PHILIPPINES

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Mercury is a known toxicant released mainly in coal-fired power plants and annual emissions of this pollutant continue to increase globally. Due to the dependence of the Philippines on these power plants for electricity generation, the need to detect and monitor the amount of Hg released into the atmosphere is steadily gaining importance. In this study, the leaves of *Mangifera indica*, a common plant species in the Philippines, is assessed for its potential as a bioindicator for Hg. Foliar samples of the species were obtained from varying distances around a coal-fired power plant in Pagbilao, Quezon and were tested for Hg content using Lumex RA-915M Zeeman with a PYRO-915 pyrolysis attachment. Samples were lyophilized to determine if this method of pretreatment effectively increases the amount of trace Hg detection. Results showed that the presence of Hg was significantly higher in the lyophilized samples, ranging from 7.94 to 27.375 ng Hg/g of sample which were 39.2 – 76.5% greater from the untreated samples. From the set of samples by the fence, the amount of Hg detected displayed a clear negative correlation ($R^2 = 0.867$) with its distance from the power plant. The samples collected farther from the plant site did not display this correlation which could be due to the effect of other factors such as topography and wind. Nevertheless, the detection of Hg found in the foliar samples of *Mangifera indica* proves its viability of being a potential bioindicator for atmospheric Hg pollution.

Keywords: bioindicator, mercury, Mangifera indica, Lumex RA-915M Zeeman, lyophilization

MPS – 10

PREVENTING FISH SPOILAGE USING *PANGIUM EDULE* (PANGI) BARK DECOCTION AND LEAF EXTRACT

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Fish spoilage has been seen as a worrying effect due to incorrect methods for extending shelf life and maintaining quality. The researchers focused on preventing fish spoilage by using the bark decocted solution and leaf extract from *Pangium edule* (Pangi). The Pangi plant sample, a naturally occurring in the province of Northern Samar, remains unnoticed because of its limited relevant scientific studies conducted. The Pangi sample was tested using *Nemipterus virgatus* (Bisugo) for fish spoilage for a series of hours in a normal room temperature environment and its physical, chemical, and antimicrobial properties were also conducted. The result implied that bark decoction and leaf extract has a positive outcome for alkaloids, flavonoids, and saponins. The antibacterial test against gram-positive and gram-negative bacteria showed that only *S. aureus* yielded a positive result while *E. coli* and *S. typhimurium* was yielded a negative result. It implied that bark decoction was found a strong antibacterial compared to leaf extract. The fish sample began spoiling after 24 hours after the application of the Pangi bark decocted solution. This implies that proper techniques, such as incorporating Pangi samples can yield a longer shelf life for fish samples.

Keywords: *Pangium edule*, *Nemipterus virgatus*, *fish spoilage, E. coli, S. typhimurium*

MPS – 11

RESISTANT STARCH CONTENT AND COOKED RICE TEXTURE OF SELECTED PHILIPPINE MILLED RICES VARYING IN OPTIMUM COOKING TIME AND APPARENT AMYLOSE CONTENT

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Apparent amylose content (AC) is regarded as the most important determinant of rice cooking and eating quality while alkali spreading value (index of gelatinization temperature [GT]) correlates well with optimum cooking time (OCT) and also influences the texture of cooked rice. Resistant starch (RS) in carbohydrate-rich foods have beneficial effects to human health but needs to be measured on the cooked form of the food following the usual cooking methods used for such. This study aimed to determine the RS levels and texture (via Instron hardness) of selected Philippine rices differing in AC cooked based on their OCT as determined via Ranghino test. Other physicochemical properties were also measured using raw and cooked samples as appropriate while RS was analyzed on the cooked samples only. Results revealed that RS content of the seven cooked rices samples varied widely from 0.9–2.9%, with the highest noted for high-AC NSIC Rc222 cooked for 20 min OCT. PSB Rc10 cooked at its OCT of 22 min showed the highest Instron hardness value (3.8 kg/cm^2) and had RS greater than 2%. Soft-cooking rices with low AC-low GT and intermediate AC-intermediate GT gave low Instron hardness values (<2.0 kg/cm^2) but varying RS levels spanning 0.9–1.6%. Two intermediate-AC samples having similar AC but different OCT and GT (IR64 and PYT47) showed significantly different Instron hardness and RS content. This may imply that OCT and GT, both amylopectin-related grain traits, greatly influence the texture and RS of cooked rice within the same AC type, and these warrant further studies related to food texture and rheology, nutrition, and health.

Keywords: alkali spreading value; apparent amylose content; Instron cooked rice hardness, optimum cooking time; resistant starch

MPS – 12

SUCROSE-CAPPED SILVER NANOPARTICLES AS SENSOR PROBES FOR THE VISUAL AND RGB-BASED DETECTION OF HYDROGEN PEROXIDE IN AQUEOUS SOLUTIONS

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The green synthesis of noble metal nanoparticles such as silver nanoparticles (AgNPs) and its application in sensing small molecules primarily due to its unique optical properties have attracted many researchers worldwide. The utilization of these nanomaterials as sensor probes offers a simple analytical strategy in detecting small molecules such as hydrogen peroxide. Detection of hydrogen peroxide is vital from an analytical point of view and in aspects of human health and the environment since this compound is widely used in various industries thereby, specific amounts are released in the environment. In this present investigation, AgNPs were synthesized via a one-pot and green strategy of using alkaline sucrose solution as the reducing and capping agent and then characterized by UV-Vis spectroscopy and dynamic light scattering techniques. The AgNPs were characterized as a bright yellow solution with a surface plasmon band at 411 nm. The Z-average size was 30.1 ± 4.2 nm with a polydispersity index of 0.7 that indicates a narrow size distribution. The synthesized AgNPs have good colloidal stability, as revealed by the zeta potential value of -26.3 ± 1.7 mV. The AgNPs were then applied as sensor probes in the detection of hydrogen peroxide in aqueous solutions through visual observations and image analyses. The sensing mechanism is based on the reduction-oxidation reactions that led to the observed color changes. The detection limit was found to be 1×10^{-3} M as monitored through visual observation and image analysis using ImageJ. Results of the study showed that the changes in the intensity of the AgNP solution decrease with increasing hydrogen peroxide concentration. The study showed a great promise on the potential of AgNPs as simple chemosensors in the detection of small molecule targets for environmental and health sensor applications.

