KDUIRC
INTERNATIONAL RESEARCH CONFERENCE

13TH INTERNATIONAL RESEARCH CONFERENCE

HOLISTIC APPROACH TO NATIONAL GROWTH AND SECURITY

15TH - 16TH OCTOBER 2020

Basic and Applied Sciences

ABSTRACTS

General Sir John Kotelawala Defence University

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Message from the Hon. Minister of Education

It gives me immense pleasure to send this message on the occasion of the 13th International Research Conference of the General Sir John Kotelawala Defence University (KDU). I would like to congratulate the KDU for being able to conduct its International Research Conference in 2020, consecutively for the 13th time. It is not an easy task to organize such a momentous event particularly under many difficulties and challenges posed by the COVID 19 pandemic situation. It is gratifying to witness that KDU, the only Defence University in the country, has been able to transform a challenge into an opportunity, as it usually does.

The theme of the conference, namely the "Holistic Approach to National Growth and Security," is very timely and of great significance for deliberation in expert panels of this conference. The nexus between National Growth and National Security is closely interwoven. The 'development' and 'security' of a country cannot be compartmentalized and discussed in isolation of each other. There is no security for a nation without economic and social progress, and likewise, economic and social progress cannot be achieved without stability and a secure environment. I hope various panels of this conference will be able to discuss many facets of national growth and security and their interconnectedness. These two areas have a direct bearing on the development of Sri Lanka, a country which succeeded in ending a 30-year long separatist war. In the context of the present need for robust development, it is absolutely necessary to engage in serious research which leads to discoveries as well as policy-oriented recommendations. Therefore, all academic establishments must provide a conducive space for their intellectuals to reach new frontiers in research. I am glad that KDU is setting an example for all other universities in Sri Lanka in this regard. I hope this year's conference will produce significant research outcomes and I wish this conference all the success.

Hon. Professor GL Peiris,
Minister of Education

Message from the Secretary, Ministry of Defence

I am delighted to send the best wishes to the KDU on this significant occasion of the annual international research conference. I would also like to congratulate the Vice-Chancellor and the team for continuing the tradition of organizing this conference consecutively for the 13th time, despite the emerging contested health environment.

This years conference theme: "Holistic Approach to National Growth and Security" focuses on the National Growth and National Security as core concepts, and it, further, suggests that 'development' and 'security' of a country should always go hand in hand. Therefore, this conference would undoubtedly become a vital forum to discuss an area of study which has a direct bearing on the development interests of our motherland.

I am glad that KDU, under our ministerial guidance, is setting an example for all other universities in Sri Lanka in progressing research in many academic fields. I hope this year's conference will produce a significant research outcome that the policy community of Sri Lanka could utilize to support the present development drive. Further, I would like to urge the conference organizers to see the possibility of distributing the conference outcome to all the relevant Ministries and Departments of the country so that these entities could link with the researchers and employ their valuable research outcomes for the benefit of the nation.

I wish that KDU IRC 2020 will enhance the wisdom of all the participants to serve Mother Lanka for a better tomorrow.

Major General (Retd) GDH Kamal Gunaratne
WWV RWP RSP USP ndc psc MPhil
Secretary - Ministry of Defence

Message from the Vice-Chancellor

The International Research Conference taking place for the 13th consecutive time is a landmark in terms of keeping continuity of events at KDU. This year's conference attracted a large number of paper submissions and it indicates the enthusiasm growing in the country on development and security research.

KDU, from its inception, was instrumental in handing down the core values of security to the development paradigm in Sri Lanka. This year's theme 'Holistic Approach to National Growth and Security" highlights the importance of maintaining a harmonious blend in security and development in all national projects.

I believe the efforts of security-based education aiming at strengthening national development should be more cooperative in the future and KDU has always facilitated any research efforts that strengthens the national security of our nation. We urge the academic community of Sri Lanka to join hands with us in all our future endeavours to support the nation especially through productive research in diverse disciplines.

The organizers of the KDU international research conference intend to set the tone to initiate more collaborative research at national and global levels. This research conference is an ideal platform to make connections. I hope that authors of KDU and various other local and international universities will take the opportunity to interact and develop friendly relationships, establish networks and to explore win-win situations. I wish all the very best for the presenters and hope you will enjoy every moment of this academic fusion taking place on two whole days.

