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UNIVERSITY OF KELANIYA
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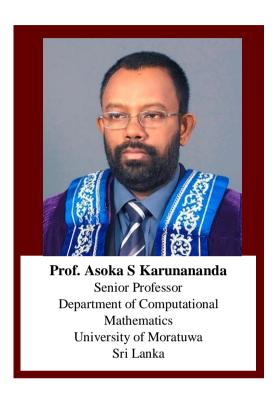Northwestern University, USA
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Keynote Speaker 1

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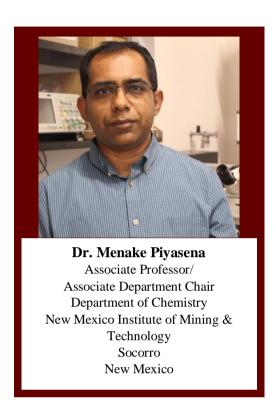Department of Computational
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Prof. A. S. Karunananda obtained BSc (Honours) degree from the University of Colombo, Sri Lanka in 1985 and MPhil from the Open University of Sri Lanka in 1992. Further, in 1995, he obtained his PhD from the University of Keele, United Kingdom. He is currently working as a Senior Professor in the Department of Computational Mathematics, Faculty of Information Technology, University of Moratuwa, Sri Lanka. He is a founder and life member of Sri Lanka Association for Artificial Intelligence from 1996 and a Senior IEEE member. Prof. Asoka Karunananda is involved in teaching and research in areas of artificial intelligence, theory of computing, research methods, and philosophy of science for undergraduate and postgraduate degree programs. He has published more than 100 research papers in reputed indexed journals and conferences including IEEE and they are also available online. In addition to that, he has published many books authored and edited by himself. Further, he has introduced the BSc (Hons) degree in Artificial Intelligence, the first such degree in Sri Lanka. His current research includes complex systems, theory of computing, ontological modelling, multi-agent systems, mindfulness interventions for education, and artificial intelligence in general. He has teaching and research experience for more than 35 years.

Keynote Speaker 2

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Dr. Menake Piyasena
Associate Professor/
Associate Department Chair
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Dr. Menake Piyasena is an associate professor in the Department of Chemistry at the New Mexico Institute of Mining Technology (New Mexico Tech), USA. He is also the Associate Chair of the department and the Chair of graduate programs. Dr. Piyasena received his BSc from the University of Kelaniya, Sri Lanka, and his Ph.D. from the University of New Mexico, USA. His research focuses on developing novel analytical and bioanalytical methods for environmental, biological, and chemical analysis and purification using microfluidic-based technologies. Microfluidics has become a cutting-edge technology in miniaturized analytical systems that offer many advantages over conventional techniques including reduced sample and reagent volume, fast analysis, and high sensitivity. Dr. Piyasena has many years of experience in developing bioassays using microfluidic and acoustic wave technologies. His research group also explores developing sensitive bioassays using micro and nanoparticles modified with lipid membranes for disease diagnosis. He has published many peer-reviewed articles in many high-impact international journals. Further, Dr. Piyasena has several patents related to his field of research. In addition to research work, he teaches analytical and bioanalytical chemistry courses both at the undergraduate and graduate levels.

Abstract of the Plenary Speech – Biological Sciences

Application of high throughput screening and -omics methodology in zebrafish (Danio rerio) to identify toxic environmental pollutants

According to the Lancet Commission on Pollution and Health, pollution is one of the largest environmental causes of disease and premature death in the world today, being responsible for an estimated 9 million premature deaths in 2015, and 16% of all deaths worldwide. After air pollution is caused by combustion, chemical pollution is a huge global problem. More than 140,000 new industrial chemicals and pesticides have been synthesized since 1950, of which few have gone through thorough risk assessment and many eventually end up in our environment.

Professor Maria Bondesson

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To be able to prioritize among the chemicals for risk assessment in mammalian species, high throughput screening methods using lower organisms or in vitro assays hold promise. We use zebrafish embryos as a primary method to evaluate the azardous effects of environmental pollutants on embryonic development. The vertebrate zebrafish model is advantageous for developmental studies because of its favorable traits, including high fecundity, short embryonic development, feasible genetic manipulation, and translucent embryos. Moreover, -omics methods, such as transcriptomics and lipidomics, can easily be performed in fish embryos.

Using transgenic fish that express fluorescent proteins in specific tissues and cells, we have screened for chemicals that cause vascular, skeletal, or neuronal toxicity. To decipher the molecular mechanisms of action of the identified disruptors, we performed whole-organism transcriptomics together with bioinformatics to identify chemical-specific altered pathways that were linked to specific malformations. Lipidomics facilitated pinpointing specific enzymes that were inhibited by the chemicals. Pathways and enzymes related to reactive oxygen species were often altered by exposure to the chemicals. Taken together, the combination of screening for phenotypic effects in zebrafish together with mapping of pathways through -omics studies can be used to identify the most toxic chemicals among environmental pollutants and provide knowledge of their mechanisms of action.

Abstract of the Plenary Speech – Physical Sciences

Observation of Room Temperature Superconductivity at Near Ambient Pressure

Superconductivity, a most profound phenomenon in nature, encompasses extraordinary properties including zero electrical resistance. However, this elusive quantum state has yet to revolutionize the world due to the low temperatures required. Consequently, ambient conditions superconductivity has become one of the most sought after goals of science since Kamerlingh Onnes' first observation of superconductivity in elemental mercury at 4.2 kelvin over a century ago. Over the last decade, high-pressure compression has dominated the search for high-temperature superconductivity. Leading the way has been the "chemical precompression" of hydrogen dominant alloys demonstrating critical superconducting transition temperatures (Tc) approaching the freezing point of water in the rare earth hydrides LaH10 and YH9 at megabar

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Assistant Professor
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pressures. Our discovery of room temperature superconductivity in a carbonaceous sulfur hydride highlighted that ternary or greater systems are likely the keys to higher Tc's and ambient conditions superconductivity. Here, we report a new hydride that exhibits superconductivity with a maximum Tc of 294 kelvin at 10 ± 1 kilobar. The compound was synthesized under high pressure-temperature conditions, and then after full recoverability, its materials and superconducting properties are examined along compression pathways. With this material, the dawn of ambient superconductivity and applied technologies has arrived with a direct path now open for tailoring extreme science hydrides to "materials by design".

Abstract of the Plenary Speech – Software Intensive Systems

Smartphone Sensing for the Well-Being of Young Adults

Over the years, mobile phones have become versatile devices with many capabilities due to the plethora of embedded sensors that enable these devices to capture rich data unobtrusively. In a world where people are more conscious regarding their health and well-being, the pervasiveness of smartphones has enabled researchers to build apps that assist people in living healthier lifestyles in for diagnosing and monitoring various health conditions. Motivated by the high smartphone coverage among young adults and the unique issues they face, we focus on ways to use mobile sensing and machine learning to understand mental well-being (mood, stress, fatigue, depression), behavior (eating and drinking behavior, complex daily activities), and context. We cover the basics of mobile health sensing, including sensors in the phone and ways to derive health and well-being-related insights using those sensors. Further, we provide a taxonomy of the domain, including aspects such as data perspective and system perspective.

Mr. Lakmal Meegahapola
Doctoral Researcher
School of Engineering
EPFL, Switzerland
Visiting Researcher
Computer Laboratory
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Next, we explore two different study directions. First, the ways to use multimodal smartphone sensors and machine learning to predict eating events. Here, using a longitudinal dataset collected from 84 college students in Mexico, we found that fully personalized user-level models trained with user-specific features could be used to infer eating events reliably. Second, we examine the generalization and personalization of passive mobile sensing-based mood inference models, where the focus is on a study done within a large European consortium. In this study, we conducted a mobile sensing app deployment among over 650 college students in eight countries to understand their daily behaviors and mood. We collected over 300K self-report data points about mood and many hours of multimodal sensor data from modalities such as activity type, step counts, app usage, location, touch events, etc. With this dataset, we examined how machine learning models trained with sensor data get affected by different countries and cultures, leading to issues related to the generalization of models.

Abstract of the Plenary Speech – Multidisciplinary Research

Transforming Biochar Research to Innovations: Towards a Green Future

Due to its unique qualities, widespread applications, and bright future, biochar has become a focus of carbon research since the turn of the twenty-first century. Biochar is a carbon-rich product produced by the thermal decomposition of biomass under limited oxygen supply at relatively low temperatures (< 700 °C). Common sources for biochar production have been agricultural and industrial waste such as rice husk, saw dust, and furthermore, invasive plants, municipal solid waste were widely tested. Starting as a soil conditioner, biochar has been widely examined for its properties and capacity as a soil amendment, carbon sequestration and for water treatment. Later, in response to issues with food security, environmental pollution, and energy scarcity, basic and practical research on the use of

Professor Meththika Vithanage
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biochar in agriculture, the environment, and energy has significantly risen. The highly stable carbon component in biochar made it useful as a soil supplement to store carbon in the soil. It can be used as a soil amendment to improve soil health, as a nutrient and microbial carrier, as an immobilizing agent to remove toxic metals and organic contaminants from soil and water, as a catalyst for industrial applications, as a porous material to reduce greenhouse gas emissions and odorous compounds, and as a feed supplement to increase animal health and productivity by increasing nutrient intake efficiency. The properties of biochar have been further improved through basic research and transformed into innovative technologies. Blended biochar, nanocomposites, and engineered biochar are some examples. Hence, biochar has become an essential material for a sustainable future, and has a wide range of novel applications that can be incorporated into the construction, clothes, electronics, and other consumer goods. Biochar reduces carbon foot print of the products. Recent developments in the applications of biochar-based materials in various energy storage and conversion fields, such as hydrogen storage and production, oxygen electrocatalysts, emerging fuel cell technology, supercapacitors, and batteries brings up a paradigm shift in biochar research towards innovations. Therefore, many studies have shown the significance of biochar research from the perspectives of scientific advancement and practical application transforming research to innovations towards a green future.

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Abstract No: BO-01

Troop composition of free-ranging Toque macaque in dry and wet zones of Sri Lanka: reviewed by a multivariate method using R

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Macaques are group-living primates, and their unit of reproduction and social life is the troop. The Toque macaque (*Macaca sinica*) found in Sri Lanka is the smallest macaque among the recognized 22 species and is endemic to the island. Studies on population, behaviour, and ecology have been carried out extensively but mainly on a single or few troops of Toque macaques. Thus, this study applied principal component analysis and discriminant analysis to the troop composition data for 42 troops using statistical software package R (Version 3.4.1). The findings of this study might act as an essential parameter of demography which summarizes the variation of troop compositions of Toque macaques in the dry and wet zone of Sri Lanka for wildlife management purposes. Troop composition data was obtained by extensive literature revisions (N=25) and ongoing fieldwork (N=17). Troop composition was represented by the five-dimensional vector $X = (X_1$: adult male, X_2: adult female, X_3: sub-adult, X_4: juvenile, and X_5: infant). The troops had a high socionomic sex ratio (XI/X2). X_1-X_2 and X_2-X_5 were strongly correlated, indicating those variables 'shape' the troop size. X_1, X_2, and X_5 were probably isotropic due to the high positive correlation. Troops were sorted into the wet zone (N=35) and dry zone (N=12). The low sample size in the dry zone might lead to misclassification in the dry zone, yet a linearly independent discriminant function indicated 85.11% accuracy. However, this function might help categorize the climatic zone of a troop of Toque macaque. Further, the study can be developed by adding the montane subspecies *M. s. opisthomelas* troop data. This study revealed the correlation between macaque individuals within the troop. It can be helpful to regulate the troop structure of the Toque macaque for wildlife management purposes since they are considered both endangered species and a pest. Further studies on demographic data collection are needed to be carried out continuously to monitor the changes of wildlife, not only on Toque macaques but also on other endangered fauna or pests, to secure the welfare of wildlife and humankind.

Keywords: *Macaca sinica*, Multivariate method, Troop composition, Troop size.

Abstract No: BO-02

Use of morphological and molecular methods in identification of Asian bush mosquito, *Aedes japonicus* (Theobald, 1901), in Sri Lanka

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Conducting routine entomological surveillance to identify new vectors and changes in the distribution patterns of vectors is important for the management of mosquito borne diseases in Sri Lanka. A recent preliminary entomological survey reported the presence of *Aedes japonicus* in Sri Lanka in March 2021. Therefore, the current study was conducted to validate the presence of *Ae. japonicus* in Sri Lanka, based on morphological and molecular evidence. The search for *Ae. japonicus* breeding sites and developmental stages using standard siphoning methods were conducted in Kosgama and Pallekanugala areas located in the Districts of Colombo and Kegalle, respectively, from May to December 2021. Collected immature stages were reared up to the fourth instar stage or adult, and specimens were identified to species level using standard morphological keys. Further, DNA was extracted from the head, and thoracic regions of the reared mosquitoes and Polymerase Chain Reaction (PCR) was performed. The amplified products were sequenced at a commercial facility (Macrogen Inc. co. Ltd., Seoul, Korea). Subsequently, the sequences were analysed for sequence identity using NCBI BLAST analysis and Geneious Trial (version 7.1.3). Based on the morphological characteristics, larvae of *Ae. japonicus* were identified from both study areas. *Ae. japonicus* was reported only from natural breeding containers such as bamboo plants and tree holes in both study areas. The molecular analysis further confirmed the morphological identification. Further, newly reported *Ae. japonicus* population denoted a close relationship to the Austrian/Slovenian population. *Ae. japonicus* is well adapted to temperate climates and has been reported to possess a strong tendency to expand and colonies into new territories, which is facilitated by human-mediated, passive transportation. According to Unweighted Pair Group Method with Arithmetic Mean (UPGMA) based hierarchical cluster analysis, newly discovered *Ae. japonicus* denoted strong affinity to a previously detected *Ae. japonicus* strain in Eastern Austria/Slovenia. The dispersal and population dynamics of *Ae. japonicus* should be thoroughly surveyed in Sri Lanka, as this species is a potential vector of Japanese Encephalitis.

Keywords: *Aedes japonicus*, Mosquito, Sri Lanka

Abstract No: BO-03

Diversity of microbiota associated with dengue vector mosquito breeding habitats in Udapalatha MOH Division, Sri Lanka

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Microbiota associated with mosquito breeding habitats are among biotic factors and serve as parasites, pathogens, predators, competitors, non-competitors, and food items for developing larvae. Therefore, there are naturally occurring microbiota species that serve as potential controlling agents against mosquito larvae, causing lethal effects on them. This information can be used in developing novel mosquito vector control strategies. Besides, the degree of parasitic, pathogenic, or predatory effects may also vary with the geographical location, influencing environmental conditions, including abiotic factors and other biotic factors within the habitat. Therefore, the current study was carried out to determine the diversity of microbiota associated with different breeding habitats of dengue vector mosquitoes; *Aedes aegypti* and *Ae. albopictus*. Sampling was performed from a variety of breeding habitats at Udapalatha MOH division in Gampola urban area from November 2021 to January 2022. Microbiota in water samples were preserved using Rose Bengal solution and Lugol's iodine and were identified under microscope, using standard identification keys. During the survey, twelve different breeding habitats, namely plastic containers, metal containers, concrete slabs, glassware, tires, leaf axils, tree holes, coconut shells, bamboo trees, ornamental ponds, discarded roof tiles and clay pots, were identified as key breeding sites of *Aedes* mosquitoes. From the collected samples 54.54% of habitats were positive for *Ae. albopictus* and 45.46% were positive for *Ae. aegypti*. Eleven microbiota species; *Canthocamptus staphylinus, Canthocamptus* sp*., Parastenocaris* sp*., Lepadella ovalis, L. patella, Rotatoria rotatoria, Rotatoria* sp*., Asplanchna brightwelli, Trichocerca rattus, Euglena* sp*., and Flagilaria* sp. were encountered from breeding habitats associated with *Ae. aegypti*. Meanwhile, *Canthocamptus staphylinus, Parastenocaris* sp*., L. ovalis, L. patella, R. rotatoria, Rotatoria* sp*., Euglena* sp. *and Flagilaria* sp. recorded from breeding habitats associated with *Ae. albopictus*. The highest Shannon Weiner diversity index and gamma diversity relating to the *Ae. aegypti* were recorded from leaf axils, while for *Ae. albopictus*, it was from metal containers. For *Ae. aegypti*, the highest heterogeneity in microbiota diversity was recorded from tire habitats and it was from plastic containers for *Ae. albopictus*. Out of the microbiota species recorded, no species was identified as parasitic or pathogenic to *Aedes* mosquito larvae. Updated information from the present investigation would facilitate implementing appropriate vector control interventions.

Keywords: *Aedes*, Associate, Control, Parasite, Pathogenic

Abstract No: BO-04

First report of *Culex (Lophoceraomyia) cinctellus* in Sri Lanka

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Disease epidemics caused by mosquito vectors have been a significant challenge faced by the health sector of Sri Lanka. Routine entomological surveillance is practised as a key approach in monitoring the population dynamics of mosquito vectors, which is vital for epidemic management. A recent preliminary surveillance conducted in Banduragoda Public Health Inspector (PHI) in Mirigama Medical Officer of Health (MOH) area has reported the presence of *Culex (Lophoceraomyia) cinctellus*, for the first time in Sri Lanka. Therefore, the current study was conducted to validate the presence of *Cx. cinctellus*, based on morphological and molecular evidence. Larval and adult surveillances were conducted from October 2019 to April 2020 at fortnight intervals in the Banduragoda Public Health Inspector (PHI) area. Standard siphoning methods were used in larval surveillance, while Cattle Baited Traps (CBT), Gravid Traps (GT), Light Traps (LT), Bird-Baited Traps (BBT), Dog Baited Traps (DBT) and diurnal human landing collections were used for adult surveillance. The collected specimens were transported to the Entomology Laboratory of the Medical Research Institute (MRI). The immature larvae were reared up to fourth instar stage. Adults and reared larvae were identified to the species level using standard morphological keys. Further, DNA extracted from the head, and thoracic regions of the reared mosquitoes were sequenced. Subsequently, the sequences were analysed for sequence identity using NCBI BLAST analysis and Geneious Trial (version 7.1.3). Adults of *Cx. cinctellus* were reported from BBT and in human baited collections. Morphological features such as well-developed pulvilli, wing with vein 1A ending before the apex of cross vein mcu, basal transverse pale bands in abdominal terga and two labial basal setae in proboscis were identified as unique features of *Cx. cinctellus*. Females of *Cx. cinctellus* reported a mean thoracic length of 0.58 ± 0.02 mm, thoracic width of 0.63 ± 0.02 mm. The average abdominal length and width were 2.15 ± 0.03 mm and 0.61 ± 0.01 mm respectively, along with a wing length of 2.91 ± 0.02 mm. The results of the molecular analysis further confirmed the morphological identification. This finding warrants the importance of strengthening routine entomological surveillance activities further to study the dispersal and population dynamics of *Cx. cinctellus* in Sri Lanka.

Keywords: *Culex, Culex cinctellus, Lophoceraomyia,* Mosquito Sri Lanka

Abstract No: BO-05

Formulation of a low-cost organic fertiliser paste from selected invasive plants enriched with *Trichoderma* species for the cultivation of *Raphanus sativus*

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Excessive use of synthetic fertilisers is a significant drawback in modern agriculture, and it has several negative outcomes; unfavourable environmental effects and adverse impacts on human health and agriculture. The present study was conducted to produce an organic fertiliser paste from alien invasive plants enriched with either *Trichoderma harzianum* or *Trichoderma virens*. Fresh leaves and immature twigs of selected invasive plants, namely, *Annona glabra, Clidemia hirta*, and *Chromolaena odorata,* and a native plant *Pongamia pinnata* were randomly collected from the vicinity of the Gampaha District, sun-dried, and powdered. The materials (2.0 kg each) were mixed, and the mixture was digested with distilled water (42.0 L) for a month to form organic fertiliser. Previously isolated and identified *Trichoderma harzianum* (KT852821.1) and *Trichoderma virens* (KP985643.1) were formulated in a mixer of solid carrier materials (compost, straw, clay, and cow urine; 2:1:1:1, moisture content - 40 %) separately. From the stock solution (100 % w/v) of organic fertiliser paste, a concentration series of organic fertiliser (10 %, 20 %, and 25 %) was prepared and enriched with one of the above *Trichoderma* spp. They were used in six treatments (T10H, T10V, T20H, T20V, T25H, and T25V, where treatments indicated by H included *T. harzianum* while V included *T. virens*). Growth and yield of *Raphanus sativus* (Raddish) were investigated by applying the above treatments with tap water as the negative control and commercially available liquid organic fertiliser ("Maxicrop") as the standard, using pot trials in a randomized block design with 15 replicates for each treatment. *Raphanus sativus* seedlings were treated weekly for 02 months as follows: 1st week - 5 mL, 2nd week - 10 mL, 3rd week – 15 mL, 4th week -20 mL, and 100 mL. Data obtained for the growth parameters of *R. sativus* were analysed statistically using one-way ANOVA with Minitab 17. As per the results, T10H treatment (10 % diluted *C. odorata*, *A. glabra*, *C. hirta,* and *P. pinnata* extract only incorporated with *T. harzianum*) recorded significantly ($P \leq 0.05$), the highest average number of leaves (23±1), leaf area (111.6±7.4 cm^2), the height of the leaf biomass (6.1±0.35 cm), average leaf length (28.01±0.98 cm), root length (20.73±0.74 cm), the average girth of the root (13.11±0.65 cm), average dry weight of the whole plant (15.2±0.62 g/plant), dry weight of the shoot biomass (8.95±0.41 g/plant) and dry weight of the root biomass (4.78±0.29 g/plant) compared to the standard and the negative controls. Therefore, out of the six organic fertiliser combinations used in the experiment, T10H treatment can be recommended as the best organic fertiliser paste to maximize the yield of *Raphanus sativus.*

Keywords: Growth performance, Invasive plants, Organic fertiliser paste, *Raphanus sativus*, *Trichoderma* spp.

Abstract No: BO-06

Alternative gelling agents to develop cost effective medium for *in vitro* propagation of *Dendrobium* cv. "Big Jumbo White"

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In vitro propagation is the most common method of Dendrobium propagation. Commonly, agar is used as an effective gelling agent though, it is expensive. However, the developing a cost-effective method is beneficial for small-batch productions and is recommended. The objective of the current study was to evaluate the efficacy of 'kithul' flour (starch extracted from the pith of *Caryota urens*) and xanthan gum as alternative gelling agents to develop an efficient, cost-effective medium for *in vitro* propagation of Dendrobium. Seeds of *Dendrobium* cv. "Big Jumbo White" was cultured using full-strength Murashige and Skoog (MS) medium. After 90 days of incubation, 1g of Protocorm Like Bodies (PLBs) and plantlets of *Dendrobium* cv. "Big Jumbo White" were transferred to twelve different MS media supplemented with BAP (Benzyl Amino Purine) (2.5 mg/L) and NAA (Naphthalene Acetic Acid) (0.5 mg/L) and solidified with either agar (1:0) or with alternative agents; kithul flour (0:1) and xanthan gum (0:1) or a series of combinations of each alternative gelling agent with agar (1:4, 2:3, 3:2 and 4:1) totalling to 12 treatments with six number of replicates per each. The weight of plantlets and PLBs, number of plantlets, number of leaves, number of roots, and length of the roots were recorded as growth parameters in fortnight intervals for a period of 90 days to assess the growth performance. After 90 days of incubation, the MS medium of agar: kithul flour (1:4) of the treatment series with kithul flour and agar: xanthan gum (2:3) of the treatment series of xanthan gum, have shown significantly high performance in the growth and development of PLBs and plantlets. Four growth parameters, number of plantlets: 44, number of leaves per plantlet: 5, number of roots per plantlet: 12 and root length: 1.5 cm, were significantly high in the agar: kithul flour (1:4) medium than in the agar: xanthan gum (2:3) medium. Moreover, compared to the conventional tissue culture media prepared using only agar, the modified medium using agar: kithul flour (1:4) has shown 73% of cost reduction. In conclusion, the use of agar and kithul flour (1:4) as an alternative gelling agent can be recommended as a cost-effective medium for the development of PLBs into plantlets of *Dendrobium* cv. "Big Jumbo White" on a small scale in *vitro* culture system.

Keywords: Alternative gelling agent, "Big Jumbo White", Cost-effective *in vitro* media, *Dendrobium* cv. Kithul flour, Xanthan gum

Abstract No: BO-07

Alleviation of drought stress on immature tea (*Camellia sinensis*) plants by exogenous application of Abscisic acid (ABA)

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Phytohormones are chemical substances regulating various physiological and biochemical processes in plants. Abscisic acid (ABA) plays a major role in response to drought stress. This study was done to identify the role of exogenous ABA application in immature tea during progressive drought. The experiment was conducted in a glasshouse at the Tea Research Institute of Sri Lanka, using one-year-old potted tea cultivars, TRI 2025 (drought tolerant) and TRI 2023 (drought susceptible). Plants were brought to field capacity and exposed to a drying cycle by withholding water. When plants achieved moderate moisture stress (volumetric water content around 25% in soil), plants were foliar sprayed with ABA at various concentrations [0 (water-spray – WS), 50, 100, 150 and 200 ppm] along with well-watered (WW - positive control) and no-spray (NS - negative control) treatments. Data were collected at 18 hours and 3, 7, 14 and 21 Days After Spraying (DAS) from randomly selected plants arranged according to Randomized Complete Block Design with 2 blocks and 24 replicate plants per cultivar per treatment. At 21 DAS, plants were re-watered, and the recovery was visually assessed after another 7 days. Physiological and biochemical parameters were measured (9.00 am to 12.30 pm) along with soil moisture content. Maintenance of comparatively a higher relative water content was observed in tea plants treated with 100, 150 and 200 ppm ABA. Although the reduction of gas exchange parameters was initially higher in ABA treated plants, it was significantly lower at later stages with progressive drought. Application of ABA in concentrations of 100 - 200 ppm resulted in comparatively higher photosynthetic rates and stomatal conductance at latter stages (14 DAS and 21 DAS). It was observed that the application of ABA did not improve osmolytes accumulation in tea under drought. At latter stage, 100 - 200 ppm ABA treated plants exhibited comparatively higher total chlorophyll and polyphenolic content in both cultivars compared to NS and WS treatments. Similarly, ABA treatments significantly increased antioxidant activity over NS and WS treatments towards the latter stage of drought. The maintenance of significantly lower dark respiration and higher recovery percentages were also observed in ABA (100 - 200 ppm) sprayed plants. Therefore, it can be concluded that ABA foliar application improves water retention and gas exchange parameters while preserving antioxidant capacity resulting restricted risk of oxidative damage under drought. The exogenous ABA application ameliorates the adverse effects of drought stress and improves drought tolerance in immature tea plants. The levels of 100 - 200 ppm concentration of ABA was better in terms of physiological and biochemical alteration and recovery under drought stress in both tea cultivars. Accordingly, considering the cost factor, the application of 100 ppm ABA can be recommended to use as a potential tool to minimize the drought stress effects in immature tea plants.

Keywords: Abscisic acid, Drought, Immature tea, Physiological responses, Plant hormones,

Abstract No: BO-08

Assessment of human health risk of cylindrospermopsin by consuming *Oryza sativa* (rice) from selected CKDu endemic areas in Sri Lanka

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The proliferation of toxic cyanobacterial blooms in freshwater bodies can seriously threaten human health. Many studies have been carried out on cyanotoxins in water sources, but studies on cyanotoxins in terrestrial plants are limited. Cyanotoxins in water sources can enter terrestrial plants when irrigated with cyanotoxin-contaminated water and cultivated in cyanotoxin-contaminated soil. As the main staple food in Sri Lanka, *Oryza sativa* (rice) is widely grown island-wide, mainly in the country's dry zone. The rice fields are irrigated with raw water from the reservoirs throughout their cultivation. Previous literature reported the presence of cyanotoxins, and potential cyanotoxin-producing cyanobacterial species in reservoirs in the dry zone in Sri Lanka. Moreover, cyanotoxins are hypothesized as one of the risk factors for chronic kidney disease of unknown aetiology (CKDu) in Sri Lanka. Cylindrospermopsin (CYN) is a cyanotoxin and negatively affects on several organs in the human body, including the kidneys. Therefore, the current study investigated CYN in *O. sativa* samples (n=102), including the most cultivated variants, samba (n=20), nadu (n=61), rathu kekulu (n=12) and keeri samba (n=9) collected from CKDu endemic Girandurukotte and Dehiattakandiya areas. As a control, rathu kekulu samples (n=22) were collected from CKDu non endemic Sewanagala area. CYN was extracted and analysed by high-performance liquid chromatography (HPLC) with reference to the CYN standard (SIGMA ALDRICH 32087). Estimated Daily Intake (EDI) of CYN was then calculated to determine the potential human health risk, for an adult by consumption of CYN-contaminated rice. Results of the HPLC analysis revealed that the mean ± SE values of CYN concentrations in samba, nadu, rathu kekulu, keeri samba rice from CKDu endemic areas and rathu kekulu from the control area were 6235.74 ± 1289.15, 6821.44 ± 694.80, 6538.66 ± 1797.81, 3702.51 ± 1321.02, and 3460.99 ± 359.91 µg/kg, respectively. Mean ± SE of estimated daily intake when exposure to CYN via consumption of samba, nadu, rathu kekulu, keeri samba rice in CKDu endemic areas and rathu kekulu from the control area were 30.45±6.29, 33.31±3.39, 31.93±8.77, 18.08±6.44 and 16.90±1.75 µg/kg of body weight per day, respectively. All these values exceeded the provisional Tolerable Daily Intake (TDI) of CYN value established by the World Health Organization (0.03 µg/kg of body weight per day), which can pose a health risk to consumers. The present study revealed that the consumption of *O. sativa* in the studied areas has a potential risk of accumulation of CYN in the human body. However, it emphasized the importance of investigating the uptake of CYN into rice, in large sample sizes in the study areas.