Keywords: green synthesis, hydrogen peroxide, sensor probes, silver nanoparticles, visual detection

MPS – 13

SYNTHESIS, ANTITUBERCULAR AND CYTOTOXIC, AND MOLECULAR DOCKING STUDIES OF FOUR CU(II) COMPLEXES MODIFIED WITH 2,2'-BIPYRIDINE, IMIDAZOLINE AND PHENANTHROLINE LIGANDS

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The key role in numerous physiological cellular processes of copper has provided foundation in developing metal-based drugs, for example in antimicrobial and anticancer drug discovery. For copper complexes to exhibit biological activity, a vital role is played by the organic motifs, its framework, and the donor atom set. Thus, four copper(II) complexes $[Cu(L)_2]$ (**1-4**) were prepared by reaction of copper(II) acetate with 2,2"-bipyridine, imidazoline and phenanthroline and characterized by elemental analysis, single crystal XRD, ^1H NMR, FTIR and UV–Vis spectroscopic techniques. Their biomolecular docking against several protein targets, antimicrobial and cytotoxicity studies were also been performed. Results revealed that copper(II) complexes remain in distorted tetrahedral coordination environments. Copper complexes **1**–**4**, were screened for *in vitro* antitubercular activities using MABA assays against *Mycobacterium tuberculosis* $H_{37}Rv$. Complex **1** showed highest antitubercular activity. According to the results obtained from the antiproliferative/cytotoxic studies, complex **2** exhibited strong activity against K-562 and HeLa cell lines. Antitubercular complex **1** showed good binding propensity to *M. tb.* enoyl acyl carrier protein reductase InhA and MurE ligase while K-562 antiproliferative complex **2** demonstrated moderate binding to BCR-ABL tyrosine kinase during *in silico* assessment, using molecular docking.

Keywords: Cu(II) complexes, antitubercular, cytotoxic

MPS – 14

A STUDY ON OPTIMAL STRATEGIES TO CONTROL SCHISTOSOMIASIS IN AGUSAN DEL SUR, PHILIPPINES

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Schistosomiasis is a neglected tropical disease and remains endemic in the Philippines, covering 28 provinces in 12 regions. Schistosomiasis in the Philippines is caused by *Schistosoma japonicum*, a zoonotic parasite which infects other mammalian hosts aside from humans. In this work, we develop a mathematical model that describes the transmission of schistosomiasis in humans, snails, and carabaos. The model is used to study optimal strategies to control and possibly eliminate the disease in Agusan del Sur, Philippines. Implementation of multiple control strategies highlights the significance of an integrated approach in mitigating the disease. Improved surveillance and monitoring of cases, and the importance of accurate and updated data are strongly emphasized.

Keywords: schistosomiasis, mathematical model, optimal control

MPS – 15

APPLICATION OF ANT COLONY OPTIMIZATION METAHEURISTIC ON SET COVERING PROBLEMS

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Ant Colony Optimization (ACO) metaheuristic is a multi-agent system in which the behaviour of each ant is inspired by the foraging behaviour of real ants to solve optimization problem. Set Covering Problems (SCP), on the other hand, deal with maximizing the coverage of every subset while the weight nodes used must be minimized. In this paper, ACO was adapted and used to solve a case of Set Covering Problem. The adapted ACO for solving the SCP was implemented as a computer program using SciLab 5.4.1. The problem of determining the optimal location of Wi-Fi Access Points using the 802.11n protocol in the UP Los Banos Math Building was solved using this metaheuristic. Results show that in order to have 100% coverage of the MB, 7 access points are required. Methodology of the study can be adapted and results of the study can be used by decision makers on related optimization problems.

Keywords: heuristics; internet router; optimization; set covering problem

MPS – 16

CONSTRUCTION OF REAL AND COMPLEX HADAMARD MATRICES FROM UNIMODULAR ORTHOGONAL QUATERNIONIC MATRIX

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Let $H = R + iS + jT + kU$ be a symmetric circulant unimodular quaternionic matrix of order n, where i, j, and k are the imaginary units and R, S, T and U are matrices with rational entries. Form the matrices:

$$W_{4n} = \begin{bmatrix} A & -B & -C & -D \\ B & A & -D & C \\ C & D & A & -B \\ D & -C & B & A \end{bmatrix}$$

$$B_{2n} = \frac{1}{2}\begin{bmatrix} A+B & -C+D \\ C+D & A-B \end{bmatrix} + \frac{1}{2}\begin{bmatrix} -A+B & C+D \\ -C+D & -A-B \end{bmatrix}i$$