Major General Milinda Peiris
RWP RSP VSV USP ndc psc MPhil (Ind) PGDM
Vice Chancellor
General Sir John Kotelawala Defence University

Message from the Conference Chair

For the thirteenth consecutive year, General Sir John Kotelawala Defence University organizes its International Research Conference (KDU IRC 2020), and this year it is held on the theme 'Holistic Approach to National Growth and Security'. It is with great pleasure and honour, the organizing committee extends its greetings to all of you taking part in KDU IRC 2020. Holding the KDU IRC 2020, under the patronage of the Vice Chancellor, amidst many challenges encountered throughout the year, was memorable experience for me, and I believe that the organizing committee was able to accomplish a very successful mission.

KDU IRC 2020 is a tremendous opportunity for researchers all over the world encompassing various disciplines such as Defence and Strategic Studies; Medicine; Engineering; Management, Social Sciences and Humanities; Law; Built Environment and Spatial Sciences; Allied Health Sciences; Basic and Applied Sciences and Computing to present their research to fellow scholars, professionals and students.

Interestingly, the theme of KDU IRC 2020 is dedicated to the national growth and security, and it reflects the prime concerns of contemporary Sri Lanka as a nation and researches based on a holistic approach towards the national growth and security would enhance the quality in all aspects in a timely manner. In this backdrop, the esteemed speakers of all plenary sessions and research presenters of all technical sessions will cater to the same objective.

Finally, I would like to extend my best wishes to all the authors, participants and the organizing committee of KDU IRC 2020, and I encourage all of you to enjoy the KDU hospitality during these two fruitful days.

Dr. L. Pradeep Kalansooriya
Dr-Eng, MSc, BSc, MIEEE, MCSSL
Conference Chair

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ID 28

Fluoride Enhances the Antibacterial Activity of Carrier Ionophore Antibiotics

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Antibiotic resistance has become a major public health problem with the emergence of multi-drug resistant bacteria. Combination therapy is a better alternative to overcome bacterial resistance. The use of fluoride as antibacterial agent is limited due to bacterial cell envelope, which limits the passage of fluoride ion. The membrane destabilizing ionophores (valinomycin and monensin) exert their antibiotic activity by conducting ions through the cell membrane but can cause host toxicity by perturbing intracellular ion homeostasis. Therefore, combination therapy provides an ideal solution to minimize the adverse effects of such antibiotics. In this study, we demonstrate that fluoride enhances the antibacterial activity of the carrier ionophores, valinomycin and monensin. Cell growth assays were performed by incubating B. subtilis at 37 °C with monensin (0.2 µg/ml) and valinomycin (50 µg/ml) with varying NaF concentrations. The absorbance readings at 600 nm were obtained after 16 hours of incubation. Our results demonstrate that the potency of monensin was increased by 5X in the presence of NaF (100 mM). Similarly, the antibacterial potency of valinomycin doubled in the presence of NaF (80 mM). In contrast, neither of the two antibiotics exerts any synergistic effect with fluoride against the gram negative bacterium *E. coli*. Overall, it can be concluded that the two ionophore antibiotics may increase the cellular uptake of fluoride to exert synergistic bacterial growth inhibition, by enhancing intracellular fluoride toxicity. This study provides new opportunities to design antibacterial compounds when combined with varying sub-inhibitory concentrations of small ions.

Keywords: *fluoride, valinomycin, monensin*

ID 43

Determinants of Life Expectancy at Birth Across Nations Analyzed Using Shrinkage and Dimension Reduction Techniques

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Shrinkage and dimension reduction techniques were applied in understanding the impact and importance of determinant factors of life expectancy at birth (LEB) that had on LEB. Also these techniques were applied with the aim of comparison while overcoming the problems of least squares procedure. Seventeen determinant factors were identified and were applied to data obtained from 193 countries of United Nations Agencies for the year 2016. As shrinkage techniques ridge and lasso regression and as dimension reduction techniques principal component regression and partial least squares regression were applied. These techniques were compared concerning mean squared error, goodness of fit and ranking based on regression coefficient estimates. The most important predictors identified through all these techniques were infant mortality rate, human development index, total fertility rate, mean years of schooling and health expenditure per capita.

Keywords: *life expectancy at birth, Ridge regression, Lasso regression, principal components regression, partial least squares regression*

ID 50

Effect of HDAC Inhibitors on the Stability of HDLP Enzyme: an *in-silico* Approach