Keywords: Cyanotoxins, Cylindrospermopsin, Estimated daily intake, Health risk, *Oryza sativa*

Abstract No: BO-09

Evaluation of toxic metal contamination in surface sediments and water in Mahakanadarawa tank; Anuradhapura, Sri Lanka

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Toxic elements, including heavy metals/metalloids, readily contaminate water reservoirs via natural mechanisms such as surface runoff, precipitation, and atmospheric deposition. As a result, some toxic metals can be accumulated in surface sediments in the reservoirs and be incorporated into the food chains. It has become a major issue because various trace elements contaminate water, soil, and sediments, which can have serious health consequences due to their toxicity, persistence, and carcinogenic nature. This study was carried out with the aim of analysing the sediment quality in a major irrigation tank called Mahakanadarawa tank in Anuradhapura district, which is located in a high prevalence of chronic kidney disease of unknown etiology (CKDu) in Sri Lanka. Fifteen composite sediment samples (five samples in each of fifteen different locations) were randomly collected around the Mahakanadarawa tank in April (2022). Twenty surface water samples (Triplicated) were collected from the Mahakanadarawa lake using twenty different locations. Concentrations of metal elements including Mn, Co, As, Cd, Pb, Cu, Zn, Na, K, Al, Ca, Mg, Fe, and Ni were determined using inductively coupled plasma mass spectrometry (ICP-MS) and multi-element standards were used for the instrumental calibration. Statistical analysis was done using SPSS Statistics Software. According to the analysis of the sediment samples, none of the analysed toxic metals have exceeded the severe effect level as well as the lowest effect level. Abundancy of the metals in the sediments samples is varied as Fe> Mn > Cr> Zn > Cu >Pb > Ni >Co> As> Cd. The Igeo (Geo Accumulation value) values obtained, and the index values exhibit that the sediment samples have a tendency to transfer to an unpolluted to moderately polluted stage with analysed toxic metals except for Zn and Cd. Owing to the long-term intense applications of the crop fertilisers and pesticides in the area, toxic metals may be transferred and concentrated in the tanks from the agricultural fields. Apart from that, average concentrations values of analysed metals, including toxic metals such as Pb, As, and Cd in surface water, were far below the irrigation standards. Contamination of food chains and worsening the hazardous conditions for aquatic life can occur due to the toxic metal accumulations in the surface sediments. In order to conduct a health risk assessment for the consumption of tank fish from Mahakanadarawa tank, further studies should be performed by conducting several sampling cycles of sediment and water as well as toxic metal contamination status of inland fish in Mahakanadarawa tank also need to be evaluated.

Keywords: Sediments, Heavy metals, CKDu, Surface water, Contamination

Abstract No: BO-10

Diversity of midgut symbiotic bacteria in *Aedes* mosquito genera: A meta-analysis

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The gut bacterial composition of mosquitos has the capability of altering mosquito pathogen transmission through numerous mechanisms, which is useful in novel transmission control strategies. Therefore, understanding the diversity of gut bacteria in different mosquito genera is highly important. The present analysis was carried out to evaluate the variations in gut-bacteria in field-caught *Aedes* adult mosquitos from different geographical locations. A literature survey was conducted to identify quantitative data related to the midgut bacterial abundance in *Aedes*, using standard search terms and keywords. The collected data were arranged at the bacterial class level and were subjected to a square-root transformation. A resemblance matrix was constructed based on the Bray-Curtis resemblance. Cluster analysis followed by the Analysis of Similarities (ANOSIM) and Distance based Redundancy Analysis (dbRDA) were used for data analysis. Gut bacterial abundance from six different countries; Netherlands, USA, Sri Lanka, India, Brazil, and Panama, were used in the study. A total of 12 bacterial classes, were recorded and bacterial classes of Alphaproteobacteria and Gammaproteobacteria accounted for the highest abundance in *Aedes* mosquitoes from most of the countries. Interestingly, *Aedes* mosquitoes from Brazil, India and Sri Lanka, did not report the abundance of Alphaproteobacteria in their gut contents. Based on the Bray-Curtis similarity-based cluster analysis, four major clusters were identified at a similarity level of 48.9%, based on the overall abundance of bacterial classes. *Aedes* mosquitoes of Sri Lanka and India formed one cluster, sharing a similarity of 81.6%, while Brazil and Panama formed another cluster. Meanwhile, *Aedes* mosquitoes from Netherland and USA formed two separate clusters. The statistical significance of aforementioned clustering status was further verified by the Analysis of Similarities (ANOSIM), which reported a Global R value of 0.96. The clustering status suggested by the cluster analysis was further verified by the findings of the dbRDA. As indicated by the loadings of the dbRDA axes, the abundance of Gammaproteobacteria and Bacilli bacterial classes were found to be responsible for the similarity between gut bacterial diversity in *Aedes* mosquitoes from India and Sri Lanka. Further studies on the gut-microbial diversity of *Aedes* mosquitoes are recommended to support the implementation of novel vector control strategies in Sri Lanka.

Keywords: *Aedes*, Diversity, Gut-microbes, Geographical, Similarity

Abstract No: BO-11

Impacts of rubber factory wastewater on the stream macrobenthic assemblages

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In this study, we assessed how the rubber factory wastewater effluents change the water quality and sediment quality parameters in some factory-associated streams, namely the Aswathu Oya, Gurugoda Oya, and Rakwatthe Ela, in the wet zone of Sri Lanka, and how such changes influence the inhabiting macrobenthic assemblages. For this assessment, we established 06 sampling sites at the Aswathu Oya based on the judgmental sampling technique [*viz.* Site A (rubber factory wastewater effluent canal, Site B (point of effluent discharge in the stream, Site C (50 m upstream control site), Site D (50 m downstream site from site B, Site D (100 m downstream site from Site B, and Site E (150 m downstream site from site B], measured some water quality parameters [*viz.* Dissolved oxygen (DO), Chemical oxygen demand (COD), Biological oxygen demand (BOD_5), Conductivity, Total dissolved solids (TDS), Temperature (T), and pH] and sediment quality parameters [Organic matter content (OMC)] and, sampled the macrobenthic faunas in each site from December 2021 to January 2022 following standard field sampling techniques. We also retrieved the secondary research data from other streams that were also subjected to rubber factory wastewater effluents, namely Rakwatte Ela (2001) and Gurugoda Oya (2011), where both studies followed a similar sampling protocol. Data were analysed using univariate and multivariate statistical methods as appropriate. Although a certain degree of variation in data in the 03 temporal frames was noted, results revealed that all 03 streams share a common variation pattern in the water quality, sediment quality, and macrobenthic assemblages. For example, the COD, BOD_5, OMC, conductivity, and TDS levels were elevated, and the DO level was reduced significantly ($p < 0.5$; ANOVA) in the highly polluted A and B sites in all 03 streams. The abundance of some macrobenthic species, particularly the tubificids and chironomids, was also significantly high ($p < 0.5$; ANOVA) in these 02 sites. In contrast, the COD, BOD_5, OMC, conductivity, and TDS levels were low, but the DO level was significantly high in the furthest downstream site F and the upstream site C ($p < 0.5$; ANOVA), but none of these parameters were significantly different between the two sites ($p > 0.05$ ANOVA). The abundance of chironomids and tubificids was also significantly low in C and F sites compared to the highly polluted A and B sites ($p < 0.5$; ANOVA). The species heterogeneity (H'), richness (SR), and evenness (J') of the macrobenthic assemblages elevated at the furthermost site F, where they became almost the same as those in upstream control site C. Therefore, the changes made by the rubber factory effluents to the water/sediment quality and the macrobenthic assemblages in the factory-associated streams are never permanent and disappear within a relatively short stretch of 150 m along the streams, most probably due to dilution of wastewater along the stream and the pollution-tolerant tubificids and chironomids are excellent bioindicator candidates to detect such changes.

Keywords: Chironomids, Macrobenthos, Point source pollution, Rubber factory effluents, Tubificids

Abstract No: BO-12

Identification of four anchovy species collected from the southern coastal belt of Sri Lanka using molecular and morphological markers

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Anchovy is a pelagic fish species belonging to the family Engraulidae. Six anchovy species have been recorded from Sri Lankan waters. They belong to two genera; Genus: *Encrasicholina,* including *E. heteroloba, E. punctifer*, *E. devisi* and Genus: *Stolephoru,* including *S. indicus*, *S. commersonii*, *S. weitei*. The current study aimed to distinguish the selected four anchovy species based on both molecular and morphological data. A total of 120 anchovy samples were collected from geographically distant fish landing sites along the southern coastal belt of Sri Lanka. For the morphological study, variation of fish body shape was studied using a geomorphometric method using eleven landmarks and data were analysed under the Principal Component and Canonical Variant Analyses, respectively. According to the results, 62% of the variance of fish body shape is explained by the first three components (PC1=32%, PC2=17% and PC3=13%) and there were three groups of taxa representing *E. heteroloba*, *S. indicus*, *S. commersonii* ($P<0.05$) in which *E. heteroloba* and *E. devisi* overlapped with each other ($P>0.05$). For the molecular study, partial mitochondrial *Cytochrome Oxidase I* (*COI*) gene sequences of the four species were compared with reference sequences available on Genbank (NCBI)) and pairwise P-distance was calculated. The average blast results combined with pairwise P-distance (under 2% criteria of speciation) revealed that there were four species of anchovies; namely, *S. indicus*, *S. commersonii*, *E. heteroloba* and *E. devisi*. Three individuals previously identified as *E. devisi* only compared with *E. heteroloba* as there were no sequences recorded in NCBI under this name. Pairwise P distance was obtained below the value of 2% for all the assumed anchovy species except *E. devisi* which 4.7% was observed with respect to the most correspondent *E. heteroloba* reference sequence. The results of the two methods were not consistent in the current study. There are some possibilities for this outcome; errors in the initial identification of species or phenotypic plasticity between *E. heteroloba* and *E. devisi* would be contributed to the similar shape variation. Further studies are warranted to correctly identify anchovy species inhabiting coastal waters in Sri Lanka.

Keywords: Anchovy morphology, Cytochrome Oxidase I, Pairwise P-distance, Phenotypic plasticity

Acknowledgement

Abstract No:BO-13

Oviposition attraction and larval performances of *Aedes aegypti* and *Aedes albopictus* under different leaf concentrations of invasive flora

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Aedes aegypti and *Aedes albopictus* (Diptera: Culicidae) are the vectors of dengue and dengue hemorrhagic fever. The survival and population density of *Aedes* mosquitoes depend on the characteristics of the oviposition media. Thus, the objective of the present study was to evaluate the attraction and larval development of *Ae. aegypti* and *Ae. albopictus* to different oviposition media prepared using alien invasive flora in rubber plantations. Three oviposition media, each having 25%, 50%, 75% and 100% concentrations, were prepared by the selected invasive flora namely, Guinea grass (*Megathyrsus maximus*), Alligator weed (*Alternanthera philoxeroides*) and Austroeupatorium (*Austroeupatorium inulifolium*) to evaluate the attraction of mosquito populations in a rubber plantation at Palmadulla (6°36'50.5"N 80°33'03.3"E). Forty-five ovitraps (four concentrations from each infusion with three blanks were placed on the identified sites for vector breeding in a completely randomized manner for four days. The experimental setup was replicated three times. The number of eggs at each concentration of leaf extracts was enumerated and reared under laboratory conditions until adults. The emerged mosquitoes were identified using morphological taxonomic keys. The highest number of *Aedes* eggs (n=32) were found in ovitraps with 25% concentration of *M. maximus*. At 25% concentration, the highest hatch rate (65%) was obtained from *A. philoxeroides* and at 50% of concentration, the highest hatch rate (75%) was obtained from *M. maximus* infusion. At 75% of concentration, the highest hatch rate (75%) was obtained from *M. maximus* infusion during the second day of rearing. But at 100% of concentration, the highest hatch rate (50%) was obtained by *M. maximus* within the first day of rearing. The highest ovitrap positivity index (number of positive ovitraps/number of ovitraps placed X 100) value of 100, was obtained by *A. philoxeroides* at concentrations of 25%, 50%, and 75%, by *M. maximus* at concentrations of 25, 50, and 100%, and by *A. inulifolium* at concentrations of 25% and 75%. *A. philoxeroides* achieved the lowest value 33.3 at 100% concentration. The maximum Egg Density Index (Total number of eggs/Total number of positive traps) value 22.0 was obtained by *M. maximus* at 25% concentration and the minimum value 2.5 was obtained by *A. inulifolium* at 100% concentration. The larval density shows a significant difference with the different plant infusions. (F=12.90, df =2, P<0.05) and also in different concentration (F=13.81, df=3, P<0.05). The interaction of plant infusion type and their concentrations showed a significant effect on the larval densities (Two-Way ANOVA, F=6.57, df =6, P<0.05). The leaf infusions attracted gravid females of both *Ae. aegypti* and *Ae. albopictus*. The mosquitoes exhibit a vastly different response to each plant species. The present study demonstrates the potential of plant infusions in stimulating oviposition by *Aedes* mosquitoes using ovitraps in mosquito surveillance. These findings confirm the critical importance of the plant species that are used to make leaf concentrations.

Keywords: *Aedes* mosquitoes, invasive flora, larval density, oviposition attraction, ovitrap positivity index, plant infusion

Abstract No: BO-14

Assessment of water quality status in a tropical river mouth: Special reference to Kalu Ganga, Sri Lanka

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Land-based pollutants are released into rivers and eventually reach coastal waters. As a result, these pollutants contaminate coastal waters in a non-point manner. Therefore, assessing river mouth water quality is crucial for managing coastal waters. Kalu Ganga is one of the major rivers in Sri Lanka, which starts from Adam's Peak and flows for about 129 km before being connected with the Indian Ocean at Kaluthara. The objective of the present study was to assess the current water quality status in the Kalu Ganga river mouth. Surface water sampling was carried out from August 2020 to October 2020 (Wet months) and January 2021 to February 2021 (dry months) every month. Six sampling locations were selected at the Kalu Ganga river mouth based on the random sampling technique, which included three locations along the right-side river mouth bank and three locations along the left-side river mouth bank. Altogether sixty water samples were subjected to the analysis of eleven water quality parameters, *viz.*, temperature, pH, electrical conductivity (EC), total dissolved solids (TDS), salinity, dissolved oxygen (DO), biological oxygen demand (BOD_5), and the concentrations of nitrate, orthophosphate (OP), total phosphate (TP), and chlorophyll-*a* (Chl-*a*) at each location using standard methods. Water temperature, EC, TDS, salinity, and pH were measured onsite using portable meters. In the laboratory, DO and BOD_5 were measured using standard titrimetric methods, while nitrate, OP, TP, and Chl-*a* concentrations were measured according to standard spectrophotometric methods. During the wet months, the average values for the temperature, pH, EC, TDS, and salinity were recorded as 30.1±0.2 °C, 7.42±0.39, 0.21±0.07 $mScm^{-1}$, 0.24±0.08 ppt, 0.0±0.0 ppt respectively. DO and BOD_5 were recorded as 9.2±0.4 mgL^{-1} and 0.4±0.3 $mgL^{-1}day^{-1}$ respectively. The average nitrate, OP, TP and Chl-*a* concentrations were obtained as 0.15±0.01 mgL^{-1}, 0.16±0.06 mgL^{-1}, 0.31±0.06 mgL^{-1} and 0.66±0.19 μgL^{-1} respectively. During the dry months, the average values for the temperature, pH, EC, TDS, and salinity were recorded as 31.1±0.1 °C, 7.98±0.04, 25.34±7.33 $mScm^{-1}$, 6.54±0.11 ppt, and 8.8±0.1 ppt respectively. DO and BOD_5 were recorded as 8.5±0.8 mgL^{-1} and 0.4±0.2 $mgL^{-1}day^{-1}$ respectively. The average nitrate, OP, TP and Chl-*a* concentrations were reported as 0.02±0.01 mgL^{-1}, 0.13±0.01 mgL^{-1}, 0.31±0.08 mgL^{-1} and 0.56±0.25 μgL^{-1} respectively. Except for BOD_5, OP, TP, and Chl-*a*, all other parameter values were significantly different between wet and dry months (paired t-test, $p<0.05$). The elevations of EC, TDS, and salinity that have been noticed during the dry months indicate the saltwater intrusion into the Kalu Ganga river mouth. Studies including microbial contamination, bottom water quality analysis, etc., are recommended in the study area. Based on the findings, it can be concluded that the Kalu Ganga river mouth exhibits a low level of pollution in terms of the evaluated water quality parameters. At the same time, it is necessary to establish water quality standards for river mouths in Sri Lanka.

Keywords: Kalu Ganga, River mouth, Water quality

Abstract No: BO-15

Hypoglycemic effect and antioxidant effect of pressured water extracts of *Alpinia calcarata* (heen araththa)

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Diabetes mellitus is a chronic metabolic condition that accounts for 1.5 million deaths annually worldwide. Since oral hypoglycemic medicines have adverse effects, there is a growing interest in employing herbal remedies for diabetes mellitus. *Alpinia calcarata*, a medicinally important plant from the Zingiberaceae family that grows in tropical climates like Sri Lanka and India, has a range of therapeutic uses. The rhizome of the plant has been used as a traditional systemic medicine in Sri Lanka for respiratory tract conditions, including asthma, cough, and bronchitis, as well as for inflammatory conditions like arthritis and metabolic disorder like diabetes mellitus. Since antioxidant activity inhibits hypoglycemic related complications, if *A. calcarata* rhizomes contain phytochemicals with antioxidant activities, it would be beneficial for diabetic patients. Therefore, the objective of this study was to investigate the hypoglycemic activity and antioxidant activity of low pressurised water extract (LPWE) and medium pressurised water extract (MPWE) of dried *A. calcarata* rhizomes. Phytochemicals in the ground rhizome of *A. calcarata* were extracted into the water by low pressurised water extraction method (0.098 MPa, 200 mL for 10 minutes) and medium pressurised water extraction method (0.103 MPa, 121°C, 100 mL for 20 minutes). The hypoglycemic effect was determined by performing the α- amylase inhibitory assay and glucose uptake by Yeast cells assay for three glucose concentrations (5 mM, 10 mM, and 25 mM). According to the results of α-amylase inhibitory assay, the IC_{50} values of LPWE and MPWE were 166.8 ± 0.1 μg/mL and 152.1 ± 0.1 μg/mL, respectively. The glucose uptake by Yeast cell assay has revealed that the rate of glucose uptake by the plasma membrane of the yeast cell in all three glucose concentrations (5 mM, 10 mM, and 25 mM), was linear and the percent increase in the glucose uptake by the yeast cells was found to be inversely proportional to the glucose concentration. The antioxidant ability was assessed by performing the Ferric reducing antioxidant power (FRAP) assay, and by comparing the absorbance changes at 593 nm in both pressured water extracts with a standard series of ferrous ions (100-1000 μM). The FRAP value of MPWE exhibited a higher FRAP value than that of LPWE and both LPWE and MPWE were proportionate to their concentrations. Altogether, the results revealed that the LPWE and MPWE of dried *A. calcarata* rhizomes may have both hypoglycemic and antioxidant activities. Additionally, the current study suggests that preparing MPWE is a more effective way than preparing LPWE for obtaining more hypoglycemic phytochemicals from the dried rhizome of *A. calcarata*.

Keywords: *Alpinia calcarata*, Antioxidant, Diabetes mellitus, Hypoglycemic, Rhizome

Abstract No: BO-16

Alpha-amylase and alpha-glucosidase inhibitory activities of a novel compound isolated from *Murraya koenigii*

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Herbal plants are composed of a vast amount of novel antidiabetic drugs for the management of diabetes mellitus. The leaves of *Murraya koenigii* L. Sprengel. which belongs to Family- Rutaceae (Common name- curry leaves) plant is known to be a promising source of natural bioactive compounds. In this research, we report the isolation and characterization of a new compound from hexane extract of leaves of *M. koenigii* and its in vitro antidiabetic activity. The new compound was identified as 3,3',5,5',8-pentamethyl-3,3'-bis (4-methylpent-3-en-1-yl)-3,3',11,11'-tetrahydro-10,10'-bipyrano [3,2-a] carbazole and the structure was elucidated based on extensive ^{13}C and ^{1}H NMR, high-resolution mass spectrometry (HRMS) and 2D NMR analysis. Investigated the *in vitro* antidiabetic activity of the new dimer using alpha-amylase and alpha-glucosidase enzyme inhibition activities. The compound exhibited significant alpha-amylase activity (IC_{50} = 30.32 ±0.34 ppm) and the alpha-glucosidase inhibition activity (IC_{50} = 30.91 ±0.36 ppm) when compared with the acarbose at 0.05 significant level. These results revealed that the new compound isolated from the hexane extract of leaves of *M. koenigii* could act as an antidiabetic agent.

Keywords: Antidiabetic compound, Enzyme inhibition assays, *Murraya koenigii*, Percentage inhibition activity

Abstract No: BO-17

Pharmaceutical and cosmeceutical potential of methanolic extract of Kaffir lime (*Citrus hystrix*) leaves

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Kaffir lime (*Citrus hystrix*), commonly known as 'gada dehi' is a citrus fruit native to Southeast Asia. As less research has been conducted to investigate the potential pharmaceutical and cosmeceutical properties, the present study aimed to evaluate the antioxidant, antimicrobial and photo-protective properties of methanolic extract of Kaffir lime leaves. Dried and powdered Kaffir lime leaves were extracted into methanol by maceration. Constituents in the extract were then sequentially fractionated with hexane, dichloromethane (DCM), and methanol (50%). The antioxidant activity of each fraction was evaluated by α-diphenyl- β- picrylhydrazyl (DPPH) free radical scavenging assay. Total phenolic content (TPC) and total flavonoid content (TFC) of each fraction were determined by Folin-Ciocalteu and aluminium chloride colorimetric assays respectively. The antibacterial and antifungal activities of methanolic extract of leaves and its fractions were determined against selected strains of bacteria *Klebsiella pneumonia*, *E.coli*, *Staphylococcus aureus,* and fungi *Aspergillus welwitschiae*, *Candida albicans* by agar disc diffusion method. The photoprotective property of the methanolic extract and its fractions were assessed spectrophotometrically by determining the Sun Protection Factor (SPF) using the Mansur equation. Among the fractions, the DCM fraction showed the highest antioxidant activity (IC_{50} 186.20 ± 4.95 µg/ml) with the highest TPC and TFC (0.64 ± 0.04 mg gallic acid equivalent/g of dried weight and 5.03 ± 0.21 mg of quercetin equivalent/g of dried weight, respectively). The methanolic extract showed inhibition against all the tested bacteria and fungi and among the fractions, the DCM fraction exhibited the highest inhibition against *K. pneumonia*, *S. aureus,* and *C. albicans*. All the fractions exhibited UV-B absorption, and among them, DCM showed the highest photo-protective property with an SPF of 34.03 ± 0.18 at 2 mg/ml while the SPF of the reference sunscreen was 33.48 ± 0.27 at 2 mg/ml. As the DCM fraction exhibited the highest antioxidant and photoprotective properties and significant antimicrobial activity, it was further separated by silica gel column chromatography into 6 subfractions. Further, the subfraction 3 (F3) was analysed by GC-MS as it contained the chemical constituents with the highest photoprotective property among the 6 subfractions and revealed that it is rich in volatile constituents including linalool oxide, α-terpinolene, 2,4-bis(1,1-dimethylethyl)-phenol, diethyl phthalate, hexadecanoic acid, methyl-3-(3,5-ditertbutyl-4-hydroxyphenyl) propionate and octadecanoic acid. These findings demonstrated that the extract of Kaffir lime leaves could be used as a natural source in the pharmaceutical and cosmeceutical industries as it is rich in phytochemicals with antioxidant, antimicrobial activities, and photoprotective properties with a high sun protection factor.

Keywords – Antioxidant, Antimicrobial, Photoprotective, Phytochemicals, Sunscreen

Abstract No: BO-18

Synthesis and characterization of BSA nanoparticles loaded with antidiabetic compounds from *Alpinia calcarata* extract

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Diabetes is the ninth leading cause of death in the world is also the no.1 cause of kidney failure, adult blindness, and lower-limb amputations. Due to this reason, the necessity for the use of antidiabetic drugs has arisen across the globe. But due to the high cost and side effects of oral antidiabetic drugs, scientists have started focusing their attention on natural products as safer and more potent alternatives for the treatment of diabetes. The rhizome of *Alpinia calcarata* Roscoe (Heen araththa) is known to exert its antidiabetic activity through the inhibition of intestinal glucose absorption by inhibiting the activity of pancreatic α-amylase and α-glucosidase enzymes. Therefore, once its antidiabetic compounds are extracted using the pressurised water extraction method, which has proven to be one of the promising techniques, an anti-diabetic nutraceutical can be produced for the treatment of diabetes. Bovine Serum Albumin (BSA) nanoparticles loaded with the bioactive compounds of *A. calcarata* are a good form of an anti-diabetic nutraceutical as they result in protection of active compounds from environmental agents, specific delivery to target sites, reduced side effects, and prolonged shelf-life. The objective of the present study was to synthesize and characterize *A. calcarata* loaded BSA nanoparticles to be used as a powder form nutraceutical with higher antidiabetic activity. In this study, an aqueous *A. calcarata* extract (4.00 mL) was added to BSA (20 mg/mL, 4.00 mL, pH 9) in the presence of citric acid as the crosslinking agent. The synthesized nanoparticles were tested for antidiabetic activity using α-amylase inhibition assay and yeast glucose uptake assay and characterized using parameters such as particle size, surface charge, morphology, and particle structure using FTIR. The IC_{50} value calculated using the GraphPad Prism 9.2.0 software for the nanoparticles was 147.00±0.97 µg/mL. The glucose uptake percentage at 5 mM glucose concentration for the 0.5 mg/mL nanoparticle sample was 73.09 ±0.06% and that obtained under the same conditions for an aqueous *A. calcarata* extract was 45.30 ±0.97%. The synthesized nanoparticles were 1030.70±75.3 nm in size, with a polydispersity index of 0.199± 0.003, zeta potential value of 2.57±0.32 mV, spherical morphology, and uniform size. The FT-IR results showed that citric acid had caused conformational changes in the protein structure of BSA and that the active compounds were successfully loaded into the synthesized nanoparticles which interacted with the protein matrix via covalent bonds. Therefore, it can be concluded that the synthesized nanoparticles have an anti-diabetic effect and the antidiabetic activity of bioactive compounds of the aqueous *A. calcarata* extract is enhanced when loaded onto the nanocarriers. The nanoparticles have also been synthesized effectively and therefore, can be used as a powder form anti-diabetic nutraceutical for the treatment of diabetes.