If $nH^{-1} = H^*$, where H^* is the conjugate-transpose of H, then W_{4n} is a Williamson-type real Hadamard matrix of order $4n$ and B_{2n} is a Butson-type complex Hadamard matrix of order $2n$, where

$$A = R + S + T + U, B = -R + S + T - U,$$
$$C = -R - S + T + U, D = -R + S - T + U.$$

Conversely, given a Williamson-type Hadamard matrix, W_{4n}, one can recover a symmetric circulant unimodular quaternionic matrix, H, with

$$R = (A - B - C - D)/4, S = (A + B - C + D)/4,$$
$$T = (A + B + C - D)/4, U = (A - B + C + D)/4.$$

Moreover, we can construct the Williamson-type Hadamard matrix, W_{4n}, from the following Butson-type complex matrix:

$$B_{2n} = \begin{bmatrix} P & N \\ M & Q \end{bmatrix} + \begin{bmatrix} -Q & M \\ N & -P \end{bmatrix}i$$

Here, $A = P + Q$, $B = P - Q$, $C = M - N$ and $D = M + N$, where P, Q, M, and N are (-1,0,1)-matrices and A, B, C, D are symmetric (-1,1)-matrices satisfying $AA^t + BB^t + CC^t + DD^t = 4nI$.

Keywords: Butson-Hadamard matrix, quaternionic matrix

MPS – 17

FORECASTING PHILIPPINE FINANCIAL TIME SERIES DATA USING WEIGHTED SUPPORT VECTOR REGRESSION BASED ON QUANTUM FINANCE MODEL

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Distribution models and predictive systems for financial data are critical in investment and trading in the financial market. A recent study has shown an efficient quantum model that captures stock market forces in estimating the stock return probability distribution. Meanwhile, support vector regression (SVR) has been successfully used in prediction problems including financial data. This study utilizes the quantum model to estimate the Philippine stock and exchange rate return probability distributions and proposes a weighted support vector regression (WSVR) by employing the obtained probability distributions and coefficients of the quantum model for financial data prediction. The experimental results show that, compared to normal distribution, the returns follow the distribution defined by the quantum model. Moreover, the average prediction accuracy of error metrics shows that the proposed system WSVR is an improvement over the traditional SVR.

Keywords: quantum finance, support vector regression, prediction, financial data

INDUCED TOPOLOGIES OF THE CARTESIAN PRODUCT OF SOME SPECIAL GRAPHS II

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The induced topologies of some special graphs $G = (V, E)$ have been described with subbases consisting of all sets $F_G(A) = V \setminus \{v \in V : v \notin A \text{ and } uv \notin E \text{ for any } u \in A\}$. In this paper, we consider the path (P_m) and cycle (C_n) graphs, of orders m and n, respectively. We then obtain the following subbases to describe the topologies induced by their Cartesian products, namely, the torus grid $(C_m \times C_n)$, web $(C_m^* \times P_n)$, and hypercube (P_2^n).

Graph	Subbase
Torus Grid ($C_m \times C_n$)	$\{\, V_{C_m} \setminus \{x_i\} \times \{1, j-1, j+1, n\},\ F_{C_m}(\{x_i\}) \times \{j\},\ V_{C_m} \times \{k\}\,\}$, for all $x_i \in V_{C_m}$, $j = 1, 2, \ldots, n$ and $k \neq j-1, j, j+1$
Web ($C_m^* \times C_n$)	$\{\, V_{C_m} \setminus \{x_i\} \times \{j-1, j+1, n\},\ F_{C_m}(\{x_i\}) \times \{j\},\ V_{C_m} \times \{k\}\,\}$, for all $x_i \in V_{C_m}$, $j = 1, 2, \ldots, n$ and $k \neq j-1, j, j+1$
Hypercube (P_n^2)	$\{\, \{x_1\} \times \{x_2\} \times \ldots \times \{x_{i-1}\} \times F_{P_2}(\{x_i\}) \times V_{P_{n-i}^2} \setminus \{(x_{i+1}, x_{i+2}, \ldots, x_n)\},\ \prod_{j=1}^{n-3}\{x_j\} \times \{S_1, S_2, S_3, S_4\}\}$, for all $i = 1, 2, \ldots, n-3$, where $(x_1, x_2, \ldots, x_n) \in V$, $S_1 = F_{P_2}(\{x_{n-2}\}) \times F_{P_2}(\{x_{n-1}\} \times \{x_n\}$, $S_2 = F_{P_2}(\{x_{n-2}\}) \times \{x_{n-1}\} \times F_{P_2}(\{x_n\})$, $S_3 = \{x_{n-2}\} \times F_{P_2}(\{x_{n-1}\} \times F_{P_2}(\{x_n\})$, $S_4 = \prod_{k=n-2}^{n} F_{P_2}(\{x_k\})$

Finally, the singletons $\{(x_i, j)\}$ are in the induced topologies the torus grid and web graphs, for all $x_i \in V_{C_m}$ and $j = 1, 2, \ldots, n$, and the singleton $\{(x_1, x_2, \ldots, x_n)\}$ is in the induced topology of the hypercube.

Keywords: induced topology, torus grid, web, hypercube, Cartesian product of graphs

OPTICAL CHARACTER RECOGNITION SYSTEM FOR BAYBAYIN SCRIPTS USING SUPPORT VECTOR MACHINE

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In 2018, the Philippine Congress signed House Bill 1022 declaring the Baybayin script as the Philippines' national writing system. In this regard, it is highly probable that the Baybayin and Latin scripts would appear in a single document. In this work, we propose a system that discriminates the characters of both scripts. The proposed system considers the normalization of an individual character to identify if it belongs to Baybayin or Latin script and further classify them as to what unit they represent. This gives us four classification problems, namely: (1) Baybayin and Latin script recognition, (2) Baybayin character classification, (3) Latin character classification, and (4) Baybayin diacritical marks classification. To the best of our knowledge, this is the first study that makes use of Support Vector Machine (SVM) for Baybayin script recognition. This work also provides a new dataset for Baybayin, its diacritics, and Latin characters. Classification problems (1) and (4) use binary SVM while (2) and (3) apply the multiclass SVM classification. On average, our numerical experiments yield satisfactory results: (1) has 98.5\% accuracy, 98.5\% precision, 98.49\% recall, and 98.5\% F1 Score; (2) has 96.51\% accuracy, 95.62\% precision, 95.61\% recall, and 95.62\% F1 Score; (3) has 95.8\% accuracy, 95.85\% precision, 95.8\% recall, and 95.83\% F1 Score; and (4) has 100\% accuracy, 100\% precision, 100\% recall, and 100\% F1 Score.

Keywords: Baybayin and Latin script identification, Baybayin and Latin character recognition, support vector machine, optical character recognition

MPS – 20

SOLUTIONS TO INVERSE PROBLEMS IN NEUTRAL DELAY DIFFERENTIAL EQUATIONS USING GENETIC ALGORITHM WITH MULTI-PARENT CROSSOVER

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Neutral delay differential equations (NDDEs) are differential equations containing time lags not only in the states but also in the state derivatives. NDDEs have applications in modeling physical and biological systems. The use of heuristic algorithms in parameter estimation has gained popularity because of its ease of implementation, requiring only function evaluations. But to our knowledge, heuristic algorithms have never been employed in estimating parameters in NDDE models. In this work, we apply Genetic Algorithm with Multi-Parent Crossover (GA-MPC) to obtain parameter estimates of NDDE models with a discrete delay. We compare the estimates to those obtained using standard heuristic algorithms. Results show that GA-MPC is capable of consistently identifying model parameters that provide a good fit of the model to the data.

Keywords: neutral delay differential equations, parameter estimation, genetic algorithm, bootstrapping, heuristic algorithms

MPS – 21

COCONUT FIBER DERIVED MULTI-LAYERED GRAPHENE FORTHIN FILM APPLICATIONS

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Graphene was successfully synthesized through carbonization of coconut fiber (coir). It was carbonized and purged with N_2 gas in a tube furnace then exfoliated in ethanol-deionized H_2O mixture. Furthermore, the graphene solution was deposited in a glass substrate through spray deposition method to produce thin films. The deposited thin film was subjected to 13.56MHz radio frequency (RF) plasma system for nitrogen plasma exposure. The morphology of carbonized coir was determined using Scanning Electron Microscope (SEM). Untreated thin films manifested the form flakes of exfoliated carbon with no uniform sizes and random orientation. However, the plasma treated ones has perforated flakes structure with relative increase in roughness. Raman spectral analysis was used to provide information about the existence of graphene on the films. It showed a maximum and a minimum number of exfoliated graphene layers which are 19 and 12 layers, respectively. It was found that conductivity is reduced for nitrogen doped thin films. On the other hand, visible spectroscopy revealed an increase in optical transmittance by 36% after exposure to nitrogen discharge of thin films.

Keywords: graphene, plasma, thin films

MPS – 22

SELECTIVE DETERMINATION OF URIC ACID IN A TERNARY MIXTURE USING ELECTROACTIVE POLYANILINE/GRAPHITE-BASED SENSOR

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Abnormal levels of uric acid (UA) may serve as possible markers of diseases such as gout, hyperuricemia, renal failure, xanthinuria, and toxemia during pregnancy, thus making UA sensing crucial for medical diagnosis. Although research shows that many analytical techniques have been explored in the detection of UA, they often require expensive, laborious, and large-scale instrumentation. Further, these methods have selectivity issues because UA often co-exists with dopamine (DA) and ascorbic acid (AA) in physiological systems. To address the said problems, this research is aimed towards the development of an electrochemical sensor based on electroactive polyaniline/graphite (ePAni/Gr) composite for the selective determination of UA.

The synthesis of ePAni/Gr was carried out through *in situ* chemical polymerization of aniline in the presence of graphite. The surface micrograph of ePAni/Gr revealed a porous, sponge-like structure with thin sheets attached, suggesting successful preparation of the composite. The peak shiftings in the FTIR spectra may be attributed to the interlayer bonding of PAni with graphite. Also, UV-Vis analysis presented spectral shifts of absorption bands at 600, 460, and 360 nm in ePAni/Gr composite which could be due to the polaron band, π-π*, and σ-σ* transitions, respectively. Cyclic, and differential pulse voltammograms unveiled the capability of ePAni/Gr sensor in detecting UA in the presence of DA and AA. The said electrode showed good sensitivity and linearity at a linear concentration range of 2-8mM UA. Results obtained showed that the ePAni/Gr sensor exhibited promising electrochemical performance towards UA even in a ternary mixture containing DA and AA.