Keywords: *A. calcarata,* BSA nanoparticles, Citric acid, Diabetes, Nutraceutical

Abstract No:BO-19

Preliminary studies of antibacterial and antifungal activities of Paspanguwa

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Paspanguwa appears to be a traditional Sri Lankan home treatment that has been used for hundreds of years to treat common ailments. The name 'Paspanguwa' term from a combination of five primary herbs ('pas' = five, 'panguwa' = parts): ginger (*Zingiber officinale*), pathpadagam (*Hedyotis corymbosa*), katuwalbatu (*Solanum xanthocarpum*), venivalgata (*Coscinium fenestratum*), and coriander (*Coriandrum sativum*). This study focused on evaluating the antibacterial and antifungal activities of aqueous extracts from dried herbal constituents in Paspanguwa separately and the Paspanguwa mixture on the growth of *Staphylococcus aureus* (ATCC 25923)*, Escherichia coli* (ATCC 25922),and *Klebsiella pneumoniae* (DSM 16358)*, bacterial strains and *Candida albicans* (ATCC 10231) fungal strain using agar disc diffusion method and also to investigate antifungal activity of Paspanguwa mixture against *Aspergillus welwitschiae* using agar disc diffusion and spore germination inhibition analysis method. Decoctions of each dried herbal constituent contained in Paspanguwa and their mixture was obtained. To investigate antibacterial and antifungal activities, Nutrient Agar and Potato Dextrose Agar (PDA) media were utilized respectively. Optical density at 600 nm of *S. aureus*, *E. coli*, and *K. pneumoniae* bacterial suspensions was adjusted to 0.4, 0.4, and 0.2 values accordingly and for *C. albicans, A. welwitschiae* fungal suspensions at 0.4, 0.18 correspondingly. Discs impregnated in distilled water were used as a negative control and amoxicillin (0.002g/mL, 0.001g/mL, and 0.0016g/mL) as positive controls for *S. aureus*, *E. coli* and *K. pneumoniae* strains, respectively. Carbendazim (0.004 g/mL) was utilized as a positive control against fungal strains. According to the results, aqueous extracts derived from coriander (*Coriandrum sativum*) (0.7 ± 0.1 cm) and Pasapanguwa mixture (0.7± 0.0 cm) have shown antibacterial potentials only against the *S. aureus* bacterial strain. Results were obtained for the antifungal effect of herbal extracts on *C. albicans* and *A. welwitschiae* fungal strains. Only antifungal activities were achieved against *C. albicans* in the extractions of ginger (*Zingiber officinale*) (0.8 ± 0.1 cm) and Pasapanguwa mixture (0.7± 0.1 cm). However, no positive results were found for *A. welwitschiae* and these results were further proven by the spore germination inhibition analysis technique. In this technique, PDA, and spore suspension were placed on top of the sterile microscopic slides as the first and second layers, respectively. One slide set was prepared by placing distilled water as a negative control on top of the above-mentioned two layers (as the third layer) and another set was prepared by placing a Pasapanguwa mixture instead of distilled water. According to the results observed from the phase-contrast microscope, fungal spores (conidia = asexual spores) in both sets were germinated. Finally, it can be concluded that Paspanguwa water extract has antibacterial and antifungal activity against some strains, but its activity is insufficient to compare with other well-known antibacterial and antifungal drugs.

Keywords: Agar disk diffusion**,** Antibacterial activity, Antifungal activity, Paspanguwa, Spore germination inhibition

Abstract No: BO-20

Development of antioxidant encapsulated nano edible sheet using *Cocania Grandis* (Kowakka): an underutilized wild edible species in Sri Lanka

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Recently, food and nutrient security have become crucial concerns around the globe. In that context, using underutilized wild edible plant species become an option way to ensure food supply in acceptable quantity and quality. Referring to nutritional aspects, these plant species are generally recognized as potential sources of micronutrients and bioactive compounds that are essential to human health maintenance and to prevent of malnutrition. Even though they are enriched with a significant amount of nutrients, it does not mean that every ounce of those nutrients can be absorbed. Nano encapsulation technology has become a promising solution to protect food bioactive components against an unfavourable processes and storage conditions, chemical and mechanical barriers. By improving the bioaccessibility, nano encapsulation is able to increase the portion of bioactive compounds released from the food matrix which are available for intestinal absorption. For these reasons, this study was conducted to develop antioxidant encapsulated nano-edible sheet using an underutilized plant species namely *Cocania Grandis* (Kowakka). Ethanol based plant extracts (0.2%) were encapsulated by electrospinning technique using edible polymer mixture including hydroxypropyl-β-cyclodextrin (70%) and poly (ethylene oxide) (30%) as the wall materials. Fiber mats were then assessed for total polyphenol content using Folin ciocalteu reagent method while the ascorbic acid content was determined using 2, 6 dichlorophenol indophenol visual titration method. Antioxidant capacity was evaluated using 2,2-diphenyl-1-picrylhydrazyl (DPPH) and 2,2'-azino-bis (3-ethylbenzothiazoline-6-sulfonic acid (ABTS) assays. Antioxidant bioaccessibility of the fiber mats was tested using *in vitro* digestion model and the final accessibility value was calculated as the bioaccessibility fraction. Furthermore, the fiber mats were characterized for their physical properties using scanning electron microscopy and transmission electron microscopy. The antioxidant activity in Kowakka encapsulated fiber mat was 0.16 mg/mL (IC50) and 333.23 Trolox equivalent antioxidant capacity for DPPH and ABTS assays respectively. The total phenolic content was found to be 280.65 Gallic acid equivalents (GAE) mg/100 and ascorbic acid content was 4.80 mg/mL. According to the antioxidant bioaccessibility assessment, the bioaccessibility level of the encapsulated edible mat containing *C. grandis* was 63.65% higher than its' normal bioaccessibility level. *C. Grandis* encapsulated nano edible fiber mats will be a multifaceted approach for a number of applications in the food industry, as well as for improving human nutrition and health benefits.

Keywords: Antioxidants, Bioaccessibility, Electrospinning, Nano encapsulation, Underutilized wild edibles

Abstract No: BO-21

In-vivo growth control of *Aspergillus flavus* on stored rice using microencapsulated cinnamon leaf oil

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Poor storage conditions of rice lead to fungal infestation associated with severe health problems in humans. *Aspergillus flavus* is one of the significant storage fungus responsible for producing aflatoxins on stored grains. The use of cinnamon leaf oil (CNO) as an antifungal agent has gained great interest because of its low mammalian toxicity, high efficacy and availability. However, the direct application of CNO possesses many drawbacks, such as loss of bioactivity due to volatilization and degradation of active compounds and contribution to unpleasant taste and odour of foods. Microencapsulation is an efficient technique that can be used to overcome those drawbacks and obtain controlled release. This study aimed to determine the *in-vivo* growth control of *A. flavus* on rice by CNO-chitosan microcapsules (CNO-CS-MCs). CNO was encapsulated within biodegradable polymeric chitosan by ionotropic gelation method with sodium tripolyphosphate as the crosslinking agent. CNO was obtained from the local market and characterized using Gas Chromatography-Mass Spectrometry (GC-MS). Rice samples (Bg 11-11) were obtained from Rice Research Institute, Bathalagoda, Sri Lanka. *Aspergillus flavus* was isolated from stored rice and tentatively identified as *A. flavus* using morphological features and DNA sequencing. The minimum inhibitory dose and minimum lethal dose of free CNO and microencapsulated CNO against *A. flavus* were evaluated under *in-vivo* conditions. The GC-MS analysis of CNO showed the presence of eugenol (56.49 %), β-caryophyllene (9.03 %), benzyl benzoate (8.43 %) and linalool (6.0 %) as the major constituents. Free CNO mixed with rice grains showed 100±0.00 % growth inhibition (visible) of *A. flavus* at 2 mg of oil (minimum inhibitory dose) and there was no revival of the growth of the fungus treated with ≥ 5 mg (minimum lethal dose) of oil, in PDA media. Both minimum inhibitory and minimum lethal doses of CNO-CS-MCs treated rice samples were higher than that of free CNO. The minimum inhibitory dose of CNO-CS-MCs mixed with rice grains was 5 mg and the minimum lethal dose was 12.5 mg, whereas those were 10 and 17.5 mg, respectively, in treatments with CNO-CS-MCs sachets. Both CNO and CNO-CS-MCs were fungistatic and fungicidal against *A. flavus*. This study indicated the potential of using microencapsulated CNO as a natural antifungal agent against the *A. flavus*.

Keywords: Antifungal activity, *Aspergillus flavus*, Chitosan, Cinnamon leaf oil, Microcapsules

Abstract No: BO-22

Enzymatic approach to green air: Depolymerization of polycyclic aromatic hydrocarbons (PAHS) by *Aspergillus* sp. isolated from phyllosphere of urban areas

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Polycyclic aromatic hydrocarbons (PAHs) are hazardous air pollutants that are toxic to many life forms. Biodegradation is an eco-friendly efficient option found to remediate these toxic PAHs. Air pollutants from many sources get settled over the phyllosphere through atmospheric deposition. Phyllosphere is a large niche for many fungal species and some of them metabolize many PAHs to nontoxic concentrations. The present study was to determine the PAHs (phenanthrene, anthracene, naphthalene and pyrene) degradation capability of phyllosphere inhabited *Aspergillus* species. Fungal isolations were made from leaf samples (*Amaranthus cruentus*, *Hibiscus rosa-sinensis*, *Ervatamia divaricate*, *Plumeria* sp., and *Ixora chinensis*) grown in Panchikawatta, Orugodawatta, Pettah, Maradana, Colombo Fort and Sapugaskanda oil refinery sites in Sri Lanka. Out of morphologically different thirty-five fungal isolations, *Aspergillus* spp. were identified to the genus level using identification keys and pre-existing identified reference cultures. PAHs degradation ability of isolated *Aspergillus* spp. was screened using a plate assay and confirmed by High Performance Liquid Chromatography (HPLC). Further, phyto-toxicity assays were performed using *Vigna radiata* seeds to test environmental toxicity and toxicity to the degrading fungal cells in the medium from the produced metabolites. Furthermore, manganese-dependent peroxidases (MnPs), lignin peroxidases (LiPs), and laccases enzyme activities of them during the PAHs depolymerization were analysed parallel to the PAHs degradation percentages. According to HPLC analysis, *Aspergillus* sp. $P_{21}B$ - 77 showed the most efficient degradation of anthracene (80%), *Aspergillus* sp. $P_{11}B$ – 34 was the most efficient degrader for naphthalene (82%) and *Aspergillus* sp. $P_{22}T$ – 82 was the most efficient degrader for pyrene (84%) and phenanthrene (86%). MnP enzyme activity dominated the highest anthracene depolymerization ability of *Aspergillus* $P_{21}B$ – 77 However; LiPs activity dominated the highest phenanthrene and pyrene depolymerization in *Aspergillus* sp. $P_{22}T$ – 82. Moreover, *Aspergillus* sp. $P_{11}B$ – 34 showed the best naphthalene degradation, and laccases enzyme activity dominated the degradation. The toxicity assay revealed that the generated metabolites were not toxic to the growth of *Aspergillus* spp. and, also verified that those by-products were not destructive compounds to the phyllosphere. *Aspergillus* spp. could be useful as a potential biological agent for an effective bioremediation process in polluted environments contaminated with phenanthrene, anthracene, naphthalene and pyrene like polycyclic aromatic hydrocarbons.

Keywords: *Aspergillus* spp., Bioremediation, HPLC, Phyllosphere, Phytotoxicity

Abstract No: BO-23

Analyses of biometric growth parameters, feeding ecology and fisheries aspects of Frigate Tuna (*Auxis thazard*), a Neritic Tuna species found off the east, west and south coasts of Sri Lanka

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Frigate tuna (*Auxis thazard*) is a commercially important neritic tuna species in Sri Lanka contributing to over 40% of the total neritic tuna catch of the country. Only a few studies have been conducted on biometric parameters of frigate tuna in Sri Lankan waters. Therefore, the present study was conducted to study the growth condition indices and fisheries aspects of *A. thazard* in selected coastal waters around Sri Lanka and the feeding ecology of *A. thazard* in the West coast of the country. The study was based on a primary data analysis where the data were collected from the West coast from November 2021 to February 2022 and a secondary data analysis in which the data were obtained from the Department of Fisheries and Aquatic Resources (DFAR) following the year 2017 for a comparative study off the Western, Southern and Eastern coasts of Sri Lanka. The Length–weight relationship (LWR) and Fulton's condition factor (K) were estimated using the equations $W = aL^b$ and $K = 100W/L^3$ to assess the condition of the fish. The total weight ranged from 124.90 g -1405.05 g, 157.00 g -1475.00 g and 152.60 g - 890.40 g and further total lengths ranged from 23.8 cm - 44.2 cm, 21.5 cm - 46.5 cm and 25.5 cm - 44.1 cm for Western, Southern and Eastern coasts respectively. The LWRs were $W = 0.0012TL^{3.6586}$, $W = 0.0026TL^{3.4846}$ and $W = 0.0147TL^{2.951}$, in which the pooled 'b' values 3.6586 and 3.4846 for the West and South coasts indicating positive allometric growth (b>3, t-test, p<0.05) and 2.951 for the East coast indicating isometric growth (b=3, t-test, p>0.05). Both male and female fish on each coast followed the same growth pattern without any difference. The K values 1.21 ± 0.42 and 1.43 ± 0.98 calculated for the West and South coasts indicated relatively healthy conditions and 0.94 ± 0.51 on the East coast indicated comparatively poor conditions. The gillnets accounted for 98% of catches on the West coast and ring nets accounted for 68% and 67% for South and East catches based on the total landings in 2017. In the primary data analysis, the estimated Relative Gut Length (RGL) confirmed the frigate tuna as a carnivore. The size classes of 30.0 - 31.50 cm and 23.50 - 24.50 cm had the highest and lowest feeding intensities based on the Gastro Somatic Index (GaSI). The most preferred prey item was shrimps. The Fishbase reports length at first maturity as 29.5 cm. The percentages below 29.5 cm include 18.83%, 39.18% and 33.99% for the West, South and East coasts, respectively. Therefore, continuous monitoring of fish landings and data collection is recommended for a sustainable fishery.

Keywords: *Auxis thazard*, Frigate tuna, Fulton's condition factor, Growth, Length–weight relationship.

Abstract No: BO-24

The potential use of aquaculture pond sludge and fish waste to produce *Eisenia fetida* (Lumbricidae), Vermiwash: an approach towards sustainable aquaculture and fisheries industry of Sri Lanka

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Pond bottom sludge and fish waste are considered as major environmental pollutants in the aquaculture and fish processing industries and managing them are necessary to reduce their negative environmental impacts. In pond aquaculture practices, different amounts of nutrients are generated depending on the culture conditions and biological processes of fish and the environment. In the present study, aquaculture sludge and fish waste were used as bedding materials to produce vermiwash using *Eisenia fetida*. Under field conditions, vermiwash was prepared using three combinations of substrates, including (i) cow dung & *Gliricidia* leaves (control as industrial practice), (ii) cow dung & aquaculture sludge and (iii) cow dung & fish waste in a 2: 1 ratio and three replicates from each combination. *E. fetida* (250 earthworms per 6 kg of bedding materials) were introduced to each vermiwash preparation unit and fresh vermiwash samples were collected weekly after 15 days of introducing *E. fetida* to experimental units for four consecutive weeks. Chemical parameters including pH, conductivity, chemical oxygen demand (COD), total nitrogen (TN), orthophosphate (Ortho-P) and total potassium of vermiwash samples were measured. A germination test was conducted using *Phaseolus vulgaris* seeds with experimental vermiwash samples extracted in the fourth week. After three months, the number of earthworms in vermiwash units was counted to assess their survival ability. TN in aquaculture sludge vermiwash (0.22±0.20%) was comparatively higher than the fish waste (0.09±0.04%) and the control (0.16 ± 0.15%). However, TN among the control and treatment vermiwash solutions were not significantly different (P = 0.783). *P. vulgaris* seeds treated with aquaculture sludge vermiwash had the highest percentage of seed germination (63.3%). The germination of seeds (%) in the distilled water was 61.7% and 47.2 % in the control. The lowest seed germination was observed in the fish waste vermiwash (33.7%). The number of *E. fetida* in vermiwash preparation units of the control and aquaculture sludge increased by 49.2% and 33.3%, respectively, from the initial introduction. Higher mortality of *E. fetida* was observed in the fish waste vermiwash preparation, and only 9.2% of *E. fetida* survived at the end of the experiment. It can be concluded that, aquaculture sludge can successfully be used as a bedding material for vermiwash production as it supports the multiplication of *E. fetida* which also contains higher TN content and higher seed germination of *P. vulgaris*. Except for the low K level, aquaculture sludge vermiwash is chemically comparable with the control vermiwash. However, fish waste was not suitable to prepare vermiwash in the proportions tested in this study as *E. fetida* couldn't multiply and survive in this bedding material. The seed germination in fish waste vermiwash treated *P. vulgaris* seeds is also low. Aquaculture sludge can successfully be used as a bedding material for vermiwash production as it supports the multiplication of *E. fetida*, contains comparatively higher TN content and increases the seed germination (%) of *P. vulgaris*.

Keywords: Aquaculture sludge, *Eisenia fetida*, Fish waste, Vermiwash

Abstract No: BO-25

A survey on cosmetic applications of herbal oils in the Northern part of Sri Lanka

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Herbal oils have been used for therapeutic and beauty applications in Sri Lanka, with a documented history of over 2,500 years. It is inherited knowledge which has been handed down from generation to generation and provides a largely unexplored source for the potential development of cosmetic formulations. Herbal oils are used in the management of skin care, hair care, hand and foot care, and dental care. The northern part of Sri Lanka has a rich plant diversity, and the local people of the region have a good knowledge of the use of plants for cosmetic purposes. Therefore, this present survey was conducted to identify the various beautifying applications of cosmetic potential herbal oils in the Northern part of Sri Lanka. Personal interviews were conducted via a semi-structured questionnaire with randomly selected 385 participants. Data were collected on the cosmetic application of herbal oil for skincare, hair care, foot care, eye care, nail care, lip care, and oral care topically. The acquired data were verified using the authentic Siddha literature and further reviewed for various chemical compositions and relevant pharmacological activities. Eight herbal oils were identified for different cosmetic applications for skincare (46%), hair care (32%), foot care (6%), eye care (6%), nail care (4%), lip care (4%) and oral care (2%) topically. The identified herbal oils possess anti-tyrosinase, antioxidant, anti-tumor, anti-microbial, and anti-inflammatory activities. In conclusion, acquired information could ultimately be utilized for the development of herbal cosmetic formulations through the isolation and characterization of bioactive compounds from the herbal oils while preserving the traditional knowledge in Sri Lanka.

Keywords: Cosmetics, Herbal oil, Natural, North, Sri Lanka

Abstract No: BO-26

Preliminary analysis of phytochemicals in different parts of Jack fruit tree (*Artocarpus heterophyllus* Lam) in Sri Lanka

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Jackfruit is the world's largest tree-borne fruit which is one of the greatest ancient fruits indigenous to Sri Lanka. The different parts of Jack fruit tree (*Artocarpus heterophyllus* Lam.) are associated with numerous medicinal characteristics and are employed in various traditional and folk systems of medicine to treat a variety of illnesses, particularly in the management of blood sugar. However, little research has been done on the phytochemicals found in the various parts of these plants, as well as their bioactivities. The goal of this research was to find out the screening and analysis of phytochemicals in seeds, bark, leaves, and fruits of the Jack fruit tree. The phytochemicals were assessed using conventional procedures. The different parts of *A. heterophyllu*s were collected from Jaffna District and their identification was authenticated at the Department of Botany, Faculty of Science, University of Jaffna. The ethanolic, methanolic and aqueous extracts of different parts of *A. heterophyllu*s were subjected to phytochemical screening and analysis based on standard laboratory procedures. The phytochemical analysis was done for three replicates of each plant part. The findings of the phytochemical screening of aqueous, ethanolic, and methanolic extracts showed that the presence of flavonoids, tannins, phenols, alkaloids, saponins, terpenoids, quinones, phytosterols, xanthoproteins, reducing sugars, carboxylic acids, and steroids in different parts of *A. heterophyllu*s indicating its potential therapeutic use. The aqueous extract of leaves had the highest total tannin (84.44 ± 0.53 µg TAE/g) and alkaloid (183.30 ± 11.52 mg/g) contents; the aqueous extract of fruits had the highest phenolic content (24.36 ± 0.32 µg GAE/g), while methanolic extract of leaves had the highest flavonoid contents (144.85 ± 0.53 µg QE/g) among the extracts. The findings are consistent with the presence of biologically active constituents in the different extracts of different parts of *A. heterophyllu*s. This obtained information may be helpful to use as documentation for quality control of nutraceuticals prepared with *A. heterophyllus*, in the future for the management of various disease conditions, including diabetes mellitus. Further, research should be carried out to separate the active phytochemicals and determine the anti-diabetic potentials by recommended methods.

Keywords: Analysis, *Artocarpus heterophyllus*, Jackfruit, Phytochemical, Screening

Abstract No: BO-27

Phytoliths of selected Sri Lankan species of the family Cucurbitaceae

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Detecting the possibility of using phytoliths in archaeobotanical and paleoenvironmental investigations is a great necessity for the advancement of archaeological sciences. Since several edible plant species exist in the family Cucurbitaceae, the family receives central attraction in archaeobotanical research that deals with ancient agriculture and food consumption. However, the use of phytoliths in archaeobotanical studies in Sri Lanka is still in its infancy due to the lack of morphometric details related to the identification of species based on phytoliths. The present study aims to reveal the morphometric features of phytoliths in different plant parts (leaf, stem, petiole, fruit and flower) of nine species of the family Cucurbitaceae, *viz. Citrullus lanatus*, *Cucumis melo*, *Cucumis sativus*, *Cucurbita maxima*, *Momordica charantia*, *Momordica denudata*, *Mukia maderaspatana Sechium edule* and *Zanonia indica,* by wet oxidation method. The size (length and width) of phytoliths and their weight in 1 g of dried plant material were detected in three replicates per species while their shape was described using ICPN 2.0 nomenclature. Results revealed that *C. maxima* contained a significantly high mass of phytoliths compared to the rest of the examined species ($p < 0.05$), but no phytoliths were extracted from *M. charantia* and *M. denudate* by the used protocol. However, the shape of phytoliths of the above species does not allow the discrimination of these species into respective plant taxa. For a given plant species, the average length and width of phytoliths varied significantly in different plant parts ($p < 0.05$) though the shape did not vary significantly. Therefore, predicting the commonly grown Cucurbitaceae plant species in Sri Lanka in archaeological species based on the shape or the size of phytoliths in soils of past vegetations becomes impossible. Therefore, phytolith studies should be combined with studying other palynomorph types, such as pollen, to gain undeniable conclusions.

Keywords: Archaeobotanical research, Archaeological sciences, ICPN 2.0 nomenclature, shape of phytoliths, wet oxidation method

Abstract No: PO-01

Computational assessment of novel derivatives of epigallocatechin gallate as potential anti-Alzheimer agents

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Alzheimer's disease (AD) is a chronic, neurodegenerative disease that affects memory, thinking, and behaviour problems. The neuroprotective effects of natural products against AD have been studied in preclinical and clinical studies using in vitro and in vivo models. This computational chemistry study explores the effects of epigallocatechin gallate (EGCG) and its novel derivatives as potential anti-Alzheimer agents using computational chemistry. Among natural products that are tested against AD in clinical studies, catechins are a very commonly found constituent of green tea. Catechins are a bioactive ingredient of green tea and potential anti-oxidative and anti-inflammatory agents. In addition, various putative features associated with AD prevention and modification have been discovered in preclinical in vitro and in vivo studies of catechins. Due to its anti-inflammatory and antioxidant properties, EGCG has neuroprotective effects on AD patients' brains. EGCG inhibits the formation of neurotoxic beta-amyloid and regulates the formation of a soluble form of amyloid protein (sAPP) and prevents AD progression. Effects of EGCG and its derivatives on Amyloid precursor protein (APP), Amyloid β-protein (Aβ), Alzheimer's Beta A fibrils (Aβ - fibrils), Acetylcholine esterase (AChE), Butyryl choline esterase (BChE), and Tau protein were investigated in this study. Those proteins are highly associated with AD. The Density Functional Theory (DFT) calculations were used to get energy-optimised structures of EGCG and derivative EGCG-G1, EGCG-G2, PEGCG, EGCG-EPA, 5,3,4,3,4,5-O-ethyl-EGCG, and (-)/ (+)-epicatechin-3-O-gallate. The binding interaction of those ligands with each protein can be understood by molecular docking studies. To compare protein-ligand interactions, the protein-donepezil complex was used as a reference in molecular docking. Donepezil is a clinically approved drug for AD. Among considered ligands, EGCG, PEGCG, and (-)/ (+)-epicatechin-3-O-gallate showed better docking scores with AChE, BChE, and APP proteins. Those protein-ligand complexes that showed the best docking scores and protein-donepezil complexes were taken to further analysis of Molecular Dynamics simulations (MD). MD simulations were done for a 50 ns period on protein-ligand complexes which are selected according to docking scores. In MD simulations, CHARMM36 forcefield was used for protein. For ligands, external sources were used for generating topology. The parameters that were used for MD analysis to determine the stability of protein-ligand complexes were Radius of gyration (Rg), Root Mean Square Deviation (RMSD), and Root Mean Square Fluctuation (RMSF). The MD analysis, along with docking studies, revealed that the EGCG and derivative PEGCG can act as anti-Alzheimer agents due to their effects on important AD-related proteins.

Keywords: Molecular docking, Molecular dynamics MD, Radius of gyration, RMSD, RMSF

Abstract No: PO-02

Heart disease prediction using multivariate data

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This study addresses the problem of determining the important attributes of deciding heart disease. Heart disease can be considered one of the most common diseases in the world. Nowadays, diagnosing a disease in an early stage is a more crucial task. If it goes to later stages, it is hard to save human life and is a major problem for health care workers. In order to identify the heart condition as early as possible, it is essential to understand the main factors that may affect one's heart condition. With this motivation, we apply statistical methods to determine the significant attributes that cause heart disease. This study presents the application of various statistical methods to find the significant factors in heart disease for decision support during the diagnostic process. Heart Disease data from UCI Machine Learning Repository is considered for the analysis. The data set is divided into two parts, exploratory data and confirmatory data. We conducted a descriptive analysis for the classification of the heart disease dataset based on association, dimension reduction, and a confirmatory analysis based on principal components and hypothesis testing to discover the most important information in the heart disease dataset. In the explanatory analysis, we got a brief idea about the factors which need to be looked at when diagnosing heart disease and their relationship based on different classifications. Principal Component Analysis (PCA) and hypothesis testing were used in the confirmatory data analysis. As a result of a hypothesis test, it can be concluded that there is no significant difference between the mean of the variables on exploratory data and confirmatory data. This implies that we can use any part of the data for our analysis. According to the principal component analysis, the first four principal components explain 90.4% total variability of the data. PCA further reveals that the cholesterol level, maximum heart rate, and resting blood pressure have a major impact on heart disease.

Keywords: Dimension reduction, Heart disease, Multivariate, Principal component

Abstract No: PO-03

Incorporation of Sri Lanka's natural minerals, zircon and apatite, in radiation shielding

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With the rapid increase in the application of ionizing radiation, radiation protection has become a predominant factor in ensuring the safety of humans and the environment. Blocking high-energy photon radiation has proven to be much more challenging due to its excessive penetrating power. Lead-based materials are commonly used for shielding due to their high efficiency in attenuating gamma rays and X-rays. However, the cumulative toxicity of lead to the ecosystem, the weight and the stiffness have made it unpopular when portable shielding application is considered. This study aims to investigate the possibilities of using naturally available minerals in Sri Lanka to develop multifunctional shielding devices for various radiation protection applications. In this preliminary work, zircon and appetite were utilized as the primary attenuating materials due to their elemental compositions. Using silicone rubber and epoxy as binding materials 0.5 cm thick composite layers of zircon and apatite were prepared separately. The selection of binders and the weight ratio of the filler to the binder were chosen to fulfil the requirement of flexibility, low-weight and processability. The capability of radiation shielding of each sample was tested for 662 keV gamma radiation emitted from Cs-137 isotope. Radiation was detected by a NaI (Tl) scintillation detector and analysed by a multi-channel analyser. The linear attenuation coefficient of the binders, single layers of zircon and apatite, and the effective linear attenuation coefficient of two-layer systems with possible orders of layer-arrangement were calculated. The linear attenuation coefficient of epoxy was considerably higher than that of silicone rubber. Among the fillers used, zircon showed more attenuation than apatite due to the higher effective atomic number. In addition, the higher electron density of zircon leads to a higher Compton scattering rate compared to apatite. The linear attenuation coefficients of pure zircon and apatite are calculated to be 0.092 and 0.059 cm^{-1}, respectively, for 662 keV photons. It was observed that in the two-layer composite system effective attenuation coefficient depends on the order of the material layer. Out of the two-layer structures studied, apatite-zircon combination with epoxy as the binding material showed better shielding with 18.1% blocking rate where the apatite layer was placed towards the source. The effective linear attenuation coefficient of this composite system is calculated to be 0.087 cm^{-1} with an effective half-value layer thickness of 7.9 cm.