Keywords: polyaniline, graphite, electrochemical sensor, voltammetry, uric acid

SOCIAL SCIENCES

SS – 01

"I'M ANXIOUS AND EXCITED" – STUDENTS' TREPIDATION AND ANTICIPATION ABOUT LEARNING DURING EDUCATIONAL DISRUPTION

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The COVID-19 pandemic has drastically affected students' learning worldwide. In the Philippines, flexible or distance learning has been the abrupt solution to continue Filipino learners' education. This narrative inquiry explored the university students' trepidation and anticipation in learning during the COVID-19 educational disruption. Fifty students from a state-owned university in Central Luzon, Philippines, were purposively selected to participate in this qualitative investigation. The participants shared their fears and excitement in learning during the health crisis through their written narratives. What excites students are the engaging and innovative pedagogical strategies, the flexible learning modalities, use of video-teleconferencing and digital applications in education, the creation of relevant and timely digital products, and the opportunity to enhance their technological literacy. They reiterated how exciting to continue their education from the comforts of their homes amid these challenging times. However, they fear adjusting to the new learning setup as they are accustomed to the traditional face-to-face classes. Likewise, they are anxious about coping up with the present learning setup, facing the digital divide, experiencing new assessment methods in a remote learning mode, overcoming digital fatigue, and not having their conventional internship program. A conceptual framework is designed to describe the students' trepidation and anticipation in learning during a disruption. The framework can inform higher education institutions (HEIs) in crafting policies and programs which are responsive to the students' needs in the context of the volatile, uncertain, complex, ambiguous, diverse and disruptive (VUCAD^2) world and in the context of the post-pandemic era.

Keywords: COVID-19, educational disruption, narrative inquiry, trepidation and anticipation, VUCAD^2 world

SS – 02

ANALYSIS OF THE COMPETITIVENESS, PRODUCTIVITY AND TECHNICAL EFFICIENCY OF SOYBEAN AS FOOD IN THE PHILIPPINES

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Soybean is a raw material for food products in the Philippines. However, the country remained to be import dependent that called forth assessment of its productivity, technical efficiency and competitiveness in production to identify measures to further develop local production.

There were 154 farmers from Regions II, XI, XIII and 26 processors of soymilk, taho and tofu from Region II, III, XI, XIII and NCR interviewed. Descriptive statistics, stochastic frontier, technical ineffiency, cost and return, and domestic resource cost were used in data analysis.

National data revealed local soybean production decreased by an average of 3% per year while area harvested declined at an average of 2% per year. Primary data from 2018 farm survey revealed mean yield of 1,384 kg per ha in 2018, slightly higher than the national's 1,300kg. Seeds was found to be the most important input in production along with herbicide and insecticide for weeds and insect pests' control, and labor in pre-planting, harvesting and post-harvesting. Technical efficiency of growers was 0.622 ($\pm$0.219) in 2018. Years in farming and contact to LGUs were the two significant variables to explain farmers' technical efficiency.

Transforming product form of soybeans had higher value. Profitability of processed food products were dependent on scale of operation, cost of labor and depreciation of processing machines. Domestic resource approach revealed that raw soybean production from Mindanao was cost competitive relative to soybean imported from Canada among medium yield and high yield farmer groups. Taho, tofu and soymilk processing had competitive advantage against imports.

Keywords: soybean, productivity, technical efficiency, competitiveness

SS – 03

CHALLENGES AND COPING OF COLLEGE STUDENTS AMID THE COVID-19 PANDEMIC

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The global COVID-19 pandemic has massively impacted all areas of human existence which has forced several sectors in the society to modify its processes and protocols. The education sector had to use the online platform in the delivery of its teaching-learning services – a modality in which teachers and students alike were unprepared for. Since much is still to be improved in the delivery of teaching using the online platform, this study employed a descriptive survey design to identify the challenges college students experience during this pandemic and what they do to cope with these challenges. A total of 338 college students from a university in Cavite, Philippines responded to a mixed-design online survey composed of the 14-item Warwick-Edinburgh Mental Well-Being Scale (WEMWBS) to measure students' mental well-being, and open-ended questions that asked in detail challenges that students experience and coping activities that they do to cope with the challenges. The WEMWBS resulted to a sum average mean of 45.89 from a possible total mean of 70 which indicated a moderate level of mental well-being. The qualitative responses generated 4 themes in terms of challenges that depict issues in online learning, family, health, and environment. The challenges in these areas greatly affected students' mental health which manifested changes in their cognition, affect, and behavior. In terms of coping, 40% of the respondents used religious beliefs and practices (prayer, trusting God), 23% of the students found support from family and friends to be comforting, 10% indicated that a change in mindset and attitude was effective, while 4% had to resort to learning a new hobby. Fifteen percent of the students used a combination of all these coping activities, while 8% admitted that they do not know how to cope at all. These results imply that schools should not solely focus on the implementation of online teaching, but such delivery must ensure that even students' emotional and mental health needs are met. Recommendations for the school's academic and non-academic areas are further discussed in the study.

Keywords: online learning, covid-19 pandemic, students' mental health

SS – 04

INDIGENIZATION OF SCHIZOPHRENIA AMONG
AETA MAG-ANTSI TRIBE

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Various studies and researches by almost all psychologists in the world rate schizophrenia as one of the most debilitating mental disorders. It affects people from all walks of life transcending cultures and tribes of different indigenous people (IP). It is sad to note, however, that this qualitative study, using Interpretative Phenomenological Analysis, the researchers aims to understand only on a limited scope how *Aetas,* particularly the *Mag-antsi* tribe cope and deal with the manifestations of the symptoms of schizophrenia based on their cultural affiliation and beliefs.

At the onset, it can be noted that the scientific description of the disorder is beyond their knowledge and is quite ambitious task for the researchers to dig information in such way that scientific and academic functions will not clash with their cultural beliefs and norms. The central question of this study is "how does IPs collectively characterize their cultural understanding on the impression, expression and live experiences of schizophrenia?" A total of six participants were purposively chosen to take part in this study, in-depth interview and some Filipino indigenous research method were used. Thus, this study presents the results that phenomenological lived experiences of the *Aetas* of *Mag-antsi* tribe in Capas, Tarlac and revealed that ethnic minorities are also vulnerable to mental health issues and schizophrenia has significant variations in presenting the symptoms.

Keywords: Indigenization, Schizophrenia, *Aeta Mag-antsi*, IPA

SS – 05

KNOWLEDGE, ATTITUDE AND PRACTICES OF UNIVERSITY STUDENTS TOWARDS COVID-19

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Documenting university students' knowledge, attitude and practices (KAPs) towards health threats is essential for policy formulation and curriculum enhancement of science. This descriptive cross-sectional online survey explored the university students' KAPs towards Coronavirus disease (COVID-19) in a government-owned university in Central Luzon, Philippines. A total of 289 students completed the online survey questionnaire. Results revealed that the students' major sources of information of COVID-19 are social media, television, and the internet. Respondents have high knowledge of COVID-19. They have a favorable attitude towards the disease and expressed that COVID-19 has affected their education. They always practice health protocols related to curbing the viral disease. Generally, COVID-19 knowledge had no significant relationship with attitude towards the disease and low significant relationship with preventive practices. Higher knowledge of the is slightly associated with preventive practices. The study recommends greater efforts in improving the students' KAPs towards COVID-19. Government policies are suggested for adoption by higher education institutions to respond to the current health crisis and prevent future pandemics.

Keywords: COVID-19, KAPs, online survey, pandemic, university students

SS – 06

KNOWLEDGE, ATTITUDES, AND PRACTICES (KAP) TOWARDS COVID-19 AMONG FACULTY AND ADMINISTRATIVE EMPLOYEES OF A PHILIPPINE STATE-UNIVERSITY: AN ONLINE CROSS-SECTIONAL SURVEY

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The COVID-19 has changed the lives of everyone in the planet. The pandemic caused a time of uncertainty where people are losing businesses and jobs, experiencing depression and the disruption of education and work. To learn more on how the university employees (faculty and administrative employees) veer from the normal activities to the new pandemic situation, an online cross-sectional survey was conducted to measure their Knowledge, Attitudes and Practices (KAP) towards COVID-19. The survey was done in a state university (SU) of which 185 faculty members and 32 administrative employees participated from April 5 to May 5, 2020. The responses from the survey items were measured using a 5-point Likert scale. The results revealed university employees were extremely aware (Knowledge score: 4.7 ± 0.3) to the information about COVID-19 severity, symptoms, mode of transmission and preventive measures of the disease. The respondents have shown agreement to the attitudes expected in facing infectious diseases (Attitude score: 4.4 ± 0.4) and strong agreement to the current practices (quarantine, hygiene practices, social distancing etc.) in preventing spread of the COVID-19 disease (Practice score: 4.7 ± 0.1). The aggregated KAP scores appeared to be independent on the respondents' sex, age, and employment sector. A few KAP questions however have shown dependence with these factors. This study has shown promising levels of KAP of SU employees during the pandemic. While the country is waiting out this pandemic, the academic community is encouraged to promote positive knowledge, attitudes, and practices to help the nation in its recovery from the pandemic.

Keywords: *COVID-19, Knowledge, Attitudes, Practices, University,*

SS – 07

LOW GLYCEMIC INDEX RICE AND RICE-BASED PRODUCTS: CONSUMER AWARENESS, KNOWLEDGE, AND BEHAVIOR

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The incidence of diabetes among Filipinos is increasing as per capita consumption of polished rice is still high. Dietary interventions, particularly the consumption of foods with low glycemic index (GI), can curb this health problem. This study was conducted to determine the awareness and behavior of consumers toward low-GI foods. The online survey using convenience sampling and structured questionnaire captured answers from 328 respondents (≥18 years old, 123 males, 205 females) from all regions in the country. Results showed that majority of the respondents were millennials (24-41 yo), unmarried, and completed college degree. Although only 4% of them had pre-diabetes/diabetes and 13% have family history of the disease, >75% consume polished rice at least 2x a day. Only 13.5% of the respondents indicated awareness on GI, but most of them correctly answered that high GI foods are "foods that raise blood sugar levels within a short period after consumption." Majority also selected the correct answer when asked to identify which among the food groups presented were considered low-GI. Four out of four questions on knowledge level were answered correctly by majority of the respondents, which validated their level of awareness. All respondents signified interest in rice with naturally low-GI, but only half of them were willing to consume unpolished/brown rice. Majority were willing to buy low-GI rice, brown rice, and cereals. More than half were also interested in low-GI rice-based products, notably bakery foods, *kakanin*/native rice cakes, and ready-to-drink (RTD) beverages. Taste, satiety, nutritional/health value, product safety and affordability were among their top considerations in buying food. Results from this study showed that although GI is an unclear concept for most respondents, there is demand for low-GI rice and rice-based products, which the breeders and food manufacturers must consider. Purchase intention of millennials, the biggest segment of the market, should also be studied.