Keywords: Apatite, Attenuation, Gamma radiation, Radiation shielding, Zircon,

Abstract No: PO-04

Estimation and comparison of patient doses in lumbar spine X-ray examination: A case study at a government hospital in Sri Lanka

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The number of projection X-ray examinations is rising rapidly worldwide due to its extensive usage in accurately diagnosing diseases and injuries in patients. Apart from the enormous benefits of X-ray examinations, the patients are exposed to substantial radiation doses, which may cause stochastic and deterministic effects that could be harmful to the patients. The lumbar spine X-ray test is considered the most routinely performed projection X-ray examination for the proper diagnosis of various clinical indications, including low back pain, fractures, arthritis, spondylolisthesis, tumours, and degenerative pathologies. Diagnostic Reference Levels (DRLs), the concept introduced by the International Commission on Radiological Protection (ICRP), can be used to assist in optimising radiation doses during radiographic procedures. Accordingly, radiation doses associated with lumbar spine X-ray examinations need to be assessed, justified, and optimised in terms of benefits and risks to improve patient protection. The objective of this study was two-fold: first, assess the kerma-area product (KAP) of adult patients undergoing lumbar spine X-ray examinations (anteroposterior (AP) and lateral (LAT)), and then compare the obtained patient doses with the DRLs reported in some other countries: United Kingdom (UK), Ireland, Austria, Germany, France, Greece, India, Iran, and Australia. This study was conducted in a government hospital in Sri Lanka with 80 adult patients. The ages of the patients involved were from 18 years to 84 years, while their weights ranged from 38 kg to 78 kg. The AP and LAT projections of the lumbar spine examination were acquired on a digital radiography system with flat-panel detectors in the supine position. Patient characteristics (age, sex, weight, height, and body mass index) and corresponding exposure parameters (tube voltage [kV] and the product of tube current and exposure time [mAs]) were obtained. The KAP values were measured by a direct method, and descriptive statistics were utilised for the data analysis. The results showed wide variations in the KAP values for both AP and LAT of the lumbar spine examination. The mean value (1.91 $Gy.cm^2$) of the KAP of LAT projection of the lumbar spine X-ray examination was higher than 200% of the value of AP projection (0.86 $Gy.cm^2$). The KAP ranges for lumbar spine AP and LAT projections were 0.29-1.55 and 0.73-3.55 $Gy.cm^2$, respectively. The mean KAP values for the AP and LAT projections of the lumbar spine examination were lower than the reported values (AP%, LAT%), respectively in the following countries: UK (43%, 24%), Ireland (46%, 15%), Austria (57%, 40%), Germany (57%, 45%), France (68%, 51%), Greece (43%, 15%), India (8%, 39%), Iran (16%, 3%), Australia (46%, 11%). The overall findings of this preliminary study ensure the commitment of the radiographers in following the ALARA (as low as reasonably achievable) principle in this hospital and make further optimisation unessential.

Keywords: Diagnostic reference levels, Kerma-area product, Lumbar spine, Patient dosimetry, X-ray examination

Abstract No: PO-05

Study of the improvement of Ozone production: A simulation

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Ozone is an unstable, colourless gas that has a pungent odour which occurs naturally in small amounts in the stratosphere. Ozone is one of the strongest oxidants. Major applications of ozone are disinfection, deodorization, decolourization, bleaching processes, semiconductor industry, treatment of industrial wastes, treatment of flue gases, chemical synthesis, potable and wastewater treatments etc. In many industrial applications, ozone is being used as an alternative oxidant for chlorination processes. It has a minimal negative impact on the environment and the extra benefit of requiring less energy for its production than other alternatives. This work was focused on a numerical simulation using MATLAB software and this study was aimed at understanding the discharge phenomenon in the ozoniser in detail, which could not be observed by experiments. It considered the rate coefficients of different plasma chemical reactions as a function of time using a single pulse and multiple pulses. The simulation study was carried out using differential equations of the plasma chemical reactions with the peak pulsed voltage (42.5 kV), pulse repetition rate (100 pulses per second, pps), input energy per pulse (~0.22 J), pulse width (FWHM 100 ns), flow rate (3.0 l/min), the gaseous gap spacing (36 mm), the reactor length (1 m) and 1 cm pitch length of the spiral wire forming the central electrode at a pressure of 1.01×10^5 Pa and a temperature of 293 K. A central copper wire (1 mm in diameter) made to a cylindrical configuration (22 mm in diameter) in a concentric coaxial electrode system without a dielectric barrier was considered. The concentration of ozone was found for a single pulse as well as for multiple pulses, and the production yield of ozone was found at different concentrations. The dependence of the densities of atomic oxygen, excited and ground state of molecular oxygen has been investigated. The concentration of ozone reached a saturated value of 137.2 ppm after about 18 μs when a single pulse was applied. When a large number of pulses (10^5 pulses) were used, ~33% of ozone could be produced from oxygen. The production yield of ozone was found to be strongly dependent on the concentration of ozone and it showed an optimal behaviour for each and every repetitive pulse. The dependence of the concentration and production yield of ozone in oxygen on the parameters studied generally agreed with the published literature, thus confirming the validity of the simulation model. This study covered a wide range of ozoniser conditions, including low and high concentrations and low and high yields of ozone that can be applied to various industrial applications.

Keywords: Concentration, Plasma chemical reactions, Production yield, Rate coefficient

Abstract No: PO-06

Stochastic modelling of Lotka-Volterra competition

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The concept of stochasticity, which is based on probability theory, has played a vital role in describing the population fluctuations in most species. Demographic and environmental stochasticity are the main branches of stochasticity and occur due to the random nature of events and irregular or noisy dynamics, respectively. In particular, this study focuses on the concept of demographic stochasticity for studying the distribution of two competing populations. In the literature, the deterministic models of two competing populations have been studied, including the Lotka-Volterra competition model. Unlike prior work, we analyse the stochastic modelling of two competing populations where one population is subject to the Allee effect and understocking. The deterministic model of two competing populations, which is based upon the classical Lotka-Volterra competition model, is used to construct the corresponding continuous-time Markov chain (CTMC) and Ito stochastic differential equations (SDEs). Moreover, in the construction of CTMC and SDEs, demographic variability due to random birth and death have been applied to the populations, which is absent in the deterministic setting. In addition, the moments of the random variables in the populations based on the moment-generating functions of the transition probabilities are derived theoretically in such a way that the transition probabilities satisfy the forward Kolmogorov differential equations. Also, there is an infinite number of SDE models that correspond to the same ordinary differential equation system. In this study, we formulate two SDE models considering two different birth and death rates to see the variability in population interactions. The parameter values are taken from existing literature to justify the analytical results. The Euler-Maruyama numerical method is applied to simulate the numerical solutions of the Ito stochastic differential equations for comparing both types of stochastic models with the deterministic system numerically. From the numerical simulation, we have observed that the sample paths of the SDEs are closer to the solution of the deterministic model. Moreover, variabilities of the population interactions are highly correlated with the birth and death rates. In addition, for the chosen parameter values, though the populations coexist in the deterministic setting, we capture sudden population extinction in the stochastic setting. The study concludes that the theoretical results established in the deterministic setting may not be valid in the stochastic models due to random effects of the birth and death process embedded in the populations. Therefore, stochastic modelling with the Allee effect and stocking can significantly affect the competition outcomes and population interactions.

Keywords: Demographic stochasticity, Ito stochastic differential equations, Stocking

Abstract No: PO-07

Sedimentology and depositional environment of neoproterozoic stromatolitic limestones of Langrial and Miranjani areas, Lesser Himalayas, Pakistan

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Stromatolites are a helpful tool in predicting age, depositional environment and correlation of stratigraphic sequences over vast continents. Stromatolites are the signature of the Neoproterozoic age (1 billion years – 538.8 million years) to about 300 million years. This study highlights the detailed study of two stromatolitic limestone (Langrial and Miranjani) units of Hazara Formation, Lesser Himalayas, Pakistan, at various scales from outcrop, macroscopic and microscopic levels. These stromatolitic limestones are well known, but detailed sedimentological work was not present. The rock types of the two units were differentiated based on their field examination using hand lens, testing with 10% diluted solution of HCl for carbonate rocks, as well as the stratigraphic column of the area. The field photographs taken were geo-referenced by Picasa software V. 3.9. Almost 500 field photographs were taken during the study. Petrographic thin sections of thirty rock samples were made based on facies types. The facies of the limestone units of the Hazara Formation were determined using section measurement. The limestone is grey nodular limestone, with no observed sedimentary structures. The nodules are about 5-10 cm. The limestone beds are about 40-110 cm thick. There are four types of facies present in this formation, namely, carbonate mudstone facies, stromatolitic facies, nodular limestone facies, and thin to thick-bedded limestone. The facies indicate a variety of depositional environments. Petrography reveals that the limestone is dominantly micritic in nature. It also shows that the limestone is parallel laminated, non-laminated, with no bivalves, foraminifera or recognizable fossils. It also shows the presence of feldspar, quartz and clay minerals. Here, in the Hazara Mountains, limestone units are bounded by turbidites, which are deep sea deposits. However, these stromatolitic limestones form in a very shallow marine environment like tidal flats in modern environments. Such stromatolitic limestones also occur in Neoproterozoic rocks of Sri Lanka, Nepal and India. Their study can help understand the occurrence of these limestone deposits in highly deformed Lesser Himalayas and the palaeogeography of the Indian Plate.

Keywords: Carbonates, Limestone, Neoproterozoic, Stromatolites, Tidal flats

Abstract No: PO-08

Design of heat sink and simulation of electronic cooling of power transistor circuit

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Heat sinks are utilized in industrial equipment to disperse surplus heat from heat-generating components to the surrounding environment. In recent years, efforts have been made to develop mechanical or electronic devices that are lighter, smaller, and more affordable. Heat dissipation from the heat sink is a major issue that many researchers are attempting to address. In this work, a traditional heat sink design technique of computer power supplies, which is extending fin topology, is used with four power transistors. This study attempts to improve the cooling of power transistor circuits by designing a new heat sink attached to four power transistors and seeing how the joule heating profile of the power transistor circuit and heat sink are changed. *COMSOL Multiphysics* version 5.6 software is used to graphically design the heat sink, four-transistor circuit and simulate the heat profile of the design. An electric currents interface and a heat transfer in solids interface are included in the Multiphysics interface. The multiphysics couplings add electromagnetic power dissipation as a heat source and investigate the joule heating and the temperature distribution on power transistors without the heat sink and with the heat sink. Transistors without the new heat sink get heated more than the transistors with the new heat sink with the same applied current density to the circuit board. It shows that joule heating is minimized with the new heat sink design. Here, the results of several studies of a new geometrical 3D model that focus on four power transistors attached to an aluminium heat sink are discussed. The results show the impact of the heat sink area and surface-to-ambient radiation to the power transistors and the circuit board. Based on the simulation results, four transistors become very cooled with the new heat sink design. How the heat-sink thermal performance is affected by shapes and space between fins is also reviewed. It could be observed that in the proposed design, the joule heating was reduced remarkably.

Keywords: COMSOL multiphysics, Joule heating, Heat sink, Power dissipation, Power transistor circuit

Abstract No: PO-09

Detecting abrupt changes in thermal electricity production data in Sri Lanka

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A changepoint or an abrupt change is a distributional change in a time series data structure. Over the past years, many studies have been conducted to search these changepoints and many researchers proposed several multiple changepoint detection methods. One such search method is the Pruned Exact Linear Time (PELT) method, which is exact and under mild conditions, has a computational cost which is linear in the number of data points. This method is a more accurate and faster method to detect multiple changepoints. The objectives of this study are to detect abrupt changes in thermal electricity data in Sri Lanka and predict thermal electricity production accurately. Since undetected changepoints may cause incorrect modelling or prediction, the accurate analysis of electricity data is vital. In this study, electricity production (Hydro, Thermal oil and coal, and wind) by Ceylon Electricity Board (CEB) in Sri Lanka for the period 2000 to 2019 was used to find abrupt changes. The PELT method is used to detect these changepoints and their location in the variance of electricity data. First, the total electricity production of oil and thermal data were used and a changepoint was found in April 2011. This is a documented changepoint since, according to CEB Annual Report 2011, 1487 GWh of thermal (oil) power was added to the system during 2011, which was a significant change. Moreover, two models, for the periods 2000 to 2019 and 2011 to 2019 (after the detected changepoint) were fitted for forecasting the production. Root Mean Square Error (RMSE) and Mean Absolute Percentage Error (MAPE) were calculated to compare the forecasting accuracy of these models. The first model (ARIMA (2,1,3)), which does not consider the changepoint structure, results in RMSE and MAPE values of 0.911 and 6.009, respectively, for the period 2000 to 2018 for the thermal electricity data. For the second model (ARIMA (1,0,3)), RMSE and MAPE were 0.244 and 3.267, respectively, for the period 2011 to 2018. It can be seen that the models fitted by considering changepoints give more accurate results for forecasting electricity production.

Keywords: Changepoints, Electricity data, Forecasting, Modelling, PELT method

Abstract No: PO-10

Design of novel perfect metamaterial absorber for Radio Frequency energy harnessing

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Due to the rapidly growing wireless communications and sensing applications, the frequency spectrum has already been saturated. Consequently, the abundance of Radio Frequency (RF) signals in the ambient environment made the concept of wireless energy harnessing to be emerged as an attractive solution to energize low-power wireless devices. In this study, a novel tuneable perfect metamaterial absorber (PMA) unit cell was designed by combining two C-shaped split-ring resonators (SRR) embedded with simple electronics circuitry. The feasibility of harnessing energy from 1.8 GHz signals was investigated through electromagnetic (EM) simulations. The design and numerical analysis of the proposed PMA structure is carried out with the aid of the commercially available EM simulation software, High Frequency Structure Simulator (HFSS). The proposed structure's capability to absorb EM energy as a perfect metamaterial absorber is studied. According to the simulation results, it shows a high absorption coefficient of around 99%. This verifies that the proposed tuneable PMA structure encompasses a high absorption of RF energy. It can be used for the harnessing of RF energy to power up low-power devices and wireless sensor networks.

Keywords: Electromagnetic energy, Metamaterial unit cell, Perfect metamaterial absorber, Radio frequency, Wireless energy harnessing

Abstract No: PO-11

Performance of seasonal and double seasonal autoregressive integrated moving average models with ARCH/GARCH in forecasting exchange rates in Sri Lanka

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The exchange rate is one of the most essential economic indices and forecasting its chaotic and uncertain behaviour is challenging for business practitioners and academic researchers. This study mainly evaluated the performance of Seasonal Autoregressive Integrated Moving Average (SARIMA) and Double SARIMA (DSARIMA) with Autoregressive Conditional Heteroskedasticity (ARCH)/ Generalized ARCH (GARCH) models in forecasting daily exchange rates in Sri Lanka. This is the first study that used DSARIMA models with ARCH/GARCH of different specifications of error distributions, as previous studies focused on either on annual or weekly seasonality separately in forecasting exchange rates. The study considered USD, EURO, JPY, GBP, AUD, CAD, SGD and CHF against LKR, daily exchange rates from 1st January 2008 to 28th February 2022. Data were split non-randomly for training from 1st January 2008 to 07th January 2022 and the remainder for testing. The stationary of the exchange rates was checked, and the weekly and annual seasonality patterns were examined from the tests of Webel-Ollech (WO), Friedman rank (FR), and Kruskal-Wallis (KW). Model diagnostics checking was carried out with the tests of Ljung-Box, Jarque–Bera, and ARCH to check the presence of autocorrelation, normality, and heteroskedasticity in the residuals, respectively. The ARCH/GARCH specifications of normal, skew-normal, student-t, and skew-t were applied, as the correct innovation of the appropriate error distribution increases the accuracy of the fitted volatile model. Moreover, DSARIMA models were compared with the Seasonal Autoregressive Integrated Moving Average (SARIMA) models considering several performance criteria which were calculated from the original test values and forecasted values. Transformations of log and differencing were applied respectively to convert all the non-stationary exchange rates to stationary. Overall, weekly and annual seasonality patterns were observed for all the exchange rates from the results of WO, FR, and KW tests, except for FR test results, indicated that there is no annual seasonality in every exchange rate. Hence, SARIMA and DSARIMA models were fitted incorporating weekly and annual seasonality separately and together, respectively. Here, the seasonality feature was included using Fourier terms as external regressors to the ARIMA process. In conclusion, the compared results between fitted models favoured SARIMA for CHF against LKR, SARIMA with ARCH/GARCH for USD, EURO, JPY, GBP, and AUD against LKR, and DSARIMA with ARCH/GARCH models for CAD and SGD against LKR with the lower values. Overall, predicted values captured the behaviour of the exchange rates. However, a considerable number of volatile movements of the currency exchange rates were not very well captured, and they were observed by the graphs of actual vs fitted. Hence, as future work, this study proposes to build a time-series extension model incorporating the real distribution of the exchange rates. Nevertheless, the knowledge from the results of this study is important in managerial and financial decision makings and many others. Further, this study will add more value to the existing literature.

Keywords: ARCH, Double Seasonal Autoregressive Integrated Moving Average (DSARIMA), Exchange rates, Forecasting, GARCH.

Abstract No: PO-12

A study on factors associated with child sexual abuse and recognizing the severity: Special reference to Galle district

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Child Sexual Abuse (CSA) has been a universal and social crisis with serious life-long consequences. One in four girls and one in six boys worldwide have experienced some form of sexual abuse in their childhood. According to Police statistics, CSA cases have been increasing rapidly in recent years in Sri Lanka. Galle is among the four districts where the reported child abuse cases are high, and the reported CSA complaints are rising drastically. Further, no previous study has been carried out in the Southern part of the island regarding the crisis of CSA. Therefore, the main objective of this study is to determine the key risk factors affecting the CSA cases in Galle Police Division and to develop suitable statistical and machine learning models to recognize the severity of CSA. All the 225 CSA cases reported to the Police Child and Women Bureau of Galle Police Division during the 2017 – 2020 period were considered for this study. The severity of CSA can be categorized into not fatal, child sexual exploitation, and fatal categories. Out of the twenty-one risk factors, which were found from the literature and knowledge of domain experts, sixteen factors showed a significant relationship with the severity of CSA at 10% significance level according to the chi-square test of association. These significant risk factors were area, child's age, gender, whether mother lives with child, reason, the willingness of child, frequency of abuses, place of incident, relationship to the perpetrator, perpetrator's age, education level of the perpetrator, perpetrator's job, marriage status, whether the perpetrator has children, the number of children he has, and drug addiction of perpetrator. The Ordinal Logistic Regression (OLR) model was trained using a backward selection method with different data selection criteria. Next, the machine learning techniques: Decision Tree (DT), Support Vector Machine (SVM), and Probabilistic Neural Network (PNN) were employed to predict the severity of CSA. The random over-sampling technique was used to overcome the class imbalance problem that persists in the dataset. The bagging technique was implemented to preserve the robustness of the models and to improve their performance. The adequacy of the OLR model with the oversampling technique was examined and it was selected as the best model after considering the proportional odds assumption and analysis of deviance. The model classified the severity of CSA with 68.85% accuracy and area, gender, reason, frequency of abuses, place, perpetrator's job, and whether the perpetrator has children can be identified as the significant predictors for CSA. The DT, SVM and PNN models classified the severity of CSA with an accuracy of 82.15%, 77.68% and 81.25%, respectively for the bagging technique. The PNN model performed better than the other fitted models with higher accuracy. The results obtained from this study can be used to get precautions and to arrange awareness sessions for parents and adults to reduce CSA in Galle Police Division. Similarly, the scope of the study can be extended to the whole island to reduce CSA and to make a better place for children.

Keywords: Bagging technique, Child sexual abuse, Machine learning techniques, Ordinal logistic regression, Oversampling

Abstract No: PO-13

Impact of past mental and physical harassments on undergraduates of University of Kelaniya

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Harassment is any physical, verbal, written, or otherwise unwanted, unwelcome behaviour that may offend or humiliate an individual. Discriminatory harassment, physical harassment, mental harassment, psychological harassment, sexual harassment, etc., are frequently experienced worldwide, and these are related to adverse physical and mental health outcomes and injuries. The existing state of knowledge on this topic is that these incidents are prevalent even though no one has been able to pay much attention to such incidents. As a result, harassment increases gradually, and society has not enforced directive laws and punishments against those who commit such offences. Our objective was to determine the impact of past mental and physical harassment on undergraduates of the Faculty of Science, University of Kelaniya. This study considers the most impacted scenarios and the discomforts undergraduates have gone through since childhood. From the results of a pilot study, a sample of 342 undergraduates from the faculty of science have undergone a survey. The study uses a stratified sampling method, and the level/ academic year of study is considered as strata. Major discomforts and aftereffects such as stress, anxiety, sleeping disorders, sexual malfunctions, weight loss, mental retardation, etc., of more specific harassments were analysed here. There is an equal proportion of participation in both males and females. The descriptive study shows how the respondents were impacted: physically, mentally or both. The way they reacted to the discomfort, to whom they were informed, and how much time has been taken for the action are discussed here. Major afflictions came out to be bullying, gender discrimination, cyberbullying, sexual abuse and racial/religious discrimination. Highest impacted discomfort has been experienced severely by most females but mildly by most males. The categorical analysis gave a relative risk of 1.121 to 2.247 on the female being more likely to encounter an aftereffect from discomforts. Experiencing severe cases is higher for females than males. The odds of a female encountering sexual abuse are about three times more likely than a male. Further, chi-square tests revealed aftereffect is independent of gender, but aftereffect and the discomfort types are significantly associated. Ratings (mild, moderate, severe) are associated with the discomfort type. The study identifies that there is an equivalent experience of harassment no matter what gender they belong to, but females have a higher tendency to get harassed. Consequently, the severity of the incident is higher for females than males. Further studies can be conducted to determine actions to reduce the aftermath, find cures and enlighten society about how to avoid discomfort.

Keywords: Categorical analysis, Chi-square test, Discomforts, Harassments, Stratified sampling

Abstract No: PO-14

Forecasting foreign exchange reserves in Sri Lanka

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Foreign exchange reserves are mainly used by governments to stabilize the exchange rate and balance international payments. They play a major role in the current financial crisis in Sri Lanka too. The purpose of this study was to build a suitable forecasting model and to detect factors affecting foreign exchange reserves in the context of Sri Lanka. The findings of this study can be used to provide suggestions for some policy measures taken by the government for the overall improvement of foreign exchange reserves. Monthly data on the foreign exchange reserves, United States Dollar (USD) exchange rate, foreign direct investments (FDI), gold reserves, imports, inflation rate, remittance, and total exports from January 2010 to September 2021 were used for the model fitting procedure. To transform quarterly data on gold reserves into monthly data, the cubic spline interpolation approach was utilized. The preliminary analysis identified a significant association between the foreign reserves and predictor variables: exchange rate, FDI, gold reserves, imports, and remittance. Augmented Dicky Fuller (ADF), Kwiatkowski Phillips Schmidt Shin (KPSS), and Phillips-Perron (PP) unit root tests were used to examine the stationarity. A time series regression model was fitted, adhering to the assumptions of residual diagnostics: multicollinearity, homoscedasticity, serial correlation, and autocorrelation, except for the normality. Further, the presence of co-integration was tested with the Johansen cointegration test revealed long-run equilibrium. Hence a vector error correction (VEC) model was fitted which adhered to assumptions of model residuals, including serial correlation, heteroscedasticity, and except for normality. The forecasted VEC model has a Mean Absolute Percentage Error (MAPE) of 5.30%, indicating that the VEC model is better for forecasting compared to the fitted time series regression model with a MAPE of 9.52%. The results of the analysis further revealed that foreign exchange reserves have a positive significant impact on the remittance to Sri Lanka and foreign reserves of seven months ago.

Keywords: Cubic spline interpolation, Forecasting, Foreign exchange reserves, Remittance, Time series regression

Abstract No: PO-15

Selection of the best fitting mathematical models to investigate the growth inhibition of selected plant pathogenic fungi by *Trichoderma harzianum*

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Plant diseases can cause a significant impact on agricultural productivity. One of the main causative factors for plant diseases is pathogens. Plant pathogens can be fungi, bacteria, viruses, or nematodes. Plant diseases can be prevented, mitigated, or controlled by using a variety of methods. Among these methods, bio-controlling is more effective and environmentally friendly. *Trichoderema* species are the most commonly used fungal biocontrol agents against various plant pathogens. Many researchers observed that the potential of *Trichoderma harzianum* in controlling various pathogens, but there were no proper mathematical models to understand how this fungus inhibits those pathogens. This research is focused on selecting the most suitable mathematical models to investigate the growth inhibition of pathogenic fungi; *Fusarium oxysporum, Colletotrichum gloeosporioides, Lasiodiplodia theobromae,* and *Xylaria spp.* by *Trichoderma harzianum*. For this purpose, five existing growth models, namely Exponential, Logistic, Brody, Von Bertalanffy, and Gompertz were used to investigate the growth inhibition. The data had been collected using the dual culture method to test the antagonistic properties of *Trichoderma* against the fungal pathogens. The data set consisted of 50 data points for six consecutive days. First, statistical analysis was performed to identify the distribution and characteristics of the data and detect outliers. Then one-way Analysis if Variance (ANOVA) test was done under the 95% confidence level. The results revealed that all the mean values are statistically significant. Tukey test was then conducted to check which specific group means were different. Then the most suitable growth models were identified for each fungus separately under two conditions: in the absence of *T. harzianum* and in the presence of *T. harzianum*. In the absence of *T. harzianum*, for the fungi*; F. oxysporum, C. gloeosporioides, L. theobromae,* and *Xylaria spp*. the best fitted models were given by Exponential, Gompertz, Exponential, and Exponential, respectively. In the presence of *T. harzianum* for the fungi*; F. oxysporum, C. gloeosporioides, L. theobromae,* and *Xylaria spp*. the best fitted models were given by Brody, Exponential, Brody, and Von Bertalanffy respectively. The goodness of fit was tested using the Coefficient of Determination (R^2), Root Mean Square Error (RMSE), Sum Squared Error (SSE), and residual plots. Then the comparison of the growth in the absence of *T. harzianum* and the presence of *T. harzianum* was made graphically using the above best fitted models. Hence the simulation results indicated significant growth controls of all the pathogenic fungi tested by *T. harzianum.*

Keywords: Fungi, Mathematical model, *Trichoderma harzianum*

Abstract No: PO-16

Modelling extreme motor insurance claims with extreme value theory: A case study from Sri Lanka

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In recent years, the motor insurance business has grown significantly in Sri Lanka due to the excessive importation of vehicles. However, the large volumes of vehicles on the road increase the risk of occurrence of extreme claims, which undermine the profit and sustainability of the business. In response to this, researchers attempted to model the extreme claims as accurate information on the tail is critical to determine the appropriate level of insurance premium, reserves and re-insurance, which assures a profitable business. The objective of this study is to identify the best fit model for extreme motor insurance claims. The motor claims obtained from one of the pioneer insurance companies in Sri Lanka from July to December 2021 were considered for this study. The Peak Over Threshold (POT) approach of the Extreme Value Theory was utilized for modelling, which approximates the excess claim amounts over a sufficiently high threshold as the Generalized Pareto Distribution (GPD). The claim amounts at 20 percentiles between 79% and 98%, which covers the range of values proposed in the literature for sufficiently high thresholds, were considered as tentative thresholds to find the optimal that separates extremes from bulk. Then the excess amounts over each of these tentative thresholds were modelled separately as GPD using four different parameter estimation methods, viz. Maximum Likelihood Estimation (MLE), Method of Moment (MOM), Unbiased Probability Weighted Moment (UPWM) and Biased Probability Weighted Moment (BPWM) to identify the best in case of the dearth of information for the tail. Next, the accuracies of the fitted GPDs at each tentative threshold for each parameter estimation method were evaluated by calculating the Mean Squared Errors (MSEs). Then MSEs were compared to select the optimal threshold and the best parameter estimation method, which yielded the best fit model for tail data. The threshold and the parameter estimation method with minimum MSE were selected as the optimal threshold and the best parameter estimation method, respectively and the GPD fitted under these conditions was selected as the best. The validity of modelling as the GPD was tested using the bootstrap goodness of fit. It was revealed that the amount of motor claims varied from Rs. 2,167.00 to 193,065.00 during the study period. Moreover, the motor claims were positively skewed with a skewness of 2.45 and leptokurtic, which confirms heavy-tailed. The minimum MSE was attained at the threshold of 91% (Rs. 61,056.00) with the BPWM method. There were 47 claims above 91% identified as extremes which can be best described by GPD with shape and scale parameters of 1.02 and 92.09, respectively. The p-value (0.997>0.05) of the bootstrap test confirms the GPD with a positive shape parameter for extreme motor claims. Findings confirm the existing results in the literature that PWM methods are preferred when the shape parameter is positive and less than or equal to 1 and the sample size for modelling is small. The information on tail helps to review existing strategies for better management of risk due to such extreme claims in future.

Keywords: Claims, Insurance, Percentile, Threshold

Abstract No: PO-17

Predicting a top rank batsman in an ODI match, using the first few balls faced: A case study

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Predicting the success of a top-rank batsman will play a crucial role in the decision-making process in the game of cricket, on the field as well as off the field. This research is carried out with the purpose of achieving the aforementioned task. The proposed procedure explicitly followed to rank one, two and three players in the world by August 2021. Therefore, the results cannot be generalized to a wider set of players. Among several models tried out, Decision Tree (DT) model with a training ratio of 0.9 showed the highest accuracy of 72% in predicting whether the batsman will be successful, i.e., scoring fifty or more runs on a given day. Probabilistic Neural Network (PNN) and Support Vector Machine (SVM) models with a similar test ratio resulted in an accuracy of around 65% for the three players, Rohit Sharma, Babar Azam and Virat Kholi. PNN recorded a maximum accuracy of 64.2% when predicting the performance of Rohit Sharma and the SVM model recorded a maximum accuracy of 59% when predicting the success of Babar Azam. The aforementioned accuracy of the DT model was achieved using the first five balls for Virat Kholi and Rohit Sharma and the first seven balls for Babar Azam. The findings of the study can be used to make accurate decisions in the game of cricket.

Keywords: Cricket, Decision tree, Probabilistic Neural Network, Support Vector Machine

Abstract No: SO-01

A way forward for Sustainable Human-Computer Interaction

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Sustainability has become a buzzword in the modern world. In fact, the United Nations (UN) has proposed seventeen Sustainable Development Goals (SDG) to achieve by 2030. SDG can be achieved through different approaches. As modern society is moving forward with a digital world through novel technologies, one promising way of achieving SDG is Sustainable Human-Computer Interaction (SHCI). SHCI is a relatively new research area that is trying to address sustainability issues mainly through sustainable social transformation. Thus, we conducted this research with two main objectives. 1) To analyse how Human-Computer Interaction (HCI) researchers have contributed to this evolving research area 2) To find further opportunities to address sustainability issues using HCI designs. Then finally, we suggested novel approaches to address sustainable energy goals through technological device usage. At the initial stage, research articles were collected through mainly five (05) databases: Google Scholar, IEEE Xplore, Scopus, ACM Digital Library, and ResearchGate. There, keywords such as "Sustainable HCI", "Sustainable Human-Computer-Interaction", "Sustainable interaction design" and "SHCI" were used for collecting research papers through keyword-based filtering. In addition, other research papers were collected through the references of the selected most cited papers. We considered research papers published in top-ranked HCI research conferences and journals for this review. The total collected number of 56 research articles was filtered through the inclusion and exclusion criteria of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) method. Out of 30 papers, most of the articles were published in 2014 and 2015. The bibliographic results show a decrease in SHCI research publications after 2015. According to the findings, SHCI can be achieved mainly through Sustainable Interaction Design (SID). There are two main categorizations of SID. 1) Sustainability in design 2) Sustainability through design. "Sustainability in design" aims to find solutions to social, economic, and environmental issues in our own design, implementation, and evaluation practices. For example, "Affordable and Clean Energy" can be achieved by reducing the energy consumption of the computerized machines used in our daily routines. For instance, introducing lightweight mobile apps can be a successful move for reducing data usage and energy consumption in daily-using mobile apps as a suggestion aligned with the identified opportunities for future development. "Sustainability Through Design" means designing interactive products that promote the sustainable behaviour of its users. For instance, we can consider designing mobile applications as a tool for awareness and encouraging behavioural changes favouring sustainability. One of the key findings of this study is that "sustainable energy" is the specific area that most researchers have addressed through SHCI. The results of this study are beneficial for researchers in different disciplines, such as HCI, sustainability, digital technology, and interaction designs, to contribute to sustainability by reducing energy consumption.

Keywords: Interaction Design, Sustainability, Sustainable Development Goals, Sustainable Human-Computer-Interaction

Abstract No: SO-02

An efficient credit score prediction model with Deep Neural Network

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The rapid expansion of the financial industry over the evolution of Computer Science is a breakthrough for both fields. Financial institutes tend to get the maximum benefit from computer science by analysing huge stack of unstructured data which increases daily. One of the most common facilities those institutes provide is loan facilities for both individuals and businesses. Before taking a decision, they need to consider many factors and a wide variety of reference documents to lend on loan. The credit score of a person or a business is an important aspect that needs to be considered when lending money. It depicts the ability of the borrower to pay back the loan on time. This research focused on developing a credit score prediction model based on a deep neural network to predict creditworthiness. Two separate models had been created for personal loans and micro loans. In the initial phase, data had been pre-processed, and correlation tests were carried out for the input feature selection against the prediction of approval. We performed the dimensionality reduction based on principal component analysis to discard components that have low information related to the credit score. This study will support machine learning algorithms to explore, analyse and visualize the data with a more efficient approach. The deep neural network model was trained with the pre-processed data and tuned for the best model by changing weights and activation functions. A REST API was developed as a plugin using the model which is to be integrated into prevailing systems of institutions. Therefore, the overall architecture goals of the system were to provide a high-functioning REST API with a low response time (150 – 200 ms), and to predict the creditworthiness of a client with the details of the relevant inputs which have been achieved with an 80% level of accuracy for the personal loan approval model without tuning the hyperparameters and 72.6% level of accuracy micro loan approval model with the hyperparameter tuning. We achieved better prediction performance of the models by adjusting the hyperparameters such as weight values and biases of the Recurrent Neural Network model selected for model building as the deep learning algorithm. To make the prediction model more accurate and precise, it is required to thoroughly identify the impact points and key features of the relationship between the financial institutes and the borrower.

Keywords: Correlation, Credit score, Deep neural network, Principal component analysis, REST API

Abstract No: SO-03

Estimating determinants of healthcare expenditure in OECD countries

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The COVID-19 pandemic has had a direct impact on increasing the healthcare expenditure of countries across the world. Thus, it is essential to determine the factors that contributed to the expenditure in the healthcare sector previously in order to face the current and future health risks successfully. This research aimed to identify the major variables in the estimation of Healthcare Expenditure (HE) as a share of gross domestic product in Organization for Economic Co-operation and Development (OECD) member countries with the decision tree method and random forest method. 2018 data of 37 OECD countries was comprised as the study population in this study. The HE product was considered the dependent variable. Further, 11 independent variables were defined based on previous studies, such as the Gross Domestic Product (GDP) per capita, percentage of the total population covered by Public and Private Insurance (PPI), Out-of-Pocket (OOP) health expenditure as a percentage of total expenditure on health, Age Dependency Ratio (ADR), Life Expectancy at Birth (LEB), Number of Hospitals (NOH) per million population, Number of Physicians (NOP) per 1000 population/head counts, Pharmaceutical Sales (PS) in USD/per capita (using economy-wide PPPs) and Perceived Health Status categorized into good, bad, and fair (PHSG/F/B). The data were taken from OECD health data and World Bank data repositories. Similar studies done to identify major variables in HE, had used the decision tree method by using different types of algorithms. Furthermore, the previous studies that were conducted considering the variables GDP, HE, public financing, NOP, number of hospital beds per 1000 population, tobacco consumption, life expectancy, and population above 65 years old, have shown that gross domestic product, the population aged 65 years and life expectancy as the most important determinants in health expenditure of OECD countries. In this study according to the fitted decision tree model GDP, PS, NOP, LEB, NOH, and PHSB were identified as the major variables in the estimation of HE. GDP and ADR were identified as the major variables in the random forest method. The precision, recall, F1 – score, accuracy, and the ROC Area Under the Curve (AUC) values were used to compare the performance of the two methods. This study indicates that the random forest model performs better in determining the HE and identified GDP as a major variable from both methods. With the current pandemic situation all around the world, we believe that this evidence-based information will be useful in making the decision for policymakers. However, the factors that affect healthcare expenditure are not limited. Those factors change from time to time, especially with the pandemic situations such as COVID-19. Thus, investigating those using different models would provide more comprehensive information.

Keywords: Data mining, Decision tree method, Health expenditure, OECD, Random-Forest Method

Abstract No: SO-04

Medicinal plant identification and plant disease classification

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Today, with the development of technology, most manual methods are replaced by automated computer systems to ease the lives of human beings. Plant identification and disease classification are two major agricultural research areas focusing on introducing computerized systems rather than manual methods. Many researchers used various identification and classification techniques to identify and classify plants and diseases using computer-based systems because human classification errors lead to risk and high costs. When it comes to medicinal plants, most people recognize them by their knowledge and experience. But there is a lack of people who know how to identify those valuable plants. Therefore, most of the time, it needs an expert in the field for the correct identification of medicinal plants and diseases. In this study, a medicinal plant identification and disease classification system is implemented, which can help any person who needs support in identifying medicinal plants and classifying diseased medicinal plants. This study targeted the design of herbal plant identification and classification of diseased leaves, with improvements to the existing systems. This work consists of two parts: medicinal plant identification and medicinal plant disease classification. Medicinal plant leaf images were taken as input for the models of this study. There is no standard database for medicinal plants in Sri Lanka. Thus, two datasets were collected separately for medicinal plant identification (dataset 1) and their disease classification (dataset 2). Each dataset consists of images of five different medicinal plants. But finding the diseased leaf images of plants was challenging and all the collected images of medicinal plant diseases for this research were fungi. The disease name of the medicinal plant is not very significant in traditional or Ayurvedic medicine. Therefore, five different medicinal plants were classified into two types as healthy and fungi including the plant type which leads to 10-class classification. Total images of dataset 1 are 2000, and dataset 2 are 2269. With the help of the literature review and various experiments, deep learning models were implemented according to the Convolution Neural Network (CNN) architecture and transfer learning separately. CNN models were assessed with and without image pre-processing methods, such as converting RGB colours to grayscale and applying image filters to remove noise. Eleven layers were used to build CNN model for identifying medicinal plants, while 14 layers were used to classify diseases. In transfer learning, MobileNet V2, Inception V3, and VGG 16 models were used to retrain the two datasets of this study. Here, a new block of layers is trained on top of the existing models to classify five classes of dataset 1 and ten classes of dataset 2. Furthermore, a comparison between CNN and transfer learning was carried out with four types of performance measurement matrices. Transfer learning models outperformed CNN models for medicinal plant identification with 99.5% accuracy for MobileNet V2 and their disease classification with 90% accuracy for VGG 16.

Keywords: CNN, Disease Classification, Medicinal Plant Identification, Traditional Medicine, Transfer Learning

Abstract No: SO-05

Predicting the execution time complexity of a computer program using Machine Learning

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Performance enhancement of a computer program is an important aspect of today's world. The developers produce programs and there is a lack of accurate methods for predicting the execution time of a computer program prior to its execution in an executable environment. Predicting the execution time of a particular program before execution would be great to develop the program with the highest performance efficiency and the lowest execution latency. Theoretically, there are a lot of ways of calculating the complexity of a computer program. Mathematically it is impractical to find a universal method to compute the complexity of all types of programs. Therefore, this research introduces a Machine Learning based solution to predict an execution-time-based label for a given computer program. There are three main types of parameters in a computer program that affect the execution time, such as Static Code Features, Hypertext Transfer Protocol (HTTP) Calls, and the Hardware Performance of the execution environment. In this research, the Machine Learning (ML) model was trained for the parameters of the above types (Programs with Static Code & HTTP calls) by executing them on a fixed hardware infrastructure execution condition. We analysed the number of if conditions, methods, breaks, switches, loops, nested-loop-depth, frequencies, and the behaviour of HTTP calls, kind of features of a computer program in order to generate an accurate execution time complexity prediction label of a computer program. The label is forecasted based on five pre-defined complexity classes by considering the minimum and the maximum overall execution time of the considered dataset, such as Execution Time is Higher, Execution Time is High, Execution Time is Medium, Execution Time is Low, Execution Time is Lower. Further, in the collected dataset, the most prominent features which affect the complexity among the features that we considered are the number of HTTP calls and nested loop depth, followed by loops. Accuracy Score, Precision, Recall, and F1 Score values of the ML model were generated for the traditional classification algorithms such as Decision Tree Classifier, K Nearest Neighbour Classifier, Random Forest Classifier, Naive Bayes Classifier, Support Vector Classifier, and MLP Classifiers in order to verify the effectiveness of the model. The best accuracy score was achieved with an overall 88% by using the approach of Random Forest. The findings of this research can be optimized for implementing an Integrated Development Environment (IDE) plugin or a developer tool that can forecast the exact execution time of a given computer program live by integrating the specifications of the execution device. It will help developers to optimize a particular computer program and develop it for a minimum execution latency and enhance the performance of the program.

Keywords: Complexity, Execution, Machine Learning, Performance, Prediction

Abstract No: SO-06

Machine Learning based Postpartum Depression risk level detection in Sri Lanka

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Postpartum Depression (PPD) is approaching epidemic rates in many South Asian countries. Because of that, it requires community-level public health interventions such as screening, early detection, and treatment. It occurs in some mothers after childbirth because of their physical, behavioural and emotional changes. This mental disorder is hard to detect and its symptoms are complex. In Sri Lanka, previous studies have shown that 15.5% at 10 days and 7.8% at 4 weeks will have a PPD prevalence after a childbirth. The main objective of this research is to present a new model to detect PPD risk levels of mothers within 6 months after child delivery using Machine Learning (ML) techniques. ML is fast, accurate, and very advanced method that can be used to detect risk levels which includes techniques such as Feed-Forward Neural Network (FFANN), Adaptive Neuro-Fuzzy Inference System with Genetic Algorithm (ANFIS - GA), Random Forest (RF), and Support Vector Machine (SVM). After reviewing past literature, we can find many models that have gotten the best performance through these models. As an initial step here, we have collected data and pre-processed the dataset to improve the quality of the dataset. For that, we have used standard ways to identify risk levels based on Edinburgh Postpartum Depression Scale (EPDS) and score guide. Then, the risk levels were classified into four classes mild, moderate, severe, and profound, for the dataset of 686 Sri Lankan mothers. After that, each ML model was trained on the dataset, and the best model was identified depending on the model's performance for detecting risk levels. According to that, as multi-classification models, the FFANN, SVM, and RF have given 95.62%, 93.43%, and 92.7% accuracies, respectively. The FFANN model for 25 epochs, has given the best performance among classification models. When considering ANFIS - GA model, it was shown a testing error of 0.0496 as the best result as a regression model with 500 generations. Here multi-classification models have given their output as risk-level class names, while the regression model has given output as risk level values of user-entered data. Then, comparing the model performances in this research and previous research works, it is concluded that FFANN with multi-classification has the best performance when detecting PPD risk levels. Further, it helps to identify more influenced factors relevant to the PPD. According to that, this method with the improvements can be used as a screening tool for PPD.

Keywords: Feed-Forward Neural Network (FFANN), Machine Learning (ML), Postpartum Depression (PPD)

Abstract No: SO-07

Grey Literature usage in Software Engineering undergraduate research

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The Grey Literature (GL) is a common and popular information source among the Software Engineering (SE) research community. The exponential growth of SE practitioners has led to a rapid increase in GL availability. However, the contribution of GL to SE research is still a little-known fact. In this study, we analysed how SE undergraduates of a Sri Lankan state university use GL in their final year research project. For example, awareness of GL, purposes of using GL, types of GL that they use, and pros and cons related to GL were investigated in this study. An online questionnaire was distributed among SE undergraduates who had recently completed their final year research. Students were asked to complete 12 close-ended questions about GL usage. For further analysis, a convenience sample of 70 responses from final-year SE undergraduates was selected. A quantitative data analysis approach was followed to analyse the responses. To our knowledge, this is the first study considering undergraduate GL usage in the SE community. As per the responses collected, they have conducted various types of research, e.g., original research (52.9%) and systematic literature reviews (14.3%). However, most of them have utilized GL while unaware of the term "Grey Literature." Since this study specifically focuses on the students who have accessed GL, 45 responses were taken for further analysis. Among those, 44.3% of students cited more than five GL sources as references. According to the results, we identified that web articles were the most used type of GL (82.2%) and the least used GL type was News articles or magazines (28.8%). Apart from that, popular platforms such as Medium Blogs and YouTube have been used as the main sources of GL. Among the respondents, GL was mainly used to find related studies (73.3%) and to create the research problem (62.2%). Further, we identified ease to access (86.7%) as a significant benefit and unreliability (60%) as a major challenge when using GL. These results indicate that, GL plays an important role in acquiring knowledge about current SE challenges and technologies for SE researchers due to the rapid change in technology and the lack of updated publications. The findings of our study provide better insights into the usage and significance of GL in undergraduate SE research while contributing to the SE research community.

Keywords: Data mining, Evidence-based software engineering, Grey literature, Software engineering research, Survey

Abstract No: SO-08

Digital companion for kids using Artificial Intelligence

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Today children experience anxiety and loneliness due to long-time school closures, pandemic and economic crises and disruption in family income. Therefore, to overcome the anxiety and loneliness, the children heavily engage in online games and movies and are vulnerable to online abuse. This prospective work focused on designing a digital assistant to support kids between 2 and 10 years old in situations related to online abuse, including recommendations on how to involve parents and other guardians. Further, a high-level voice bot conversation flow addresses kids' expectations and concerns. Today Artificial Intelligence creates great opportunities for personalized, flexible, and very adaptable learning environments. A Voice assistant or a digital assistant is such a good example. The digital assistant uses voice recognition, language processing algorithms, and voice synthesis to listen and responds to specific functions. This study focuses on creating a digital assistant and facial emotion detection model. The assistant can help to attend online classes by scheduling alarms and improving politeness in communication. This work also improves English language skills and able to reduce stress in children. Dialogflow framework is used to create the digital assistant because of its vast integrations. Intents are created to rebuke impolite voice commands and encourage studies. Specific intents are created to control angered situations by responding to their voice commands. Emotions can be expressed in different ways: facial expressions, behaviour, actions, and speech. This work chooses facial expressions for the emotion detection of children. This paper proposed a Convolution Neural network (CNN) based deep learning architecture for emotion detection from images. It has achieved 80% accuracy for emotion detection on seven emotions for the FER2013 dataset without using extra training data. Emotions are categorized into happy, sad, angry, fearful, surprised, neutral, and disgusted. The model is trained with 45, 55, 65, 75 and 85 epochs. Deep CNN, which was trained with 85 epochs, gave the highest accuracy of 80%. A comparison of existing voice-bot frameworks and the pros and cons of Artificial Intelligence services is also summarized in this study. Future work is involved in developing safe online search, storytelling, and activity scheduling and combining all as a mobile application. A questionnaire for user satisfaction with facial emotion detection and digital assistant is conducted. 87% of participants have convinced of their satisfaction with this work. Finally, suggestions on improving accuracy in the facial emotion detection model and future works to be done are also discussed.

Keywords: Artificial Intelligence, Commands, Emotion, Detection, Digital Assistant

Abstract No: SO-09

Sign language generator for video platforms

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Over 5% of the world population (430 million people) suffer from hearing loss and deafness. Therefore, communication with them is a challenging task. One of the popular communication methods with deaf people is sign language. It is achieved by simultaneously combining hand gestures, body language, and facial expressions. Even though it is possible to communicate in written format, deaf people still find difficulties in reading natural language texts. Therefore, formal sign languages have been introduced to fill this gap. There are different standards for sign languages. For example, the USA has American Sign Language (ASL), UK has British Sign Language (BSL), and Sri Lanka has Sri Lanka Sign Language (SSL). However, modern video platforms do not have sign language support. This research introduces and evaluates the user experience of a customizable sign language converting extension for video platforms. The proposed machine translation model translates English sentences in videos into equivalent Sri Lanka Sign Language. Moreover, the position, size, and background colour of the 3D human animator are customizable. This system was evaluated with deaf people from different demographics. The user test was conducted as a questionnaire survey. The participants were deaf or hard-of-hearing under three categories (deaf, hard-of-hearing, and severely deaf) and belonged to different age groups (0-10 years,11-20 years, 21-30 years, 31-40 years, 41-50 years, 51-60 years, and above 60). Personal health information and accessibility barriers faced by each participant was questioned in the questionnaire. The user test was conducted by providing participants with three videos with the proposed extension, where participants should complete a series of tasks according to the provided guidelines. The video platform considered for the evaluation was YouTube. The usability issues of the proposed extension were recorded. In addition, new requirements requested by the participants were also recorded. According to the results, 88% of participants identified the correct and incorrect Sinhala sign language generators based on the accuracy of Sinhala sign language, 96% of participants identified the sign language generator as user-friendly. Participants found that the most critical features of this extension were adjusting background colour according to the video and the human animator.

Keywords: Different age groups, Sign Language converter, User experience, Video platforms

Abstract No: SO-10

Comparison between the Machine Learning Algorithms to determine the suitable input features for personal theft, sexual assault, and house burglary victimization prediction

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The crime-related predictions can be vastly supported by most of the available supervised machine learning models. The possibility of becoming a victim increases daily in each crime category. The main difficulty is to find how severe the impact is upon the victim after the crime. Here, the Random Forest, Support Vector Machine (SVM), K-Nearest Neighbour (KNN) algorithm, and Neural Network models were compared with the use of available features found from a secondary dataset to build a better prediction model, which has been implemented in four main phases over two aspects based on the possibility of becoming a victim and severity of the crime. The available features were used as the inputs for phase I and Principal Component Analysis and correlation tests were performed to identify the appropriate and essential feature combinations for the rest of the phases. The pre-processed datasets were used to implement and train the models. Moreover, the Random Forest model was proven to be the most efficient model with an accuracy of 85.33% in phase four when comparing the accuracy levels of the models over different phases, while the KNN and Neural Network models obtained an accuracy of over 70% and SVM obtained the least accuracy in the same phase. In phase one, the Random Forest algorithm was executed with a precision of 76%, while KNN and Neural Network model obtained around 70%. The final outputs obtained for phase four showed that factors such as age, year, gender, race, and relationship with the perpetrator will be the most suitable features to build an accurate machine learning model for victimization prediction. The mentality level of the offender and intention of doing it has the main impact on the severity level. Also, authorities need to keep track of the fact whether it is a repeat offence or not, the main offender or not and the contribution of the offender to support better information inputs for the prediction models. This study developed a victimization prediction model with reference to personal theft, sexual assault, and house burglary. This would be a step forward from previous research works of rule-based victimization possibility index prediction for small victim clusters. Further, new features were identified in the last phase, which can be used to develop models to predict criminal behaviour after sending them back to the society. This will greatly benefit the authorized bodies to monitor them and reduce the possibility of victimization.

Keywords: Correlation, Machine Learning, Neural Network, Severity, Victimization

Abstract No: MO-01

Numerical evaluation of wave energy absorption and performance of a selection of wave energy converters in southern sea conditions of Sri Lanka

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Ocean wave energy is undoubtedly the next crucial step in Sri Lanka's energy sector. The abundance of this source of green energy, mainly in the Southern seas of Sri Lanka, has been identified and estimated in a handful of preliminary studies. In the present work, three wave energy converters are numerically modelled with the objective of estimating annual average electrical power and variations in seasonal average electrical power. A 1-body point absorber, 2-body point absorber, and an oscillating surge flap are simulated in sea conditions native to Tangalle, Galle, and Matara generated using measured and re-analysis data. The selection of the devices is mainly based on the depth of the location at which the data is available. The open-source numerical wave energy converter simulating software WEC-Sim is used as the dynamic equation solver, while the open-source Boundary Element Method code NEMOH is used to calculate hydrodynamic parameters. The power take-off is modelled as a linear spring-damper system in all three cases. A damping coefficient optimisation procedure is carried out using samples drawn from each set of data in which a comparative analysis was done to select the damping values that give the maximum power output. Under the optimised damping conditions, mechanical power matrices are generated which are then converted to electrical power matrices using a PTO efficiency conversion factor. Annual and seasonal average power outputs are calculated utilizing both electrical power matrices and joint probability distributions of sea states. The electrical power matrices generated for the 2-body point absorber, and oscillating surge flap are a clear indication that both the devices are naturally tuned to the dominant wave frequencies of tested locations, while the 1-body point absorber is tuned to sea states with lower periods. The highest output power is observed for oscillating surge flap, the second highest for the 2-body point absorber, and the lowest for the 1-body point absorber. The variation of the seasonal average power is significant over the four climatic seasons of Sri Lanka. The highest power observed in South-West monsoon is more than twice the lowest observed in North-East monsoon. The calculated annual average power and seasonal average power outputs are a clear indication of Sri Lanka's potential for wave energy harvesting, although the greater variation in seasonal average power poses a considerable challenge.

Keywords: Damping optimisation, Green energy, Point absorber, Sri Lankan seas, Wave energy

Abstract No: MO-02

The use of electrooxidation for treating wastewater generated by automobile service stations

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Automobile service stations are water intensive and discharge oils, greases, detergents, degreasers and heavy-duty cleaning products during their operations. Hence, treating this effluent before releasing it to the environment is absolutely essential to prevent environmental pollution. Treating the wastewater to a level at which it can be reused for its operations would be economically beneficial to the industry. Also, most importantly, it helps to conserve one of the earth's most precious resources, water. In this regard, several treatment methods have been proposed and some of those have been employed in Sri Lanka and around the world, including physical, chemical, biological and combined methods. Electrooxidation is an attractive method of treating wastewater, possessing several advantages over conventional treatment methods, such as offering relatively fast treatment, with no use of additional chemicals and no generation of sludge. For industrial applications, the use of graphite electrodes is very beneficial compared to other types of electrodes as they are relatively cheap and inert. The main objective of this study was to investigate the effectiveness of applying electrooxidation using graphite electrodes and sodium chloride as the supporting electrolyte to treat automobile service station wastewater. In addition, it was expected to optimise the applied voltage considering the number of electrodes and the treatment time. Further, it was evaluated whether gravity filtration using a filter of pore size 11 μm as a pre-treatment would improve the process efficiency. Wastewater samples obtained from a service station in Negombo, Sri Lanka, were analyzed for 3-day Biological Oxygen Demand (BOD_3), Chemical Oxygen Demand (COD), oils and greases (OG), Total Dissolved Solids (TDS), Total Suspended Solids (TSS) and pH. The levels of COD and OG were detected as 356.70 mg/L and 2650 mg/L, respectively and their variation under different applied voltages (3 V, 5 V, 8 V), numbers of electrodes (2, 3, 4, 5, 6 electrodes) and treatment times (60 minutes, 120 minutes) were used as the basis to assess the efficiency of each treatment condition and select the optimum conditions. It was found that optimum conditions for the treatment process include applying 3 V, the use of 4 electrodes and 120 minute treatment time. The corresponding efficiency removal of the COD and OG were 73.0% and 97.1%, respectively, for the samples that were filtered. The percent removal efficiencies of the COD and OG were 62.2% and 70.4%, respectively by electrooxidation for unfiltered samples. The pH of the water was observed to be close to 7 after the electrooxidation of filtered samples. Further development of this method could be done by optimising other necessary parameters in order to fully improve the water quality up to the requirements for effluent discharge. An industrial scale study could be performed in order to study the applicability of this method to vehicle service stations of different scales, as well as the long-term costs associated with it.

Keywords: Automobile service station, COD, Electrooxidation, Oil and grease, Wastewater treatment

Abstract No: MO-03

Analyse and design for water distribution network in community water supply using different simulation techniques

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The water supply scheme mainly supplies potable water to houses, commercial and industrial institutions. Supplying water to the consumers at the required quantity with adequate pressure is the prime purpose of any water distribution network (WDN). However, the performance of the WDN may vary from the original design in the long run. In this study, a WDN network model was built using WaterGEMS and WaterCAD computer simulators and hydraulic analyses were conducted to obtain an optimal WDN design for an existing community water supply scheme of a village called Poomalanthan in Sri Lanka. A series of steps such as; models, network representation, verification, problem identification, model application, and results analysis were carried out in developing the WDN simulation model. The demand for domestic, industrial, commercial and unaccounted for water was forecasted for twenty-five years while considering the average per capita daily demand as 100 litres. The analysis was carried out using the Hazen-Williams friction method and the hydraulic parameters such as pressure, flow velocity and flow rate were analysed under extended period simulation. The result revealed that all nodes in WDN operate above the threshold pressure limit of 10 mH$_2$O pressure throughout the day, including peak hours. The pressure during peak hours is the critical output factor which shall give an idea of ensuring water supply to every consumer at an adequate pressure. The nodal pressure is negatively correlated with the ground elevation. Most pipes have a relatively low velocity than specified in the design guidelines, which may be due to the low daily water demand of the small community. However, the chance of silt deposition in the pipes is the disadvantage of maintaining low velocity in WDN. Hence frequent pipeline line washout is recommended to eliminate the silt deposition in the system. The water flow rate in the pipes depends on the water demand at every node. The same hourly flow rate was not observed since the demand in the system was not constant throughout the day. Instead, it varies with the time of the day, and usually, the peak demand arises in the morning and late evening hours when people consume water for bathing, washing, and cooking. The water tower was optimised at 10m height to supply water at sufficient pressure. The WDN was designed for optimised pipe sizes with pipe availability in the market. Statistical comparison through an ANOVA test reveals that there is no significant difference in the nodal pressure, flow velocity and flow rate results derived from WaterGEMS and WaterCAD simulation techniques. Water network computer simulators used during this design can handle various water supply network problems. Computer-aided WDN simulation techniques provide significant advantages over conservational computations in terms of optimisation, results in accuracy, monitoring of the system during operation, time consumption and room for future modification.