Keywords: glycemic index, millennials, ready-to-drink, rice, survey

SS – 08

MEDIATING ROLE OF COPING STRATEGIES ON RELIGIOSITY AND MENTAL HEALTH PROBLEMS AMONG BPO EMPLOYEES

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The Business Process Outsourcing (BPO) has been a popular employment of choice to many young adults in this generation. There is a growing evidence however that due to its contemporary setting, workers in the BPO sectors are at risk for distress and its related disorders. To address mental health needs of BPO employees, this study focuses and investigates on the mediating role of coping strategies to religiosity and mental health problems of Filipino BPO employees. The study used a quantitative research design, employing mediational analysis to meet the study's objectives. Three questionnaires such as the researcher-made Measure of Religious Practices and Experience (MRPE), Coping Strategies Scale (CSS) which was adapted from the Filipino Coping Strategies Scale, and the Depression Anxiety Stress Scale (DASS-21) were used to measure the variables in the study. These questionnaires had to be transformed using the online platform as face-to-face data gathering was not possible due to the pandemic. A total of 172 BPO employees (50% male; 50% female) responded to the online questionnaires. An excellent model fit was generated (*Chi-square/DF*=1.88, *RMSEA*=.072, *GFI*=.916 and *CFI*=.956) from the original hypothesized model without omitting variables. Findings indicate that coping strategies fully mediate the relationship between religiosity and mental health problems (path a is β=.34; path b is β= -1.45). This means that religiosity is not directly related to BPO employee's mental health, but individuals who are more religious tend to use coping strategies that help curb stress, anxiety, and depression. Other implications as well as best coping strategies that lower mental-health risks are further discussed in the study.

Keywords: bpo employees, coping strategies, religiosity, mental health problem

SS – 09

MOVING BEYOND THE BLACKBOARD: TEACHER'S ATTITUDE AND COMMON BARRIERS TO PARTICIPATION TOWARD USING OF GOOGLE CLASSROOM AS LEARNING MANAGEMENT SYSTEM (LMS) IN TIMES OF NCOV CRISIS

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This current education setting in a new normal raises a whole new spectrum of concerns related to technologies in improving quality education courses that also represents a factual challenge for teachers to delineate their culture of teaching. As they need to scrutinize the impact or efficacy of using the collaborative e-learning tools in teaching operations, teaching angles and phases like organizing and checking learning or course content, delivery of subjects to the students, monitoring learners' participation, assessment and evaluation. Past studies prove the advantages of using collaborative e-learning tools in improving the quality of education in universities. It has shown that it gives an environment for teaching without the restrictions of time or distance.

The interest of this study is in most used e-learning software which is the google classroom. One of the most important findings in this quantitative research was that teachers had positive attitude about using the google classroom. Although, google classroom have gathered lot of enthusiasm, advantages and attention, they have also raised criticism or barriers among academics. In line with these fundamental problems there are still many other questions and hindrances includes these questions about teacher's adaptability, computer self-efficacy and willingness to share materials, technical restrictions, school support and environment cues to be discussed prior of using this google classroom as learning management system (LMS) in larger scale particularly in the context of NCOV Crisis.

Keywords: attitude, common barriers, learning management system, NCOV Crisis

SS – 10

SENIOR HIGH SCHOOL RESEARCH COMPETENCIES: BASIS FOR DEVELOPMENT OF PRACTICAL RESEARCH WORKBOOK

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This study aimed to determine the level of research competencies of Grade 12 STEM students from four selected public senior high schools in Zamboanga City to serve as basis in the development of Practical Research Workbook. This study employed descriptive - development research design. There were 191 students participated in the research competency assessment using the Research Competencies Inventory Checklist. Focus group discussions were carried out to explore factors that affect their performance in conducting research. The competencies which the students were least competent were considered as basis to determine the topics for the development of Practical Research Workbook. The developed workbook were validated by 6 experts using the validation checklist adopted and modified from Espinar and Ballado (2016). Furthermore, the developed workbook underwent acceptability evaluation by 12 Practical Research Teachers and 37 students using the DepEd Rating Evaluation Sheet for PRINT Resources.

Results revealed that, in general, students were competent to perform most of the research competencies. Nonetheless, some competencies require enhancement: i.) describe the background of the research; ii.) draw out and manage information from different literature; iii.) select study sites appropriately; iv.) construct research instrument; v.) infer and explain qualitative data, and; vi.) select and process statistical tool. Factors affecting their performance in these competencies include the researcher's ability, availability of resources, peer factor, teacher's factor, and respondents.

The developed Practical Research Workbook obtained a commendable rating from the experts. Thus, the developed workbook is highly valid and reliable in terms of content and instructional design. More so, teachers and students expressed that the developed workbook is highly acceptable. These findings imply that the developed Practical Research Workbook can serve as supplementary instructional material in teaching Practical Research in senior high school.

Keywords: *research competencies, workbook, validation, acceptability*

SS – 11

SOCIO-ECONOMIC ASSESSMENT OF LAKE MAINIT WATERSHED COMMUNITIES: A BASIS FOR PROTECTED AREA ESTABLISHMENT

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This study is conducted as basis for the declaration of Lake Mainit Watershed as protected area. Lake Mainit Watershed located between provinces of Agusan del Norte and Surigao del Norte, offers a long list of biodiversity, helps environmental and socio-economic aspect of the communities. The presence of abundant natural resources such as fishery, wildlife, forest, timber and non-timber products, mineral resources provide livelihood opportunities and food security to the communities. The beautiful views and clear water of the lake has a potential for adventure tourism and ecotourism. However, the ecological integrity of the lake watershed is threatened by various factors such as forest cover decline, water quality deterioration, disturbance of critical habitats for endemic and threatened species, and dominance and emergence of invasive species. Also, the tenurial claims such as Community-Based Forest Management Agreement (CBFMA), Certificate of Ancestral Domain Title (CADT), Certificate of Land Ownership Agreement (CLOA) and Mine Production Sharing Agreement (MPSA) will lead to resource use conflict within the proposed protected area. The declaration of Lake Mainit Watershed as protected area will aid in the conservation and protection of the ecosystem for the maintenance and improvement of its ecological value and integrity.