Keywords: Design optimisation, WaterCAD, WaterGEMS, Water network model, Water supply

Abstract No: MO-04

The energy efficiency of buildings estimation by OLS & AIC

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Efficient building design and the accurate computation of the heating and cooling loads of the heating and cooling equipment are required in order to ensure comfortable indoor air conditioning. In order to estimate the required cooling and heating capacities, architects and building designers need information about the characteristics of the building and the conditioned space. We are focusing on the calculation of the energy efficiency of the existing buildings with the study of the UC-Irvine energy efficiency dataset. The dataset has two response variables (heating load and cooling load) and eight explanatory variables (relative compactness, surface area, wall area, roof area, overall height, orientation, glazing area, and glazing area distribution). First, the correlation between these two-response variables and other variables was calculated and the correlation among all the variables was studied. As obtained in the correlation matrix, the correlation between the two response variables is very high (i.e., 0.976). Hence by studying one of the response variables, we can predict the values of other response variables. Therefore, we investigated the effect of eight explanatory variables on heating load. The graphical and tabular analysis is used to analyse the features of the data set. Linear regression is handled to grope the relationship between response and explanatory variables. The Box-Cox method is used to find the optimal transformation for the response variable and Ordinary Least Squares (OLS) and Akaike Information Criteria (AIC) are used to select the best-fitted model. From recorded data, the correlation between the two response variables is very high (i.e., 0.976). When considering heating load as the only response variable, the variable "Overall Height" has a perfect correlation with the response variable heating load (i.e., 0.889). Hence, we can say that the variable "Overall Height" is a good predictor of the response variable heating load. Also, the variable "Relative Compactness" has a good relationship with the response variable, (i.e., 0.622), so it is also a good predictor of the response variable. The scatterplot concurs with the fact that there is a linear relationship between the two response variables. In the variable visualization, there might be an interaction between variables glazing area and "Overall Height". The variable "Overall Height" is the highest positive correlated feature of the data set. The regression model reveals that the weighted least squared model is the best model for energy-efficiency data. The model indicates that the surface area, wall area, overall height, glazing area and glazing area distribution are most important for heating load.

Keywords: Energy efficiency, Linear regression, Box-Cox method, Ordinary Least Squares, Akaike Information Criteria.

Abstract No: MO-05

Guava (*Psidium guajava* L.) leaves as a source of phytochemicals with antioxidant, antimicrobial and photoprotective properties for sunscreen formulations

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The skin is the largest and most visible organ of the human body, which acts as the outer protective barrier. Exposure to solar radiation, including UV A and UV B can cause UV induced skin damage leading to sunburn and skin carcinogenesis. Sunscreens with natural ingredients for skin care have become a new trend in cosmetology as they protect skin against photo ageing and dermatologic disorders. Plant parts of guava are known to be rich in phytochemicals with antidiarrheal, anti-diabetic, antimicrobial, hepatoprotective, analgesic and antihyperglycemic activities, but less research has been conducted to explore their photoprotective properties and potential to be used in sun protection cosmeceuticals. Therefore, this study aimed to evaluate the antioxidant, antimicrobial and photoprotective properties of methanolic extract of guava (*Psidium guajava* L.) leaves to investigate its potential to be used in sunscreen formulations. Chemical constituents in guava leaves extracted into methanol by Soxhlet extraction were sequentially fractionated with hexane, dichloromethane (DCM), and aqueous methanol. Each fraction was tested for their bioactivities. The antioxidant activity of each fraction was determined by α, α-diphenyl-β-picrylhydrazyl (DPPH) free radical scavenging assay, hydrogen peroxide scavenging assay and ferric ion reducing antioxidant power assay (FRAP). Agar well diffusion method was used to determine the antimicrobial activity against the potential pathogens in cosmetics, bacterial strains of *Escherichia coli* (ATCC 25922), *Pseudomonas aeruginosa* (ATCC 9027), *Staphylococcus aureus* (ATCC 25923) and a fungal strain *Candida albicans* (ATCC 10231). Mansur equation was used to estimate the sun protection factor (SPF) of each fraction by *in-vitro* method using UV spectrophotometry. Among the fractions, aqueous methanol fraction exhibited the highest DPPH free radical scavenging activity with IC_{50} value of 90.07 ± 0.73 µg/mL and H_2O_2 scavenging activity with EC_{50} value of 12.65 ± 1.01 µg/mL. The ferric ion reducing ability of aqueous methanol fraction also was found to be the highest (247.0 ± 0.51 mg of Ascorbic acid equivalents/mL of extract) among the three fractions. Aqueous methanol fraction showed an antimicrobial activity against all the tested microorganisms and its activity was comparable (zone of inhibition of 20.0 ± 0.75 mm) to that of the positive control Amoxicillin (zone of inhibition of 22.0 ± 1.00 mm) against *Pseudomonas aeruginosa*. The aqueous methanol fraction had an impressive SPF value of 41.51 ± 0.64 which was higher than that of the reference sunscreen (SPF = 39.18 ± 0.56). As the results revealed among the tested fractions, the aqueous methanol fraction is the richest in phytochemicals with antioxidant, antimicrobial activities, and photoprotective properties with a high sun protection factor and guava leaves can be used as a natural source of these phytochemicals for the development of sun protection cosmetics.

Keywords: Antimicrobial, Antioxidant, DPPH, FRAP, SPF

Abstract No: MO-06

Risk assessment of toxic metal contamination in groundwater and paddy soil; A study in CKDu affected Maradankulama area in Anuradhapura, Sri Lanka

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Chronic Kidney Disease of Unknown Etiology (CKDu) has emerged as a serious public health concern in Sri Lanka. The North Central Region (NCR) has the highest CKDu prevalence in the country, and the disease is more prevalent among farming communities and people who rely on groundwater as their primary source of drinking water. Meanwhile, heavy metal/metalloids exposure and accumulation are recognized as the causative agent of many acute and chronic diseases in certain vulnerable human tissues, including the kidneys. This study assesses the level of contamination of heavy metals/metalloids in drinking water and agricultural soil in a CKDu endemic area in NCR, Sri Lanka. Fifteen groundwater samples collected from wells were analyzed for pH, EC, hardness, heavy metals, and anion concentration using potentiometric, conductometric, titrimetric, inductively coupled plasma mass spectrometric, and ion chromatographic methods, respectively. From six sampling sites in a paddy field, composite soil samples were collected from the surface, and two depths (30 cm and 60 cm). Soil samples were analyzed for pH, EC, organic matter, potassium, phosphate, and heavy metals using potentiometric, conductometric, titrimetric, flame photometric, colorimetric, and inductively coupled plasma mass spectrometric methods respectively. Accordingly, the mean pH of groundwater is 7.25 and this lies within the guideline values. Mean EC is 662.4 μS/cm and mean hardness is 287.0 mg $CaCO_3$/L. Among fifteen samples, four and five water samples have exceeded the health guideline values for EC and hardness, respectively. Metal content varies in the following order, $Cd < As < Cr < Cu < Co < Fe < Ni < Mn < Zn$. Pb was not detected in any of the water samples and other metals were found in concentrations well below the standard guideline values. Only one sample and three samples exceeded the guideline value for fluoride and nitrite, respectively. Mean pH, EC, organic matter, potassium, and phosphate in paddy soil is 7.57, 101.8 μS/cm, 1.34%, 148.9 mg/kg, and 24.05 mg/kg respectively. Heavy metal content in soil varies in the following order, $Cd < As < Pb < Co < Ni < Cu < Zn < Cr < Mn < Fe$. Paddy soil from the very bottom showed the highest pH, Pb, Cd, As, Zn, Ni, Mn, Cr, and Fe content while the highest EC, organic matter and potassium content was detected in topsoil. EC, organic matter, and potassium content decreased with the depth of the soil, and the concentration of Pb, As, Zn, Mn, and Fe increased with the depth. This study reveals the dependence of some soil quality parameters on the depth of the soil profile. Monitoring the soil quality is important to minimize the possibility of heavy metal uptake by rice plants. Low heavy metal concentration in groundwater may not have an acute health effect on humans. But long-term chronic exposure to toxic heavy metals together with high EC, hardness, and fluoride would be a reason to trigger the prevalence of CKDu in Maradankulama area.

Keywords: Anuradhapura, CKDu, Drinking water, Paddy soil, Toxic metals.

Abstract No: MO-07

Electrochemical conversion of graphite to graphene oxide and electrophoretic deposition of graphene oxide

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Graphene and graphene oxide (GO) have gained huge importance in multiple fields, including chemistry and physics due to the desirable and incomparable properties which they possess. Practical applications of graphene and graphene related materials (GRM) such as graphene and GO is a progressive topic in the research world. Various methods are available for the synthesis of graphene and GO. Conventional chemical methods have the drawbacks of the evolution of toxic gases, which are highly expensive and environmentally unfriendly. Current approaches targeted on increasing the yield of GO synthesis with minimal environmental effects using vein graphite obtained from Bogalapathala, Sri Lanka. The electrochemical methods are much more favoured since they are scalable, high yielding, cost effective and less time consuming. In this work, an electrochemical synthesis method was followed in the production of GO by oxidizing graphite and subsequently, its electrophoretic deposition was carried out on various substrates. During the first part of the research, electrochemical exfoliation of graphite to GO was carried out using $(NH_4)_2SO_4$ solution as the electrolyte. Initially, a cylindrical graphite pellet was made using graphite powder and was covered with a cellulose bag. Electrolysis was carried out by using the prepared graphite pellet as the anode and carbon electrode as the cathode. Various experimental conditions were tested to find out the optimum conditions which give rise to an efficient electrolysis with a maximum production yield of GO. Concentration of $(NH_4)_2SO_4$ was varied from 0.5 M to 1.0 M, electrochemical exfoliation time was varied from 1 to 8 hours, applied voltage was varied as 5 V, 10 V and 15 V, the temperature was varied from 30 °C to 50 °C and mechanical stirring speed was varied from 100 rpm to 300 rpm. The second part of the research is based on the electrophoretic deposition of GO. This was carried out by using Pt as one terminal and glass-FTO or the stainless steel substrate as the counter terminal. The process was carried out using a mixture of N,N- DMF and $MgCl_2.6H_2O$ as the dispersion medium. The GO coatings were annealed at 350 °C under N_2 atmosphere as the post electrophoretic deposition treatments. The experiments resulted in a maximum yield of 59.25% of GO. The UV-Visible, the FTIR spectra and XRD diffractograms obtained confirmed the formation of GO. The two main factors which cause the exfoliation of graphite are; intercalation of ions between the adjacent layers of graphite and the expansion of graphite induced by the evolution of gases at the electrodes. This research revealed that the GO can be effectively synthesized using a $(NH_4)_2SO_4$ electrolyte (1 M) under an applied voltage of 15 V, at a temperature of 50 °C with mechanical stirring (300 rpm) for 8 hours. Moreover, a uniform coating of GO was deposited on the glass-FTO and stainless steel substrates in both organic and inorganic suspension media of N,N- DMF and $MgCl_2.6H_2O$, respectively. This communication brings a viable method of synthesizing GO from vein graphite, using an environmentally benign and less costly method, into the spotlight.

Keywords: Ammonium sulphate, Electrophoretic deposition, Exfoliation, Graphene oxide, Vein graphite.

Abstract No: MO-08

Larvicidal activity of chemically synthesized and *Trichoderma longibrachiatum* mediated silver nanoparticles against *Aedes aegypti*

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The mosquito *Aedes aegypti* is a critical vector of infectious diseases, including dengue, chikungunya and yellow fever. Prevention of these diseases is mainly achieved through mosquito population control due to the non-availability of a commercial vaccine except for yellow fever. The use of biogenic nanoparticles to control insect vectors has been studied in several research. Byproducts of the metabolism of organisms, including bacteria, fungus, and plants, which act as reducing and stabilizing agents, can be used in the green synthesis of nanoparticles. This study aims to determine the mosquito larvicidal potential of green synthesized silver nanoparticles using *Trichoderma longibrachiatum* biomass (Tl-AgNPs) and chemically synthesized silver nanoparticles (C-AgNPs). Synthesized AgNPs were characterized by ultraviolet-visible spectroscopy (UV-VIS), Transmission Electron Microscopy (TEM) and Scanning Electron Microscopy (SEM). The colour change from pale yellow to dark brown of the solution indicated the formation of AgNPs initially. The surface Plasmon Resonance (SPR) band in the range 415 - 400 nm in the UV-VIS confirmed the formation of Tl-AgNPs and C-AgNPs. TEM and SEM images confirmed that Tl-AgNPs and C-AgNPs were spherical in shape. Third instar larvae of dengue vector mosquito *Ae. aegypti* were subjected to larvicidal bioassay in a range of concentrations of Tl-AgNPs and C-AgNPs (10-50 mg/L). Both types of AgNPs were larvicidal against *Ae. aegypti* larvae. The percentage mortality of the *Ae. aegypti* was found to increase with the increase in tested concentrations of AgNPs. LC_{50} value of Tl-AgNPs was 16.82 ± 0.17 mg/L whereas C-AgNPs was 22.10 ± 0.71 mg/L for *Ae. aegypti* at 48 h exposure. Hence, Tl-AgNPs exhibit higher larvicidal activity than C-AgNPs. Tl-AgNPs have the potential to be developed as a green larvicidal treatment for *Ae. aegypti*.

Keywords: *Aedes aegypti*, Green synthesis, Larvicidal activity, Silver nanoparticles, *Trichoderma longibrachiatum*

Abstract No: MO-09

Sampling and analysis of Microplastics in the coastal area from the Estuary of Kelani River to the Estuary of Mahaoya

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Plastic particles that are less than 5 mm in dimension are referred to as microplastics (MPs). The formation of MPs can occur either by fragmentation of macroplastics (secondary MPs) or the production of micro-sized plastics (primary MPs) for intended applications. MPs have been identified as an emerging threat to the environment. MP pollution in marine environments around the globe is severe, and enough precautions have not been taken so far for its prevention. The focus of this study was to adopt suitable methods to collect and separate MPs from beach sediment and seawater samples and to identify their presence and the type by the optical microscopy and FTIR-ATR spectroscopic techniques, respectively. Therein, the distribution, types and abundance of MPs along the western coast from the Estuary of the Kelani River to the Estuary of Mahaoya in Sri Lanka were investigated while selecting nine sites along a stretch of 42 km (Hendala, Wattala, Uswetakeiyawa, Sarakkuwa, Bopitya, Dungalpitiya, Morawala, Browns beach and Estuary of Mahaoya). Random sampling was employed to collect a minimum of 8 sediment samples from each site within a 100 m area stretch in the intertidal zone of the beach during October and December 2021. Water samples were also collected parallel to the sediments from the ocean surface. A digestion method was tested and validated using KOH and Methanol. Sodium bromide was used as the density separator to extract MPs from sediment samples as an efficient method. The analysis revealed the presence of MPs in different colours (blue coloured fragments, blue and white coloured fibers, and white and yellow pellets and foams). The FTIR analysis revealed that most of the MPs found were thermoplastic polymers of polyethylene (PE), polypropylene (PP), polystyrene (PS) and polyethylene terephthalate (PET) while some are thermosetting polymers of phenol formaldehyde (PF). Amid the 81 water samples analyzed, the mean abundance varied from 161 items/L (in Hendala) to 2 items/L (in Kepungoda and Browns Beach). Among, the 166 sediments samples analyzed, the mean abundance of MPs varied from 656 items/m^2 (in Estuary of Mahaoya) to 3 items/m^2 (in Dungalpitiya). The MPs found were identified in different shapes as fragments (80.15%), pellets (14.88%), fibers (2.7%) and foams (2.48%). The FTIR analysis revealed that the beach sediments are mainly contaminated with PE (65.27%) and PP (15.28%) while surface seawater is dominated by PE (60.87%) and PP (4.34%).

Keywords: Coastal pollution, FTIR, Microplastics, Negombo, Sri Lankan beaches.

Abstract No: MO-10

Atmospheric chemical composition of bulk precipitation in different regions of Gampaha District

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Wet and dry deposition, both referred to as bulk precipitation, are the two methods of removing gases and particulates from the atmosphere. This research primarily focuses on bulk precipitation analysis to evaluate the pollution sources and the extent of seasonal characteristics of precipitation for air quality monitoring in the vicinity of Kerawalapitiya-Yughadhanavi Power Plant, the largest oil-fired power plant, and Sapugaskanda Oil Refinery, the single largest oil refinery in Sri Lanka. During the northeast and first intermonsoon seasons, 30 rainwater samples were collected over a five-month period from November 2021 to March 2022, in Kerawalapitiya (site A), Sapugaskanda (site B), and Kadawatha (site C), all densely populated and heavily industrialized areas, and Keragala (background site D), a rural area in Gampaha district where anthropogenic influence is minimal. Based on volume weighted mean (VWM) pH variation, Kadawatha area showed acidic precipitation (5.21 ± 0.3) during the study period, while sites A (6.81 ± 0.3), B (5.75 ± 0.8) and D (6.12 ± 0.2) had alkaline pH values. The neutralization factors (NFs) for the major cations (Na^+, K^+, Mg^{2+}, Ca^{2+}, and NH_4^+) in the precipitation indicated that higher levels of Na^+ and NH_4^+ contributed to the neutralization of the acidic components at sites A and D, respectively. The VWM concentrations of ionic species were determined by ion chromatography followed the order of $Na^+> Ca^{2+}>SO_4^{2-}>Mg^{2+}>NO_3^->Cl^->NH_4^+>K^+>Br^-> F^-$ in Kerawalapitiya, $NO_3^->SO_4^{2-}>Ca^{2+}>Na^+> Cl^-> K^+>NH_4^+>Mg^{2+}> Br^->F^-$ in Sapugaskanda and $SO_4^{2-}>NO_3^->Na^+> K^+>Cl^->Ca^{2+}>Mg^{2+}>Br^->F^-$ in Kadawatha. Nevertheless, Keragala showed a relatively low ionic composition, and it was in the order of $NO_3^->NH_4^+>Na^+>Cl^->Ca^{2+}>K^+> SO_4^{2-}>Mg^{2+}>Br^->F^-$. There was a reduction in the VWM SO_4^{2-} concentration in the Sapugaskanda site compared to a previous study done in this area in 2021. This may be due to the time-to-time shutdown of the Sapugaskanda oil refinery during the study period for the first time since 1969. Enrichment factors (EFs) associated with the sea (EF_{sea}) and crust (EF_{crust}) confirmed that the Cl^- ions at all four sites were marine in origin, although Ca^{2+}, K^+, and SO_4^{2-} were not from marine sources. In addition, the values of EF_{sea} and EF_{crust} for SO_4^{2-} and NO_3^- showed greater than 1 in all four sites. This may be due to human activities in the study area. Also, Mg^{2+} has a significant contribution from both marine and soil at sites B, C, and D, while it is of anthropogenic origin at site-A. VWM metal concentrations determined by ICP-MS revealed that all sites had higher values for Al, Mg, K, and Zn, but lower concentrations of Cd, As, Co, and Cr. The results of this study further confirmed that rainwater analysis is an indirect indicator of air quality in a given area.

Keywords: Air quality, Bulk precipitation, Ionic composition, Monsoon seasons

Abstract No: MO-11

Study of chemical composition and microbial content of bulk depositions of selected sites in Gampaha district

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Wet atmospheric deposition, a natural primary scavenging process, removes organic and inorganic pollutants from the atmosphere. Significant variations in this process are observed depending on geographic conditions and anthropogenic factors. There is considerable research interest in the composition of atmospheric depositions, as it is important to decide the extent of atmospheric pollution and to predict the atmospheric quality of a selected area. However, in Sri Lanka, fewer previous studies have been reported on the chemical composition and microbial content of rainwater. In this study, three sites; Kerawalapitiya (Site A), University of Kelaniya (site B), and Keragala (Site C-control site), were selected from Gampaha district to investigate the chemical and microbial parameters of rainwater from November 2021 to March 2022. The bulk precipitation was analyzed for pH, conductivity, cations (Na^+, Ca^{2+}, NH^{4+}, K^+, Mg^{2+}), anions (NO^{3-}, SO_4^{2-}, Cl^-, Br^-, F^-) using ion chromatography and trace metal elements (Mg, Al, Zn, As Fe, Ni, Pb, Cu, Mn, Cr, Co, Cd) using Inductively coupled plasma-mass spectrophotometer. The pH range of all considered events was 5.98-7.31($\pm$0.4). Volume Weighted Average (VWA) conductivity was 120, 72 and 55, respectively in sites A, B, and C. The highest VWA conductivity was observed in Kerawalapitiya. Although there were differences in the order of ions, Na^+ and Ca^{2+} can be mentioned as the dominant cations in all the sites except in Keragala, where NH^{4+} was the dominant cation. Further, SO_4^{2-}, Cl^-, and NO^{3-} can be mentioned as dominant anions in the selected sites. VWA of trace metal elements showed that the most abundant metal in all the sites was Mg, followed by Al and Zn. Co and Cr metal concentrations were comparatively the lowest in all three sites. The highest neutralization potential was associated with Na^+, Ca^{2+} and NH^{4+} in sites A, B, and C, where the neutralization factors were 1.396, 0.655 and 0.310, respectively. Furthermore, the One -way ANOVA test revealed that there were significant differences in bacterial and fungal contents between all three sites ($p_{bacteria}= 0.000$, $p_{fungi} = 0.027$, $\alpha=0.05$).

Keywords: Anions, Cations, Metals, Microorganisms, Rainwater.

Abstract No: MO-12

Exploring the MSG related metabolic mechanisms through computational docking

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Monosodium Glutamate (MSG), also known as Ajinomoto is a widely used flavour enhancer in various food industries. Glutamate is the major component of the MSG which is produced within the human body. Also, it acts as an excitatory neurotransmitter within the central nervous system. Because of the characteristics of umami taste-producing capability, various foods contain MSG as a food additive. Normally in the market, it is known as E621 flavour enhancer. Among L and D enantiomers only L enantiomer has the flavour enhancing property because of the stimulation of the taste receptors. Even taste-enhancing properties, there are some health problems associated with the monosodium glutamate in the human. Triggering of obesity, diabetes, neurotoxicity (neurological disorders such as Alzheimer, Parkinson, Sclerosis), hepatotoxicity, oxidative kidney damage, headache, sweating, numbness, chest pain, and nausea are mainly associated with the consumption of higher amount of MSG containing foods. Various animal-based trials were performed already to find out the effect of MSG under different laboratory conditions. Computational docking was used to investigate the synergistic effect between monosodium glutamate (MSG) and the receptor proteins and metabolic enzymes. Before the docking step, the glutamate ligand was energetically optimised by using the Gaussian 09 software and the 3D structures of selected receptors and enzyme modeled via the SWISS-MODELER. Also, the proteins were refined by the Galaxy Refiner. The results showed specific changes upon the interaction of MSG with xenobiotic-metabolizing enzymes (CYP2E1), xenobiotic sensing receptor (CAR), GLP-1 receptor, mGlu5 receptor in terms of energy and conformation. The mGlu5 receptor exhibited the most favourable binding interactions with MSG due to the presence of both polar and non-polar amino acids in the binding pocket of receptor. Ser152 tends to form strong hydrogen bonds with the glutamate ligand. Five residues in the binding pocket Ser173, Gly150, Ala174, Tyr223 and Trp100 played critical roles in forming hydrophobic interactions. Also, Gln234, Lys197 and Arg310 was observed as H bond forming amino acids with the glutamate ligand in the GLP-1 receptor. As well as CYP2E1 showed a considerable binding affinity for the glutamate ligand in MSG. The receptor proteins and enzymes, which consisted of non-polar functional groups, demonstrated the lowest docking energy and docking interaction energies. This computational study provides an insight into discovering umami-enhancing compounds and how they may interfere/ interrupt natural metabolisms.

Keywords: CYP2E1, CAR, Docking, Numbness, Umami.

Abstract No: MO-13

Assessment of the potential utility of sugarcane distillery spent wash as a liquid nutrition source for agricultural crops

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Spent wash generated from sugarcane molasses-based ethanol industries has the potential to be used as an organic fertiliser for various crop types due to its nutritional qualities. The present study evaluated the potential of raw spent wash as a liquid nutrition source to improve the growth of the commonly grown vegetable variety, tomato (*Solanum lycopersicum*). Selected physicochemical characteristics of the spent wash of the raw spent collected from a distillery industry in Sri Lanka were measured using APHA (2017) standard procedures. The crop experiment was conducted in the open field using agricultural guidelines provided by the Department of Agriculture. Tomato plants were treated with different spent wash doses (0.5, 1.5, 2.5, 5.0, 7.5 and 10 mL) divided into six treatment categories. Certified organic fertiliser and tap water were used as positive and negative control categories, respectively. Growth morphometric attributes of the plants and fruits were monitored for 60 days. The data were statistically analyzed using univariate statistical methods. The physicochemical analysis revealed a highly acidic nature (pH, 3.3 ± 0.08) with Nitrate (255 ± 0.04 mg/L), Phosphate (38 ± 0.07 mg/L), and Potassium (3.39 mg/L) levels. The physicochemical characterization of the raw spent wash proves that the spent wash may contain minerals and nutrients where the land application can enhance the crop yield of selected crops. Among growth-related morphometric attributes of tomato plants, shoot lengths, the number of leaves, and the number of buds and flowers were found to have less significant variations ($p > 0.05$). In contrast, other treatment categories recorded significantly reduced fresh fruit weight compared with the positive control ($p < 0.05$). Measured fresh fruit weight was more favourable towards high-end doses. The experiment results indicate that the sugarcane spent wash could be more favourable during the fruiting stage than in the vegetative stage. However, these findings should be solidified through repeated scientific studies. A recent study recommends mixing raw spent wash with other organic ingredients to improve the nutritional qualities. Continuous soil testing should be conducted in future studies to identify the effects on soil characteristics while conducting further experiments using the raw spent wash for different crop types.

Keywords: Molasses-based, Morphometric attributes, Physicochemical characters, Spent wash.

Abstract No: MO-14

Comparison of sensitivity of *Lemna perpusilla* (minute duckweed) to chromium, nickel, and zinc ions

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In recent times, the pollution of tropical aquatic ecosystems due to heavy metals has become a great issue. The major sources of heavy metal pollution in aquatic ecosystems are effluents from metal-based industries and municipal wastewater. Duck weeds (*Lemna* species) are widely used in the treatment of wastewater and sewage effluents as they have the ability to absorb nutrients in the wastewater effectively. The species, *Lemna minor* and *L. gibba* generally represent temperate areas while *L. perpusilla* is native to Southeast Asia. Objective of the present study was to compare the sensitivity of *L. perpusilla* to chromium (Cr), nickel (Ni), and zinc (Zn) ions under tropical temperature exposure based on standard laboratory ecotoxicity tests. Growth reduction of *L. perpusilla* under Cr, Ni, and Zn exposure was assessed using a standard ecotoxicity procedure with a range of metal ion concentrations (Cr^{6+}: 0, 12, 30, 60, 90 and 120 mg/L; Ni^{2+}: 0, 0.03, 0.06, 0.15, 0.30 and 0.60 mg/L; Zn^{2+}: 0, 0.1, 0.25, 0.5, 1.0 and 2.0 mg/L). Toxicity thresholds of Cr^{6+}, Ni^{2+} and Zn^{2+} for the duckweed *L. perpusilla* under tropical temperature exposure (27°C - 29°C) were estimated based on multiple endpoints (total number of fronds, percentage of green fronds and green frond area). Triplicate test vessels were used for each concentration and the controls. The average specific growth rate and percent inhibition growth rate for each treatment and control replicate were determined. Metal contents in the exposure media were analytically verified using atomic absorption spectrophotometry. One way ANOVA followed by Dunnett's test was used to estimate the lowest observed effect concentration (LOEC) for each endpoint. Effective concentrations of metals at different percentile effect levels (EC50, EC20, EC10 and EC5) were estimated through nonlinear regression modelling using USEPA Toxicity Relationship Analysis Program software. Based on different endpoints used for the toxicity assessments, lowest observed adverse effect concentrations (7 day LOAEC) for growth reduction of *L. perpusilla* for Cr^{6+}, Ni^{2+}, and Zn^{2+} were estimated as 21 mg/L, 0.06 mg/L, and 0.26 mg/L, respectively. For growth reduction of *L. perpusilla*, the most sensitive 7-day effective concentration for 10% effect (EC10) for Cr^{6+}, Ni^{2+}, and Zn^{2+} were 21 mg/L, 0.021 mg/L, and 0.2 mg/L, respectively. In conclusion, the sensitivity of *L. perpusilla* to the three metal ions followed the decreasing order: $Ni^{2+} > Zn^{2+} > Cr^{6+}$. This study revealed that *L. perpusilla* is more sensitive to Ni^{2+} than Cr^{6+} and Zn^{2+}. Of the three metals tested, Cr^{6+} exposure could be most tolerated by *L. perpusilla.*

Keywords: Chromium, Duckweed, Nickel, Tropical, Zinc

Abstract No: MO-15

Assessment of pollutant removal efficiencies of municipal landfill leachate treatment techniques in the tropics

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Leachate generation is a major problem for municipal solid waste (MSW) landfills and causes a significant threat to surface and groundwater. Therefore, the treatment of leachate is essential to ensure the protection of both environmental and human health. Different treatment techniques as individual or integrated techniques, are being used in the world prior to the discharge of the leachate into the environment. This study was planned i) to explore the individual and integrated leachate treatment techniques used in the tropical region of the world, ii) to compare the percentage removals of key pollutants among leachate treatment techniques considered, iii) to determine the factors affecting the selection of appropriate leachate treatment technique/s and, iv) to evaluate the removal efficiencies of the key pollutants of the leachate discharged at the sanitary landfill at Dompe by the integrated technique of sequential batch reactors (SBR) and constructed wetland (CW). The first three the objectives were achieved through a comprehensive literature survey. The leachate samples for the fourth objective were collected at three locations within the treatment system and analyzed for selected parameters using standard methods. The statistical analysis for the data obtained from the sanitary landfill at Dompe was done using Minitab 17. Results revealed that, the aerated lagoons, aerated sludge reactor, SBR, and reverse osmosis (RO) were the more effective methods in removing the key pollutants such as chemical oxygen demand (COD), bio-chemical oxygen demand (BOD_5), phosphate and sulfate, while adsorption, coagulation-flocculation, and membrane filtration were effective in removing COD, ammonia, heavy metals as well as total suspended solid (TSS) and total dissolved solid (TDS). The integration of leachate treatment techniques showed higher removal efficiencies than any individual (physical, chemical, or biological) treatment technique. In addition, the composition, age of the waste material, precipitation, and climate were the determinants for an appropriate leachate treatment facility identified in the literature survey. Results further revealed that the leachate treated with SBR at Dompe showed significant reductions of BOD_5, COD, TDS, phosphate, and sulfate compared with influent leachate ($p>0.05$; One way ANOVA). Nevertheless, integration of SBR with CW produced effluents with significant reductions of BOD_5 (79.84%), COD (69.57%), TDS (38%), TSS (35.73%), phosphate (56.35%), sulfate (61.16%), and Pb (84.46%) ($p>0.05$; Student's t-test). Results revealed that the selected parameters were within the maximum permissible limits of effluent water quality standards for discharge into inland surface water bodies. Although the appropriate integration of leachate treatment techniques showed higher removal efficiencies of the key pollutants than any individual treatment technique, taking into consideration of–factors including age, leachate volume and composition of waste are recommended for future designs of MSW leachate treatment plants.

Keywords: Biological, Integrated treatment methods, Landfill leachate, Physiochemical, Pollutant removal efficiency

Abstract No: MO-16

Development of herbal mosquito coil formulations using mosquito repellent plant materials

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With the increasing cases of mosquito-borne diseases such as dengue, malaria, yellow fever, Japanese encephalitis, and chikungunya, it has been a global concern to control the transmission of these diseases by controlling the mosquito population and protecting from mosquito bites using repellent products. Currently, more studies are being focused on developing safe, efficient, and eco-friendly herbal mosquito repellents by combining herbal plant materials due to the health and environmental concerns of overuse of chemical repellents for a long period. Since the studies on the mosquito repellent activity of plants seem to be quite low, through this study, the collaborating mosquito repellent activity of several selected plants is explored and assessed. The objectives of this study are to develop herbal mosquito coil formulations using mosquito repellent plant materials and to evaluate the bio-efficacy of developed coil formulations using preliminary laboratory studies and field studies. In this study, *Piper betel* (Betel) leaves, *Azadirachta indica* (Neem) leaves, *Ocimum tenuiflorum* (*Maduruthala*) leaves, *Cinnamomum zeylanicum* (Cinnamon) leaf oil, and *Cymbopogon nardus* (Citronella) oil were assessed for their potential mosquito repellent activity. This study was approved by the Ethics Review Committee, University of Kelaniya, Sri Lanka, and ethical clearance was obtained before commencing the study. All of the bio-efficacy tests were conducted according to the World Health Organization (WHO) regulations and guidelines for efficacy testing of household insecticide products. In field studies, a total of 12 developed coil formulations were tested in six different locations using adult human volunteers against a free-flying mosquito population, and efficacy was assessed in terms of biting inhibition. Preliminary laboratory studies were conducted in a glass chamber (20 cm x 20 cm x 20 cm in size) using sucrose-fed female *Aedes aegypti* mosquitoes (2-7 days old) with three replicates for each coil formulation. The number of knocked-down mosquitoes was counted at regular intervals for 60 minutes, and knock-down time (KDT_{50} & KDT_{90}) and mortality of the mosquitoes were recorded after post-exposure to the smoke. The results from the field studies showed that five coil formulations are effective in repelling mosquitoes for 6 hours, with low to average smoke visibility, good- satisfactory odour, and no irritability. From the laboratory studies, the same coil formulations could be identified as having fast mean knock-down times and higher 24-hour post-mortality values above 80%. Therefore, through this study, it can be concluded that these coil formulations with neem: *maduruthala*: betel: citronella: cinnamon ratios, respectively, 1:3:1:1:1, 1:1:3:1:1, 1:1:1:3:1, and 1:1:1:1:3 are more efficient in repelling mosquitoes compared to other formulations and the plant materials used in this study have components capable of repelling mosquitoes individually or collaboratively. Further laboratory studies and field studies of a larger study population at different geographical locations with a higher number of replicates are required for the commercialization of these mosquito coil formulations as herbal mosquito repellents.

Keywords: *Aedes aegypti,* Bio-efficacy-testing, Herbal-plants, Mosquito-coil, Natural-repellents,

Abstract No: MO-17

Development of a reduced fat ice cream by utilizing buttermilk and oats (*Avena sativa*)

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Currently, people are inclined towards smart dieting and nutritional nourishment. This trend is also seen in the consumption of ice cream too. With that drive to healthier ice cream, free-fat, low-fat, and fat-reduced products which are made with 25% less fat than the reference ice cream, are also becoming mainstream in the ice cream market. Therefore, this study was carried out to develop a reduced-fat ice cream by utilizing buttermilk and oats with high sensory attributes. Buttermilk is a byproduct of butter production that has good technological features, excellent nutrition, and health-promoting properties such as reducing levels of bad LDL, improving cardiovascular health, etc. Oat is an incredibly nutritious cereal with a bunch of health benefits, including hypocholesterolemic and anti-cancerous properties. The incorporation of oats improves the overall quality of production. Ice cream mixes were prepared by adding 50.3%, 57.09% and 53.08% buttermilk instead of milk. Treatments included 0%, 4%, 6%, and 8% oat flour while reducing the amount of milk cream by 21%, 12%, 8.8%, and 5%, respectively. After that, prepared products were subjected to physicochemical analysis (melting rate, pH, titratable acidity, fat, protein, fibre, and moisture), microbial analysis, and texture analysis by a texture analyzer. Moreover, sensory quality was evaluated on a seven-point hedonic scale by 35 untrained panellists. The over-run values of the ice creams that were tested ranged from 60-70%. The protein content, fibre content, overrun value, and melting resistance of ice cream samples were increased as the percentage of oat flour increased, but fat contents were decreased. There were negative results for *E. coli* and *Salmonella,* which fulfil the SLS specification for ice cream. The sensory evaluation with the Friedman test revealed all sensory parameters were significantly different except colour ($P<0.05$). Ice cream with 4% of oat flour was selected as the most acceptable treatment for sensory attributes. Buttermilk can replace milk with an economical benefit due to a byproduct of butter. There was 36% total solid in 4% oats incorporated ice cream. It is recommended that 4% of oats flour with buttermilk ice cream have higher sensory attributes with 2.5% protein, 0.42% fibre, and 5.5% fat content while satisfying the level of the fat content of a reduced fat ice cream, which would be an innovative product to the market.

Key words: Buttermilk, Ice cream, Oats, Reduced fat.

Abstract No: MO-18

Drinking water treatment plant sludge as a potential adsorbent for the removal of Cadmium in wastewater

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Water pollution by heavy metals is a critical environmental issue that causes the deterioration of both human and ecosystem health. Cadmium (Cd^{2+}) is a heavy metal that is non-biodegradable and bioaccumulated through food chains. It also acts as a severe human carcinogen. Adsorption is an effective wastewater treatment method for removing heavy metals from wastewater which is limited due to the high cost of conventional adsorbents. In Sri Lanka, drinking water treatment plant sludge is being produced in large quantities and disposed on landfills without proper usage and exacerbating solid waste problems. The present study investigated the potential of using drinking water treatment plant sludge for the removal of Cd^{2+} by adsorption from wastewater. The effect of pH, initial Cd^{2+} concentration, and contact time on adsorption of Cd^{2+} onto drinking water treatment plant sludge was examined. Adsorption isotherm studies and kinetic studies were carried out to describe the adsorption mechanism of Cd^{2+} onto drinking water treatment plant sludge. The Langmuir and Freundlich isotherm models were used for isotherm studies. The pseudo first-order and pseudo second-order models were used in kinetic studies. The experiments on effect of pH on adsorption of Cd^{2+} in the range of pH 3 - 8 showed that adsorption is maximum when medium is basic (pH 7-8). The experiments on effect of initial Cd^{2+} concentration on adsorption showed that with the increase in initial Cd^{2+} concentration ($2.5 – 100$ mg L^{-1}), the adsorption capacity of drinking water treatment plant sludge increased reaching to a maximum adsorption capacity of 14.6 mg g^{-1}. Cd^{2+} was well fitted to the Langmuir isotherm model indicating monolayer adsorption on a homogeneous adsorbent surface with identical active sites. The experiments on effect of contact time on adsorption showed that adsorption of Cd^{2+} onto drinking water treatment plant sludge increased with the increase in contact time and then reached the equilibrium within 4 hours of contact time. The kinetic studies showed that adsorption of Cd^{2+} onto drinking water treatment plant sludge was well described by both pseudo first-order model ($R^2 = 0.9633$) and pseudo second-order model ($R^2 = 0.9334$) indicating that both chemical and physical adsorption contribute to the adsorption of Cd^{2+} onto drinking water treatment plant sludge. Therefore, this study proves that drinking water treatment plant sludge is an effective, low-cost adsorbent for removing Cd^{2+} in wastewater. Therefore, future studies are required to be conducted on the field scale application of drinking water treatment plant sludge which will be beneficial for cost-effective wastewater treatment, especially in developing countries.

Keywords: Adsorption, Heavy metals, Isotherm models, Kinetic models, Wastewater treatment

Abstract No: MO-19

Comparative study of recycled papers to be used as an alternative for food packaging: quality assessment and heavy metal migration testing

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The permanence and durability of recycled papers are important as virgin papers are chosen for the definitive end-use. The main objective of this study was to assess the paper quality of recycled papers used as an alternative for food packaging. Three types of recycled papers, Brown Kraft papers (R1), Yellow Kraft papers (R2), and White papers (R3), were collected. Physical parameters; grammage, thickness, burst strength, tensile strength, water absorptiveness, chemical parameters; pH and optical parameters; opacity, brightness, and whiteness of the selected papers were tested using standard methods. At first, sample papers were subjected to accelerated ageing by keeping them in a closed ageing chamber at 50 % relative humidity and 90°C (ASTM D4714 method). Samples were tested after accelerated ageing of 3 days, 7 days, 14 days, 21 days, and 28 days, similar to the natural ageing of 0, 384 days, 2.5 yrs., 3.5 yrs., 4.9 yrs., 7.4 yrs., and 9.8 yrs., respectively. Heavy metal migration test was done to evaluate the suitability of the recycled papers as food packaging material. Five different food types, burgers, pizza, Sausages, candy, and chocolates, were selected, and 500 g of each food type was wrapped with 2 dm^2 sized recycled papers stated above and kept for 72 hours in normal laboratory conditions. Three replicates were used for each food type. The presence of heavy metals in food samples was extracted using a 3% (v/v) metal¬ free solution of acetic acid for 24 hours at 40°C. At the end of the treatment, contact liquid was collected and analyzed for heavy metals using atomic absorption spectroscopy (AAS). The presence of heavy metals in food packaging materials was compared with four different food packaging standards. Opacity has increased in all the recycled papers with accelerated ageing. Other parameters showed a decreasing trend over time. All three types of recycled papers failed the water absorptiveness test after accelerated ageing on day 3. Changes in pH varied from alkaline to neutral (pH 9.1 to 7.4) in recycled papers over time. In conclusion, all the recycled papers are not suitable for printing and writing as they fail water absorptiveness. As parameter changes can be observed after accelerated ageing of 21 days in recycled papers, they can be used as archival or artist's paper for 7.4 years without discolouring or deteriorating. The Recycled papers produced in this study can be recommended for food packaging as they show the highest permanence in terms of tensile and burst strength. However, as recycled papers fail the water absorptiveness, it is recommended to use them to pack dry food. The available amounts of heavy metals present Cu, Zn, Mn, and Cr are not exceeded within the EU, EC, EPA, and SLS food packaging standards for recycled papers. Ni was not detected in R1, R2, and R3 recycled papers. However, according to the Council of Europe standard, it exceeds the permissible Pb level in food packaging materials. When considering the migration of heavy metals from recycled papers into food, R1, R2, and R3 recycled papers can be recommended for food packaging as per the EPA, EC, and SLS standards without further treatments. Food items with high levels of fatty acids facilitate the higher migration of heavy metals compared to food items with lower fatty acid levels.

Keywords: Accelerated ageing, Heavy metals, Migration test, Recycled papers.

Abstract No: MO-20

Attitudinal and behavioural changes in Coconut (*Cocos nucifera*) oil consumption with the occurrence of Aflatoxin contamination in Sri Lanka

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In the recent past, there was a serious controversy within the Sri Lankan community since certain imported coconut oil brands were detected unsafe for consumption as they exceeded the permissive aflatoxin levels. The present study investigates the noticeable changes in consumption patterns and behaviours as well as the degree of awareness of households on basic information regarding aflatoxin contamination. The survey study was conducted with the participation of 521 households representing Western and Southern provinces. A simple random sampling method was used as the sample design. Data were gathered using a self-administered questionnaire which was distributed through different media. Collected data were analyzed using the social science statistical program IBM SPSS 25, along with Microsoft Excel with Data Analysis Add-in. The results showed that 91.2% of respondents are aware of aflatoxin as a potential hazard, while only 42.8% were concerned about different aspects of aflatoxin contamination, up to a considerable level. Out of the coconut oil consumers, 12.6% did not have a proper idea about the reasons for the aflatoxin contamination. A few participants (1.6%) stated that aflatoxin has no adverse effect on human health, while the majority (91.6%) believed the main effect is the carcinogenic effect. Many agreed that buying a local reputed oil brand (54.6%) and preparing your own at household levels (66.8%) are the best control measures that can be taken at household levels. Although 93.3% of respondents showed a positive interest in learning more about this food safety concern, there is no significant association ($p > 0.05$) between the highest education level of the consumers and the awareness of aflatoxin contamination as per the cross-tabulation and Chi-square test. According to the Paired sample T-test, the purchasing places, factors affecting purchasing decisions, and the buying frequency have changed significantly ($p < 0.05$) based on the different perceptions regardless of educational level. But most of the consumers did not shift to an alternative oil instead of coconut oil, while 22% have started using different oils. The significant factor considered at the purchasing point was changed from brand to standards and specifications, and the concern for the nutritional attributes has also increased after the incident. There is no correlation between the factors that affected the purchasing decisions before and after the issue ($p > 0.05$). The study concluded that the majority of coconut oil consumers have a satisfactory awareness of the potential hazard of aflatoxin, and the consumption patterns and purchasing decisions have deviated significantly after the incident. The trends and habits rather than knowledge and greater awareness on the matter are seemed to be accountable for these behavioural changes. Therefore, the relevant authorities should induce consumer education campaigns to enhance the awareness of consumers on these food safety issues, which will lead them to assure health safety and confidence in coconut oil products. Moreover, quality and safety analyses of coconut oil manufactured on small, medium, and large scales will be conducted to gain in-depth knowledge as future projects align.

Keywords: Aflatoxin, Awareness, Coconut oil, Consumer behaviour, Sri Lanka

Abstract No: MO-21

Understanding drug likeness of novel compound Fucoxanthin derivative isolated from *Chnoospora minima*

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Non-communicable diseases pose an ever-increasing burden to many worldwide, regardless of gender, age, and nationality. In Sri Lanka, type 2 diabetes is prevalent due to the rapid transition of lifestyles, unhealthy dietary changes, and population demographic changes, which could be why the epidemic is escalating in South Asia. Advances in chemical biology have expanded the understanding of the marine environment as a diverse source of important bioactive compounds. These organisms include animals, microorganisms, and, most importantly, marine algae. Previously, a derivative of Fucoxanthin has been successfully isolated from Marine algae C*hnoospora minima*, and this study characterizes and studies the compound computationally using *in-silico* solubility, toxicity, and molecular docking studies. The compound was drawn using ChemDraw (version 12.0) and was energy minimized using Chem3Dpro (version 12.0). The energy-minimized structure was used in further analysis. Toxicity and aqueous solubility predictions were conducted using OSIRIS Property Explorer. The solubility was expressed in mol/l, and the value of the corresponding log was -6.17. Nearly 80% of the drugs on the market have an estimated logS value greater than -4. Therefore, the compound displays a lower solubility. The partition coefficient of the compound was predicted in cLogP value, which was -8.91. Chemical Property prediction such as half-life, AMES toxicity, and degradation patterns of the compound was made using the EPIsuite (version 4.11). The compound was deemed nontoxic and had a half-life of 14.603 Min. The compound was classified as recalcitrant in terms of bio-degradation. Auto dock tools (version 4.2.0) were used for molecular docking studies against human pancreatic α-amylase and α-glucosidase proteins, and the binding energies were -6.56 kcal/mol and -4.83 kcal/mol, respectively. The ligand formed hydrogen bonds with the protein residue of α-amylase, Arg92, and Asn250, and the residues Pro690, Arg696, and Leu811 were essential for α-glucosidase and ligand binding. The docking procedure was repeated for both proteins with the known drug Acarbose as the ligand. For α-amylase protein binding energy was -4.08 kcal/mol and for α-glucosidase protein binding energy was -3.40 kcal/mol. The data suggest that the novel ligand shows high suitability as a drug based on docking studies. The data suggest that the novel compound could be developed into a herbal supplement against type- 2 Diabetes Mellitus.

Keywords: Bioactive compounds, *Chnoospora minima*, Drug discovery, *In-silico* assays

Abstract No: MO-22

Health risk analysis of toxic metals via consumption of rice and other food species grown in Mahakanadarawa - Maradankulama areas in Anuradhapura district; A study in Sri Lanka

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Chronic Kidney Disease of unknown etiology (CKDu) is a heterogeneous disorder that impairs kidney functions and structure. Even though a number of studies were conducted on this issue, a specific reason has not yet been discovered. Unexpected contaminants have harmed crop quality in recent decades, threatening food security and human health. This study was designed to assess the status of toxic metal contamination of frequently consuming food species in selected Maradankulama - Mahakanadarawa Grama Niladari (GN) divisions to evaluate the link between CKDu prevalence and food safety in the selected areas. Maradankulama - Mahakanadarawa GN divisions in Anuradhapura district, Sri Lanka, were selected as the sampling areas. The sampling procedure was conducted in April (2022). Food samples, including (rice grains of *Oryza sativa;* n=25, leaves of *Centella asiatica;* n=25, fruits of *Citrus crenatiflora;* n=18, grains of *Vigna radiate*; n=10) were collected from the villager's own paddy fields, and home gardens of the CKDu suspected patients according to the random stratified sampling method and the collected food samples were digested by microwave digestion. (added 8.0 mL of conc. Nitric acid to 0.2 g of food sample and digested) The concentrations of metal ions in food samples, including Cadmium, Nickel, Chromium, Copper, Iron, Manganese, Lead, Zinc, Arsenic, and Calcium, were measured using the Inductive Coupled Plasma technique (ICP). Statistical analysis was done using SPSS Statistics Software. Accordingly, mean As and Pb concentrations of *Oryza sativa* (As-0.15 mg/kg, Pb-3.10 mg/kg) and *Citrus crenatiflora* (As-0.15 mg/kg, Pb-0.47 mg/kg), Pb (0.65 mg/kg) and Cd (0.05 mg/kg content in *Centella asiatica,* and mean concentrations of As (0.14 mg/kg), Pb (9.25 mg/kg) and Cu (57.8 mg/kg) in *Vigna radiate* exceeded the permissible limits given by the FAO and WHO, 2011 (As-0.1 mg/kg, Pb-0.1 mg/kg, Cd-0.05 mg/kg, Cr-2.3 mg/kg, Cu-40 mg/kg). In addition to Pb, Cd, As, Cr and Cu, other detected metals have not exceeded the permissible limits in all samples. According to the Target Hazard Quotient (THQ) values of Cr exceeded the threshold value of 1 for all food species. In addition to that, Pb is also considered a toxic element, and THQ values of Pb in *Oryza sativa* and *Vigna radiate* reported noticeably high values. The total EDIs (Estimated Daily Intake) of Cr, Ni, Cd, As, Cu and Pb for all selected food samples studied have not exceeded the maximum tolerable daily intake (MTDI). Considering the resident's complete diet, these EDIs can be enhanced. As a result, the consumption of analyzed rice, leafy vegetables, and legumes was deemed unsafe, and their regular consumption may cause a risk for the prevalence of CKDu in selected areas.

Keywords: CKDu, Food safety, Health risk, Heavy metals, Nephropathy.

Abstract No: MO-23

A literature review on the antimutagenic effect of *Thriphala* wsr to *Rasayana* therapy

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Plants have been a prime source of highly effective medicinal preparations for the treatment of many forms of cancer. Mutations are capable of altering the genome, having an immense potency to create defects in the human body. They are reflected as hereditary disorders or cancer. At present, cancer has become a leading cause of death worldwide accounting for nearly 10 million deaths according to World Health Organization Statistics 2020. Mutagens play a key role in cancer whereas antimutagens counteract with the action of mutagens thereby curing cancer. Bestowing the normal functions and equilibrium of anatomical structure of the *Dosha Dhatu* (cells and tissues) is one of the major qualities of *Rasayana* (rejuvenative) therapy, which is one of the eight branches of Ayurveda. *Rasayana* therapy is defined as preventing senility by stabilizing youthfulness, eliminating disease and promoting longevity. *Thriphala* being a composition of *Terminalia chebula, Terminalia bellerica and Phylanthus emblica* is a frequently used medicine in *Rasayana* Therapy among its many other therapeutic uses. The main objective of this study was to review the relationship between the anti-mutagenic effects of *Thriphala* with special reference to *Rasayana* Therapy. This study was carried out as a review study and data were collected from published research articles and authentic Ayurveda texts. Among Pharmacodynamic properties described in authentic texts, *Kashaya Rasa, Laghu, Ruksha Guna, Ushna Veerya* and *Madhura Vipaka* were the most prominent. According to reviewed data of previously published research articles, *Thriphala* contains bioactive compounds such as flavonoids, saponins, anthraquinones, amino acids, fatty acids and various carbohydrates. Among them tannins, gallic acids, ascorbic acid are the major constituents mentioned to be accountable for immunomodulatory action which is achieved by inhibiting, activation of mutagens, blocking and anti-oxidation action claimed to be as anti-mutagenic. Considering the relationship between *Rasayana* and antimutagenic effect, *Agni* promoting action which is one of the predominant pharmacological attributes of *Thriphala*, is not only confined to *Jatharagni* (Digestive fire) and *Sapthadhathu Agni* (Tissue level metabolism) but also to the *Panchabhutha Agni* (Cellular level metabolism). Hence molecular targeted therapeutics are more efficient in destroying cancer cells and eradicating them at molecular levels. Therefore, the process of cell division takes place at its optimal state without any interruption, where *Panchabutagni* eliminates *Aama* at the cellular level, which can be correlated with mutagens. This process enhances the immunity of cells and tissues by imparting resistance against cancer. Hence, using *Thriphala* on a regular basis is proven to be beneficial in Ayurveda practice. Further pharmaceutical analysis of individual ingredients and compounds *Thripala* and clinical studies will be carried out to evaluate the efficacy of *Thripala* in therapeutic effect of *Rasayana* in cancer therapy to scientifically validate the results.

Keywords: Anti mutagenic effect, Cancer, *Thriphala, Rasyana* Therapy.

Abstract No: MO-24

Development of an eco-friendly and cost-effective novel preparation of herbal textile – An *Ayurvastra*

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Ayurveda is an ancient system of medicine that focuses on the preventive or prophylactic and curative aspects of health. 'Ayurvastra' is a combination of the words 'Ayuh' and 'Vastra'. *Ayuh* refers to long life and *Vastra* means clothing. The process of developing medicinally treated fabric involving *Ayurveda* to preserve health in an eco-friendly manner is a great way of adopting a healthy life. *Ayurveda* has endless scope to capture the global market for *Ayurveda* products. Foreign currency earnings by *Ayurveda* in 2020 was US$ 4571.7 million. The objectives of this project were to develop a novel preparation of *Ayuvastra* treated by herbal raw materials with natural dyeing process to provide human friendly textiles to preserve natural health of people, to introduce eco-friendly manufacturing process of herbal extracts treated clothes for modern textile industry instead of chemical dyeing process and to enhance the trend of use of herbal treated fabrics in Sri Lankan textile industry targeting with international fabric market. In this study, the pharmaceutical analysis of selected herbal raw materials (Aralu- *Terminalia chebula*, Neem- *Azadirachta indica*, Turmeric-*Curcuma longa*, Lime-, *Citrus aurantifolia*) were reviewed from previous research articles. Reviewed pharmaceutical analysis of bioactive ingredients of selected plants' raw materials showed anti-septic, anti-allergic, antifungal, anti-inflammatory, antimicrobial, and immunomodulatory in antioxidant properties. The sample was prepared following several cryogenic procedures. Selected cotton graige fabric was bleached with lime juice and the gumming process was conducted by immersion in *Aralu* decoction, then soaked into filtered Neem and Turmeric decoction, and heated under mild flame while being stirred. The medicinally treated cloth was washed by diluted decoction to remove additional colour and dried in air. As per reviewed data, it can be concluded that *Ayurvastra* can be used for skin infections, eczema, hypertension, asthma, diabetes and a broad range of diseases and it is based on the therapeutic effect of used herbal raw materials for manufacturing. Further, pharmaceutical analysis will be conducted to evaluate therapeutic efficacy of medicinally treated fabrics.

Keywords- *Ayurvastra,* Markets, Manufacturing, Medicated fabrics.

Abstract No: MO-25

Assessment of the potential distribution areas for two endemic plant species of Sri Lanka under climate change by species distribution modelling

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Climate Change is arising as a major threat on biodiversity. Long term climatic conditions have direct links with the occurrence or prevalence of a species in a particular locality. Early predictions facilitate making necessary management options to reduce the negative impacts of this phenomenon. *Calophyllum walkeri* is a severely affected species from the dieback. It has a conservation status as vulnerable. *Syzygium rotundifolium* is a range restricted species. Both are endemic to Sri Lanka and dominant species in montane forests. The objective of this study was to predict the best suitable areas for both species currently and by 2070. Maximum Entropy (MaxEnt) modelling method was used, due to its accuracy and well performance even with small sample sizes as the number of records for *Calophyllum walkeri* was very low. Secondarily obtained data from the National Herbarium for the whole country were used for *Calophyllum walkeri* (n=29) and primarily obtained presence only data by field surveys covering the whole study area namely Horton Plains National park along with secondary data for less accessible places for *Syzygium rotundifolium* were used as species occurrence data (n=55). Climate data were obtained through the databases of WorldClim website which contains climate data as spatial data with high resolution, specifically have been developed for spatial modelling activities. Average monthly weather data for 2010-2018 with 2.5 minutes spatial resolution were used as current climate data and future climate data for 2070 for *MIROC6,* Global Circulation Model climate projection with 30s spatial resolution were used as future climate data. All the cllimate data were converted into *ascii* format by using ArcMap 10.2.2 and occurrence data were converted into *csv* format and introduced into the model while selecting random test percentage as 25%. Nuwara Eliya district along with some parts of Kandy and Matale districts were resulted as the best areas for *Calophyllum walkeri* currently, while Ratnapura and Kegalle districts show moderate suitability. There is a possibility in reduction of suitability in Kandy and Matale districts in 2070 while Nuwara Eliya district will remain as the best area. There is a possibility of wet zone of the country to become suitable for *Calophyllum walkeri* including Batayaya, Denuwakanda, Dolekanda. For *Syzygium rotundifolium,* Nuwara Eliya district was the best suitable area and Ratnapura district indicated slight suitability under both current and future climate conditions. The resulting value for the Area Under Curve test which is a main statistical test of this modelling method for *Calophyllum walkeri* was 0.947 and it was 0.968 for *Syzygium rotundifolium*. Since these values are greater than 0.5, the models have performed accurately. This study recommends further studies to check the possibility of the wet zone of the country including Western and Southern regions which was resulted as a suitable region with the changing climate, to introduce *Calophyllum walkeri* in a requirement to take more conservation efforts. Conservation efforts for *Syzygium rotundifolium* can be increased within the montane region, since it is the most suitable area for it, according to the results of this study.