Keywords: Lake Mainit Watershed, protected area, ecosystem, conservation

SS – 12

THE ROLE OF ATTACHMENT AND SELF-DISCREPANCY ON ADOLESCENTS' SUICIDAL TENDENCY

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Adolescence is a stage of development on which multiple of significant changes take place (Erikson, 1968). This include psychological, physical, and social changes as the adolescent makes the transition from childhood to an early stage of adulthood. Throughout this developmental period, it is assumed that these changes are said to affect the adolescents' well-being that may cause variety of problem behaviors and negative adjustment outcomes. For instance, in a report of the World Health Organization (WHO, 2019), the remarkable increase of mental health-related deaths among aged 15-29 provides evidence for the vulnerability of adolescents to experience debilitating psychological problem.

In line with this, the present study sough to understand whether attachment and self-discrepancy predicts adolescents' suicidal tendency. To determine the respondents' degree of attachment, Adolescent Relationship Scale was used. To measure self-discrepancy among participants, the Integrated Self-discrepancy Index was utilized. A total of 170 adolescents aged 15-19 participated on this study. Parental informed consent was secured among minor participants. Multiple Linear Regression was utilized to analyze data. Results show that most participants were experienced moderate suicide ideation or average response on "most of the time" on each suicide related question. Furthermore, avoidant attachment was found to be significant predictor on suicidal tendency with 10% accountability. However, in terms of self-discrepancy, it was not found to be predictor of suicidal tendency.

It is important to understand the factors that might contribute to adolescents' suicide ideation for proper intervention. As such, it is important to understand ways on which adolescents' psychological well-being can be improved given that resiliency, mental health and other protective factors are predicted by a high psychological well-being (Casas, 2011).

Keywords: adolescents, suicidal tendency, attachment, self-discrepancy

TOWARDS A POSITIVE YOUTH DEVELOPMENT: PROMOTING PSYCHOLOGICAL WELLBEING FOR CHILDREN IN CONFLICT WITH THE LAW (CICL) THROUGH STRENGTHENING SPIRITUALITY

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Mental health and psychological wellbeing of adolescent population holds great importance in present scenario of research. It is an established fact that psychological wellbeing is a balanced state of mind in which an individual feels harmony within and around (Manjunath & Sahoo, 2011). Among the four dimensions of good mental health, spiritual aspect holds equal effectiveness in maintaining this balance. A disturbed and deviant personality is a result of disturbance between the four dimensions. Juvenile delinquency is one such problem behavior of adolescent population. Role of spiritual healing for children in conflict with the law can prove as an effective remedy for the deviations they reflect in their behavior.

In this study, participants were ten children in conflict with the law with the age range of 15 to 17 years. They were purposively selected and completed PERMA Profiler; a 23-item questionnaire which measures the 5 pillars of wellbeing and undergone series of life skills education intervention on which spiritual wellness is included. Wellbeing was measured before and after the program. Results show that spirituality is effective on improving wellbeing of the participants, $t = -9.47$ ($p = .000$), wellbeing before the program ($m = 5.13$, $sd = 1.97$) and after program ($m = 6.28$, $sd = .22$).

The spiritual component is necessary for young delinquents and it has been acknowledged by care takers that spirituality and religion based interventions and correction programs can establish a connectivity between society and the delinquent children. This would help in mainstreaming these children and would also decrease recidivism to delinquency (Larson, 2013). Spiritual healing if included as a part of life skills for CICL can give excellent results as a corrective measure for mental health problems of CICL in the country.

Keywords: psychological wellbeing, spirituality, children in conflict with the law, antitubercular, cytotoxic

SS – 14

USE OF "BIG ONE" IN NEWS MEDIA AND ITS POTENTIAL IMPLICATIONS TO RISK-INFORMED EARTHQUAKE PREPAREDNESS IN THE PHILIPPINES

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Big One is often used in the Philippine news media to refer to the destructive Magnitude 7.2 earthquake scenario in the Greater Metro Manila Area (GMMA) when the West Valley Fault (WVF) moves. While the choice of words is crucial in risk communication, it remains unclear whether the widespread use of *Big One* fosters science-based preparedness. Hence, this study sought to compare the pragmatic meaning of *Big One* as used by the Philippine news media and the Department of Science and Technology – Philippine Institute of Volcanology and Seismology (DOST-PHIVOLCS). 533 online and print stories from local news agencies were subjected to qualitative pragmatic analysis. Two (2) writers who often discussed *Big One* were also interviewed. It was found that *Big One*, a noun phrase, is a linguistic device that is used to catch attention and increase appreciation for earthquake risk. However, while DOST-PHIVOLCS maintains that there are many earthquake scenarios in the Philippines and each region can have its own worst-case scenario or *Big One*, 254 (48%) media stories lack descriptors for *Big One's* referent. Of the 279 stories that identified *Big One's* referent, 234 (83.87%) solely identified the WVF scenario. Moreover, 84 (16%) stories simply use scalar implicatures to describe the certainty of *Big One*. Meanwhile, DOST-PHIVOLCS' messages specify that the exact date and time of a scenario's occurrence cannot be predicted; therefore, preparedness must be observed at all times. In conclusion, compared to DOST-PHIVOLCS' risk messages, the risk information presented in media stories appear non-specific, uncertain, and/or inaccurate. Long-term exposure to such risk information can lead to fatalism or optimistic bias that hinders action.

Keywords: pragmatics, risk communication, earthquake scenario, disaster risk reduction