Keywords: *Calophyllum walkeri,* Climate change, Maximum Entropy, *Syzygium rotundifolium*

Abstract No: MO-26

Human dimension of plastic pollution in Sri Lankan coastal ecosystems: strategizing community-based solutions

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Plastic pollution has become a pervasive environmental issue and has gained considerable attention recently. Plastics have been redefined more easily. However, they have left harmful imprints behind. The intensity of plastic pollution along the coastal areas of Sri Lanka has been rising during the past decade, which requires immediate action. Understanding public perceptions, opinions, and knowledge about plastic pollution is a critical step in effectively engaging society. Changing human behaviour is needed in order to reduce plastic debris inputs. While Sri Lanka is home to plenty of coastal habitats, plastic pollution aided by fisheries, tourism, improper waste management practices and maritime activities have become a primary factor in degrading the ecological balance. The present study focused on understanding the public perceptions regarding plastic pollution in the coastal ecosystems of Sri Lanka. The research was conducted using an online questionnaire survey with participants selected with their relevance to marine protection covering 960 samples. Overall, the survey results indicate that the public views plastics as a serious environmental issue. Results indicate that 86% of respondents believe the coastal ecosystems are under threat by plastic inputs, and 90% believe the threat has been increasing. About 90% of the respondents have a potential knowledge of the coastal ecosystems in Sri Lanka and their significance. Notable ecosystems that respondents are familiar with beaches (92%), lagoons/estuaries (76%), followed by mangrove/seagrass (60%). Ninety-two percent of respondents indicated a desire to reduce plastic use, and the majority of respondents believe that paper (32%) and cloth (30%) are more environmentally friendly alternatives to plastics. However, the results showed that many respondents are not willing to reduce plastic usage immediately. When it comes to plastic pollution abatement, the majority (69%) of the respondents believe that the solutions should arise from the community, while significantly some others (21%) propose stern government contribution. Overall, a clear picture emerged of the perceived threats and support for coastal protection, which can be informed marine managers, policymakers, conservation practitioners, and educators to improve marine management and conservation programs. The outputs from the research can contribute toward developing adequate, appropriate strategies to address the issues of plastics and foster community-based methodologies to conserve the coastal ecosystems from plastic pollution.

Keywords: Coastal ecosystems, Conservation, Plastic pollution, Public perception, Sri Lanka.

Abstract No: MO-27

Synthesis and evaluation of phenyl hydrazone derivatives as tyrosinase inhibitors

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Melanogenesis which refers to the process of melanin formation and distribution is controlled by epidermal units in the skin. The activation of tyrosinase, a key enzyme that plays a major role in propagation of melenogenesis, is boosted when the skin is exposed to UV radiation. Abnormal melanin production in the skin resulting in highly pigmented patches could cause an esthetic concern. Therefore, inhibitors of tyrosinase could be an attractive treatment option for hyperpigmentation. Although several natural, semisynthetic, and synthetic down-regulators of tyrosinase have been discovered to date, the development of novel selective and effective classes of tyrosinase inhibitors that are less toxic to human health are still under development stage. In this study, four Schiff bases, 4-[(*E*)-(phenylhydrazono)methyl]phenol (K-1), 2-[(*E*)-(phenylhydrazono)methyl]phenol (K-2), *N*-benzylidene-*N*'-phenyl-hydrazine (K-3) and *N*-(4-methoxy-benzylidene)-*N*'-phenyl-hydrazine (K-4) were synthesized by refluxing phenyl hydrazine in 95% ethanol with 4-hydroxy benzaldehyde, 2-hydroxy benzaldehyde, benzaldehyde and 4-methoxybenzaldehyde respectively. The structures of the synthesized compounds were confirmed by FT-IR, ^{1}H-NMR, and ^{13}C-NMR experiments. Inhibitory potentials of the synthesized derivatives were examined against *Agaricus bisporus* mushroom tyrosinase. L-DOPA was used as the substrate in the enzyme assay. The inhibition of tyrosinase activity by kojic acid (the standard tyrosinase inhibitor), K-1, K-2, K-3 and K-4 at 1 mg mL^{-1} were measured and were 62.89%, 63.55%, 56.45%, 39.95% and 37.03%, respectively. These results demonstrate that all synthesized compounds possessed tyrosinase inhibitory activity *in-vitro* at the measured inhibitor concentration. It's evident that K-1 and K-2 which have hydroxyl groups attached to the para and ortho positions of the aryl aldehyde, respectively play a vital role in the potency of the compounds. Moreover, the hydroxy group in the para position showed a more pronounced inhibitory activity than in the ortho position.

Keywords: Human skin, Tyrosinase inhibition, Phenyl hydrazones.

ABSTRACTS OF POSTER PRESENTATIONS

Abstract No: BP-01

Effect of organic and inorganic sources of fertilizer on
seed germination of *Solanum melongena* var "Lena iri"

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Considering the problems associated with the use of synthetic agrochemicals, people prefer organic food. Hence there are trends toward organic farming in the world. Organic fertilizers contain the essential nutrients for plant growth, are environmentally friendly, and increase soil microbial activity. In the current study, the germination of brinjal (*Solanum melongena*) seeds was examined in relation to the effects of seven different types of organic fertilizers (chicken manure, cow dung, goat manure, rice husks, compost, vermicompost, and a mixture of all above), a commercial inorganic fertilizer (positive control), and a soil and coir dust mixture without the addition of any organic or inorganic fertilizer (negative control). Sieved organic fertilizers given above were mixed as follows: 50% of each type of organic fertilizer was mixed with 40% soil and 10% coir dust. The inorganic fertilizer mixture was prepared with 90% soil, 10% coir dust and 2 g (recommended by the producer) of commercial inorganic fertilizer. Negative control was prepared by mixing 90% of soil and 10% of coir dust without adding any type of organic or inorganic fertilizer. Equal amounts of soil mixtures were filled into plastic trays (30 cm x 20 cm). Each treatment and controls were tested in triplicate and arranged in a complete randomized design. Seeds (32) were sown in each tray and equal amount of water was added to each tray as required. The number of total seedlings in each replicate was counted daily for 42 days until seedlings reached to transplanting stage. Seed germination percentage and germination index were calculated, and data were statistically analyzed by using one way ANOVA test. According to the results of One-Way ANOVA test, there was a significant difference in average seed germination percentage ($p = 0.001$) and in average germination index ($p = 0.000$) among the treatments. Significantly high germination percentage and germination index were observed in negative control containing 90% of soil and 10% coir dust. This finding indicates a low impact of all types of organic fertilizers applied in germination of *S. melongina* seeds. A similar impact to that of negative control was also observed with commercially available inorganic fertilizer used. Compost, vermicompost and the mixture of organic fertilizers exhibited a medium germination percentage while Cow dung, Goat manure, Chicken manure, and Rice husks showed a much lower impact on seed germination percentage. When comparing seed germination rates, chicken manure showed the lowest germination rate while the other organic fertilizers exhibited medium germination rates. Only 50 % of each of the organic fertilizer was used in mixture as the seeds have some amount of stored food to be used during germination and recommended that large amounts of fertilizers are not necessary for germinating seeds. But it was evident that still the use of 50% of organic fertilizer by weight had a negative effect on seed germination of *S. melongena* and could be due to the phenomena called nutrient toxicity and hence application of 50% organic fertilizer is not recommended for the seed germination of *S. melongena*.

Keywords: Inorganic fertilizer, Organic fertilizer, Seed germination index, Seed germination percentage, *Solanum melongena*

Abstract No: BP-02

Identification of geographical origin using selected elements in tea produced in different tea regions of Sri Lanka

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Tea, derived from the leaves and buds of the shrub Camellia sinensis, is one of the world's most popular beverages owing to its unique flavour, aroma, and therapeutic properties. Due to the tendency for heavy metal accumulation in the plant, processed tea needs to be analyzed frequently to ensure its adherence to maximum limits in international standards. However, recent data is not available on the metal content in Ceylon tea. Ceylon Tea grown in certain geographical areas in Sri Lanka has also gained great popularity in the global tea market mainly due to its unique taste characteristics. As a result, identifying the geographical region of production for Ceylon tea is important to ensure its authenticity as well. Therefore, this preliminary investigation aimed to determine the content of twenty-seven elements and build a simple model that could be used to distinguish the geographical origin of Ceylon tea using processed tea leaves. Four samples each were selected from factories in all seven tea growing regions of Sri Lanka except from Nuwaraeliya (3 samples) and Kandy (2 samples) and analyzed using Microwave digestion and Inductively Coupled Plasma-Mass Spectrometry (ICP-MS). Statistical evaluation was conducted with a one-way analysis of variance (ANOVA), Pearson's correlation, and cluster analysis with a dendrogram using Minitab 19 software package. A relatively high number of elements; Be, U, Ag, Ga, Tl, Li, Cs, Cd, As, and V were found within the range of 0.01-1.0 (mg/kg) and only Co, Pb, Ni, and Cr were in the range of $1.0 - 10.0$ (mg/kg). Se, Sr, Ba, Rb, and Cu were in the range of $10.0 - 100.0$ (mg/kg). Metals such as Zn, In, Fe, and Mn were detected in concentrations below 1000.0 mg/kg. And above 1000.0 mg/kg were the elements Al, Mg, Sn, and K. These results revealed that other than Pb, the content of all other metals was below the maximum limits recommended by the Sri Lanka Tea Board. Furthermore, in cluster analysis, Tl, In, Ga, Ag, Cs, and U mainly contributed to the variability across regions. Therefore, based on the limited number of samples analyzed, there is a possibility to use those six elements to identify the region of production. However, this needs further confirmation considering a greater number of samples and the heterogeneity of metal content in the soil in corresponding tea-growing regions to provide a broader understanding of the correlation between levels of the metals in tea leaves and its native soil.

Keywords: Camellia sinensis, Cluster analysis, Elements, Geographical origin, ICP-MS, Tea

Abstract No: BP-03

Larvicidal effect of extracellular extracts of *Trichoderma longibrachiatum* and *Trichoderma viride* against *Aedes aegypti*

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Aedes aegypti is a potential vector for transmitting dreadful diseases such as yellow fever, ZIKA, dengue and chikungunya, leading to global health problems. However, there is no warranted controlling method for these diseases other than controlling the vector. Apart from destroying breeding sites, use of larvicides is also important in larval control of the vector. Synthetic chemical insecticides, which dominate mosquito control programmes, are hazardous and exert unwarranted toxicity on non-targeted organisms, and lead to develop physiological resistance in target insects. Therefore, environmentally friendly, fungal mediated insecticides have been a priority at present. In current study, larvicidal effect of extra cellular fungal extracts of *Trichoderma longibrachiatum* and *Trichoderma viride* against 3rd instar larvae of *Ae. aegypti* was investigated. The fungi were grown in Richard's broth medium containing glucose, agar, potassium nitrate, potassium dihydrogen phosphate, magnesium sulphate and ferric chloride. Eighteen different test concentrations of extracellular fungal filtrates, in a range from 0.625gL^{-1} to 175gL^{-1}, were prepared and batches of 25 number of laboratory reared 3rd instar larvae of *Ae. aegypti* were exposed to each test concentration separately with three replicates. Control bioassays were conducted with distilled water and larval mortality was recorded after 24 and 48 hour exposure periods. Results revealed that extracellular extracts of *T. viride* exhibited high larvicidal activity against *Ae. aegypti* larvae compared to the larvicidal activity of *T. longibrachiatum.* LC$_{50}$ values for 3rd instar larvae of *Ae. aegypti* at 24 hours to the extracellular extracts of *T. viride* and *T. longibrachiatum* were 99.92 gL^{-1} and 114.98 gL^{-1} respectively whereas LC$_{50}$ values at 48 hours of exposure to the extracellular extracts of *T. viride* and *T. longibrachiatum* were 92.46 gL^{-1} and 108.71 gL^{-1} respectively. This study concludes that extracellular fungal extracts of *T. longibrachiatum* and *T. viride* can act as potential larvicides against *Ae. aegypti* and they can be used as alternatives for hazardous synthetic insecticides.

Abstract No: BP-04

Preliminary studies of antibacterial and antifungal properties of typical Sri Lankan curry powder

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Curry powder is a mixture of ground spices that are typically used to enhance flavour, aroma, colour, and consistency in curries. The common Sri Lankan curry powder consists of coriander seeds (*Coriandrum sativum L.*), cumin seeds (*Cuminum cyminum*), fennel seeds (*Foeniculum vulgare Mill.*), cinnamon sticks (*Cinnamomum zeylanicum*) and curry leaves (*Murraya koenigii*) as main five ingredients. Mostly, these ingredients are used according to a suitable ratio (coriander: cumin: fennel: cinnamon: curry leaves, 16: 8: 4: 2: 1, respectively) in the mixture. This study evaluates antibacterial activity of common Sri Lankan curry powder against *Escherichia coli**, Staphylococcus aureus*, and *Klebsiella pneumoniae* and antifungal activity of common Sri Lankan curry powder against *Candida albicans* and *Aspergillus welwitschiae*. The agar disk diffusion method was used to determine the antibacterial effect of curry powder and each of the spices in curry powder individually on microbial growth of *S. aureus, E. coli*, and *K. pneumoniae* bacterial strains. Aqueous extracts of the spices were used for the study. Similarly, the agar disk diffusion method was done for both *C. albicans* and *A. welwitschiae* and the spore germination inhibition analysis was done for *A. welwitschiae* to determine the antifungal activity. Bacterial strains with different OD_{600} values (*E. coli, S. aureus, K. pneumoniae,* and *C. albicans,* with OD_{600} values of 0.3, 0.4, 0.2, and 0.4, respectively) were used in the agar disk diffusion method. Distilled water was used as the negative control for both bacterial and fungal strains. Amoxicillin was used as the positive control for all bacterial strains and carbendazim was used as the positive control for fungal strains. The spore suspension of *A. welwitschiae* was used for spore germination inhibition analysis. *A. welwitschiae* growth was observed through phase contrast microscope with distilled water as the negative control and curry powder mixture as the test sample. It was observed that coriander showed antibacterial activity against *E. coli* (0.7 0 cm) and *K. pneumoniae* (0.7 0 cm). Cinnamon showed antibacterial activity against *E. coli* (0.8 0.1 cm) and *K. pneumoniae* (0.7 0 cm). Curry leaves showed antibacterial activity against *E. coli* (0.7 0.1 cm) and *S. aureus* (0.7 0 cm). Cumin showed antibacterial activity against *K. pneumoniae* (0.7 0 cm). Fennel did not show antibacterial activity for any test strains studied. The curry powder mixture showed antibacterial activity against *E. coli* (0.7 0.1 cm) and *K. pneumoniae* (0.7 0.1 cm). Cinnamon (0.7 0.1 cm), curry leaves (0.8 0.1 cm), and curry powder mixture (0.7 0.1 cm) showed antifungal activity against *C. albicans*. There was no antifungal activity against *A. welwitschiae* in both the agar disk diffusion and slide culture method by curry powder mixture. Cinnamon was found to be the most effective spice against tested microorganisms. The weakest antimicrobial activity was displayed by the fennel. From the results obtained in this study, it could be concluded that even though laboratory-prepared, unroasted curry powder mixture has antibacterial and antifungal activity, it is less effective than its individual unroasted ingredients, which gave better inhibition results.

Keywords: Agar disk diffusion, Antibacterial activity, Antifungal activity, Spore germination inhibition

Abstract No: PP-01

Computational assessment of novel derivatives of gingerol as potential anti Alzheimer agents

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Ginger (*Zingiber officinale*) is commonly used as a spice and folk medicine, which helps to prevent heart diseases, high blood pressure and lung diseases. Gingerols, zingiberene, shogaols and monoterpenes are the principal components of the extract of ginger. Gingerol is known to provide protective effects against Alzheimer's disease (AD). AD is a neurodegenerative disease, resulting in loss of cognitive activity and memory and impaired signalling among brain cells. There are only a few approved drugs available for AD. Since developing synthetic chemicals as drugs is a challenging task, many pharmaceutical companies are now focused on the development of plant-derived drugs. Therefore, discovering natural products with medicinal properties for AD as lead compounds can be considered as an important task. There are five main proteins involved in AD: Amyloid precursor protein (APP), Tau protein, Amyloid β-protein (Aβ), Alzheimer's Beta A fibrils (Aβ - fibrils) and Acetylcholine esterase (AChE). In this study, the effects of 6-gingerol eight gingerol derivatives on those five main proteins highly associated with AD were considered to investigate anti-Alzheimer activities. Donepezil which is commonly used as a clinical drug in Alzheimer was considered as a reference compound. Initially, energy minimized structures of 6-gingerol, and its derivatives were obtained using molecular mechanical calculations. Docking studies were carried out for the 6-gingerol and suggested derivatives with AD related proteins. Through docking studies, secondary interactions with target proteins and amino acid residues in binding pockets were identified. The binding affinities of derivatives with proteins were compared with the binding affinity of the parent molecule (6-gingerol). According to the results, the parent molecule and studied derivatives have good binding affinities with Acetylcholinesterase. Therefore, further studies of molecular dynamic (MD) simulation studies were performed for the Acetylcholinesterase-ligand complexes for 50 ns using the CHARMM36 force field. The trajectories obtained from MD simulations were used to calculate the radius of gyration (Rg), root mean square deviation (RMSD) and root mean square fluctuation (RMSF). According to the Rg and RMSD results, the studied protein-ligand complexes were stable throughout the simulation time. Further, RMSF results of derivatives were compared with the results of 6-gingerol parent molecule, in order to investigate the higher binding affinities of the derivatives. The stability of the complexes is an essential feature which can provide information about the lifetime of the complex. Therefore, the ligand bound to the proteins can act as an inhibitor and inhibit the specific function of that protein. Since Rg and RMSD results showed the stability of the protein-ligand complexes, it can be stated that the studied gingerol derivatives have the ability to inhibit AChE. Therefore, the MD analysis results, along with docking results, indicated that the studied gingerol derivatives have the potential to act as promising anti-Alzheimer agents.

Keywords: Alzheimer's disease, Derivatives, Gingerol, Molecular docking, Molecular dynamics

Abstract No: PP-02

Isolation and characterization of cellulose nanocrystals from cotton balls by using sulfuric acid hydrolysis

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Cellulose nanocrystal (CNC) is a nanoscale material isolated by removing the amorphous regions in cellulose fibres by employing the acid hydrolysis method. In this study, CNCs from the cotton balls were isolated by acid hydrolysis using sulfuric acid. The cotton balls are made from 100% premium pre-treated and high-quality cotton fibres. The sulfuric acid hydrolysis process was performed with 64% (w/w) sulfuric acid and combined using a liquor ratio of 1:20 with cotton fibres while being subjected to strong magnetic stirring, which was carried out at $50^{o}C$ for 60 minutes. The CNCs have been characterized by Transmission Electron Microscopy (TEM) analysis, Fourier Transform Infrared (FTIR) spectroscopy analysis and X-ray Diffraction (XRD) analysis. The isolated CNCs have needle-shaped particles with a 6.35 nm average diameter and a length of 108.8 nm on average. The FTIR spectrum showed the functional groups of the isolated CNCs from cotton balls. The crystalline configuration of the cellulose nanocrystal can be seen in the ensuing XRD diffraction pattern.

Keywords: Acid hydrolysis, Cellulose nanocrystals, Cotton balls, Cotton fibres, Sulfuric acid

Abstract No: MP-01

Mapping of well water and soil parameters in a selected *Grama Niladhari* division of Gampaha district

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This study intends to fill an essential knowledge gap in the field of environmental information in Sri Lanka, by providing a reliable data bank supporting the information of existing chemical species of two important components, well water and soil. Further, this study would provide reference information for future work and aid in explaining the changes that would occur due to the changes in chemical composition of the environment. Thalawathuhenpita North *Grama Niladhari* division was selected as the initial site of study and sampling was done from 23 locations, where two representative samples of each soil and well water were collected from each site. All chemicals, instruments and glassware used were from recognized chemical supply companies. This study investigates several important well water quality parameters such as pH determined by a pH meter, well water hardness and Calcium content using complexometric titrations, nitrate content using a spectrometric analysis, Iron content using a colorimetric analysis, and soil quality parameters such as active pH using a pH meter, water-soluble and exchangeable cations (Na^+, K^+) using a flame photometer and water-soluble and exchangeable Ca^{2+} using complexometric titration, organic matter content using a redox titration, iron content and nitrate content were determined similar to well water analysis. The readings were duplicated and reported as means ± standard deviation, and contour maps were produced using Surfer ® (Golden Software, LLC). Maps depict the scope of variation of the determined parameters within the selected area and highlight that it is crucial to monitor the environmental resources chemically in a regular manner to address the environmental problems that may occur in the future. The mapping of the entire country on a fixed and frequent basis will give environmentalists, scientists and policymakers information about a given environment and thus make monitoring and policy making of an area easy.

Keywords: Gampaha district, Mapping, Soil quality, Water quality

Abstract No: MP-02

Development of ash gourd (*Benincasa hispida*) and banana (*Musaceae*) pseudo-stem sauce

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Ash gourd (*Benincasa hispida*), an underutilized fruit that has the potential to develop value-added products due to its high medicinal and nutritional value. In addition, banana central core, a biological waste of banana production is also known to have therapeutic properties. However, consumption of pseudo-stem is not commonly observed. Therefore, this study was aimed to develop a value-added sauce based product, from ash gourd and banana pseudo stem. Freshly prepared ash gourd pulp (AG) and, banana pseudo-stem pulp (BS) were mixed in different ratios to obtain three different blended sauces: F1 (AG: 50%, BS: 30%), F2 (AG: 60%, BS: 20%) and, F3 (AG: 70%, BS: 10%). Prepared sauce samples were analyzed for sensory attributes (colour, odour, texture, taste and, overall acceptability) using 30-semi-trained panelists and hedonic scale. Blended sauce F2 was more accepted than other two formulas with respect to all tested sensory attributes. Therefore, F2 formula was selected for physiochemical analysis and, stored at refrigerated (4°C) condition for microbial evaluation for six weeks. The results of physicochemical properties evaluation revealed, 100 g of F2 formula contains 2.51 ± 0.15 g of protein, 0.72 ± 0.09 g of fat, 2.21 ± 0.04 g of fiber and, 2.08 ± 0.05 g of ash. pH, brix value and Titratable acidity were recorded as 4.25, 26° & 0.84%, respectively. At weekly intervals, samples were tested for microbial growth. Up to six weeks of storage, total colony count was below the acceptable CFU value for sauce. However, microbial growth was gradually increased and, reached 100 CFU/g at the sixth week, making the sauce unacceptable and unsafe for consumption. Thus, the developed ash gourd and banana pseudo-stem sauce formula F2 can be stored under the refrigerated condition at least up to six weeks.

Keywords: Ash gourd, Banana pseudo-stem, Sauce, Value addition

Abstract No: MP-03

Nutritional information and healthiness of ready-to-eat/cooked packaged food products available for children in Sri Lanka and attitudes of parents living in Western province toward purchasing

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As a result of drastic changes in dietary habits and lifestyles, overweight and obesity among schoolchildren in Sri Lanka have more than doubled in the last decade. Research show that a substantial percentage of urban schoolchildren tend to consume excessive amounts of processed foods on daily basis. Children's food purchases and choices are primarily depend on parents/guardians. Thus, the present study is carried out to assess the nutritional content and healthfulness of ready-to-eat (RTE) and ready-to-cook (RTC) packaged foods available in Sri Lankan supermarkets, and parental attitudes toward purchasing them. The Nutrient Profile Model (NPM) for Sri Lanka was used to evaluate RTE/RTC foods and nonalcoholic beverages as they are more likely to be part of a healthy or less healthy diet based on the nutritional information on the package. In total, 192 products were collected and categorized into highly consuming five broad food categories; (i) ready-to-eat cereal, fine bakery wares, and confectionery products (ii) ready to eat savouries (iii) sugary beverages (iv) milk and dairy products and (v) prepared/ready-to-cook foods, to collect nutritional information. Among collected food products, 29 (15%) products were unable to evaluate due to incomplete nutritional labelling while all the tested food products were unable to be recognized as healthier for marketing. Moreover, among 26 (13.54%) products that carried health and nutrition-related claims, 19 (73.7%) were recognized as less healthy, while others were unable to evaluate due to the absence of nutritional information. A descriptive research design was used to identify the factors influencing parents' purchasing behaviour towards RTE/RTC food products. Using an online questionnaire, a sample size of 151 parents/guardians living in Western province who had one or more children, between the ages of 3-13 were selected using a stratified random sampling method. Results of the multiple regression model analysis revealed that the monthly household income, children's influence/preference, and commercial aspects are positively influenced ($p<0.05$) by the parent's purchasing behaviour. Even though, parents' opinion was negatively influenced ($p<0.05$) the parent's purchasing behaviour toward RTE/RTC food products. The findings suggest that effective policies should be implemented to increase the relative availability of healthier ready-to-eat packaged foods, as well as to improve the provision of nutritional labelling.

Keywords: multiple regression module, nutrition profiling module, purchase intentions, ready-to-eat food

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Development of a pomegranate based jelly

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Jelly is a semi solid preserved mixture of fruit juice and sugar. Chemical and artificial ingredients were used for preparation of jelly products and it has a major health related concern. Hence, this study was aimed to develop a value added product using pomegranate which is a popular functional fruit. A pomegranate based jelly was prepared using different concentration of pomegranate juice and Gracilaria seaweeds and constant concentration of Hibiscus, sugar and citric acid as a health promoting product. Four samples of jelly were prepared, and 1st part of the sensory evaluation was done using a non-trained panel of thirty members, and the best sample was selected based on the sensory evaluation. The second part of the sensory evaluation was done comparing the selected sample with a control sample Proximate and physicochemical properties were analysed by using AOAC methods. Data were analysed with MINITAB-19 version at 0.01 significance levels. The proximate analysis of jelly sample was done to determine moisture content, protein content, fat content, ash content, total sugar content, pH value and titratable acidity. The proximate analysis of sample PJ002 revealed 43.66% moisture content, 8.36% protein content, 0% fat content, 0.38% ash content, 90.33% total sugar content, 3.07 pH value and 3.03 titratable acidity. Hence, the sample number PJ002 has the overall best acceptance. The comparison of all microbial parameters (coliform, yeast, mould and total plate count) with the SLS standards for four weeks were below the SLS standards. Hence pomegranate based jelly product has a prolonged shelf life of four weeks under refrigerator conditions below 4^0c. Finally, based on the sensory, Proximate and microbial analysis, it can be concluded that pomegranate based jelly can be proposed as a product having consumer acceptability.

Keywords: Gracilaria seaweeds, Health benefited product, Jelly, Pomegranate

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A study on consumer preference for instant food products and the development of a pumpkin- and canistel-based instant pudding powder mix

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Consumer preferences are changing from time to time. Therefore, this study was conducted among working and non-working women in the Ratnapura district to identify current consumer preferences for instant food products and pumpkin-based food products. The results of this study revealed that convenience in preparation is the main reason for purchasing instant foods. However, many consumers believe that instant foods are not healthy. According to this survey, occupation, working hours per day, and the average income of the family influence, consumer preference towards instant food products. There were significant differences among occupation ($X^2 = 47.5$, P = 0.011), working hours per day ($X^2 = 3.74$, P = 0.019) and average income of the family ($X^2 = 24.52$, P = 0.001). The majority of the respondents (202) preferred to see plant-based instant foods in the local market. Additionally, many respondents (80.6%) stated that the available pudding/pudding mixes at the local market are not good for health, mainly due to less nutrients, high sugar content and too much added artificial ingredients. Therefore, this study will be useful to the manufacturers of instant foods to understand the preferences of modern consumers to enhance sales. Furthermore, this study revealed that the consumption of pumpkin and availability of pumpkin-based products in the local market are low although the post-harvest loss of pumpkin is high in Sri Lanka. Many respondents (64.5%) stated that they do not like much for the taste of pumpkin although, majority of the respondents (64.2%) were aware of the nutritional value of pumpkin. However, many respondents (83.9%) preferred to purchase new pumpkin-based food products. Therefore, pumpkin (*Cucurbita maxima*)- and canistel (*Pouteria campechiana*) -based instant pudding mix fortified with pumpkin and chia seeds was also developed in this study. This novel, cost effective, and convenient pudding mix was found to be a good source of β-carotene (7.34 mg/100 g) and fibre (4.89%). Four pudding formulae were prepared with different proportions of ingredients. A sensory evaluation was conducted to evaluate consumer acceptance for colour, texture, taste, aroma, appearance, overall acceptability and purchasing intention using a nine-point hedonic scale. The sensory attributes of the best treatment were compared with a local commercial pudding mix. The formula with 37% pumpkin powder and 25% canistel powder was significantly different from other treatments and showed the highest mean scores for all sensory attributes. Additionally, the sensory attributes of the new pudding mix were similar to the compared locally available pudding mix except for colour and aroma. Therefore, this study revealed that there is a potential to develop a tasty, nutritionally rich, and microbiologically safe pudding mix from pumpkin and canistel.

Keywords: Beta carotene (*β*-carotene), *Cucurbita maxima*, Instant foods, *Pouteria campechiana*, Sensory attributes

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