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Deacetylation of histone proteins is controlled by the enzymatic activity of histone deacetylase enzyme (HDACs). Alterations of gene expression are causing cancer, and evidence suggests that the alterations are mediated by epigenetic mechanisms. HDAC inhibitors have been considered as more potent anticancer agents. Undeniably, the inhibition process of HDAC is a rapidly growing and very promising area for cancer chemotherapy in modern medicine. This work focused on studying the impact of HDAC inhibitors on the stability of the HDAC enzyme, mainly through computational techniques. These techniques were used to investigate the atomic level description of drug binding sites and investigate how the HDAC inhibitors change the environment of the active site of the HDAC enzyme. The crystal structure of the HDAC like protein HDLP was downloaded from the Protein Data Bank and the structures of inhibitors were optimized using the G09W package. A blind docking was carried out by Auto Dock Vina, and the resultant complex was used to initiate the molecular dynamics (MD) simulation. The trajectories of the HDLP-inhibitor complexes from the MD simulation were used to perform the structural analysis. The results obtained from RMSD, Rg, and hydrogen bond analysis are used to compare the stability of the HDLP-SAHA complex, HDLP-PCI24781 complex, and HDLP-SB939 complex with that of the free HDLP enzyme in the aqueous environment. The results indicated that all the HDLP-inhibitor complexes are more stable than the free HDLP enzyme. Among the three inhibitors, obtained results clearly show that the new inhibitor PCI24781 is more effective than the reference inhibitor drug SAHA, therefore it is evident that PCI24781 has the potential to be used as an alternative to the reference drug SAHA, for the inhibition of histone deacetylation. In contrast, SB939 shows some deviations from PCI24781 and SAHA, which make SB939 relatively less efficient.

Keywords*: HDAC, MD simulation, RMSD, Rg, SAHA, PCI24781, SB939*

ID 55

Cloning of *Rigidoporus Microporus* Laccase Gene to Enhance *Trichoderma Reesei* Cellulase Activity on a Formulated Cost-effective Rice Straw Derived Medium in Search of Bioethanol

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Trichoderma reesei secretes many extracellular cellulases and hemicellulases, and deconstructs biomass, producing fermentable reducing sugars. Rice straw is an inexpensive waste material produced in paddy cultivation. Bridging these two 'resources' for bioethanol production proposes a cost-effective and eco-friendly solution for the aggravating energy crisis. To formulate a cellulase yielding medium, the endo-1,4-β-D-glucanase activity of a highly cellulolytic *T. reesei* strain on different rice straw derived culture media were studied against the commercial CMC medium. The reducing sugar concentrations resulted by cellulases were recorded at 24 hour intervals with the DNS assay at 540 nm and analyzed using the IBM-SPSS®. Alkaline and acid pretreatments on mechanically processed straw were enhancing cellulolysis, almost equally. The highest supernatant endo-1,4-β-D-glucanase activity (3.599 CMCase U/ml) was in the medium carrying alkaline pretreated straw in mineral salt medium with Tween-80, gelatin and L-ascorbic acid, on the 7th day after inoculation with *T. reesei*. Tween-80 was identified as a cellulase inducer. Gelatin and L-ascorbic acid could not significantly increase cellulase production. Although *T. reesei* is cellulolytic, it usually cannot degrade lignin. Laccase oxidizes phenolic and lignin-related non-phenolic compounds, and is used in xenobiotic degradation and many industries. An attempt to create a multi-purpose organism by cloning the laccase gene, from *Rigidoporus microporus* to cellulolytic *T. reesei* by *Agrobacterium*-mediated transformation using pBI121 vector was made, expecting improved saccharification thus high bioethanol yields. The transcriptome of *R. microporus* was reverse-transcribed, and amplified using a gradient PCR with laccase gene-specific primers and requires further optimization.

Keywords: *cellulolysis, tween-80, laccase*

ID 204

Identification of *Wolbachia* Like Endosymbiont DNA in *Setaria Digitata* Genome and Phylogenetic Analysis of Filarial Nematodes

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Setaria digitata is a *Wolbachia*-free filarial parasite that causes cerebrospinal nematodiasis in non-permissive hosts, such as, goats and sheep, leading to substantial economic losses in animal husbandry. Therefore, there arises a considerable need for the development of new interventions to disease control and eradication of this filarial parasite. Owing to the limited knowledge on *S. digitata* genome, its host-parasite relationship and the potential impact of the *Wolbachia* endosymbiont in filarial nematodes, this research was focused on the generation of the draft genome of *S. digitata*; identification of *Wolbachia* like endosymbiont DNA in *S. digitata* genome; phylogenetic analysis as well as functional annotation and metabolic pathway analysis of the genome. A draft genome of 78.8 Mbp size with a GC% of 31.45% was generated for the *S. digitata* worms collected from the peritoneal cavity of slaughtered cattle, using NGS Illumina platform. FASTA36 sequence similarity analysis was able to identify homologous sequences of *coxA* and *gatB Wolbachia* MLST genes within the *S. digitata* genome, while phylogenetic analysis using Geneious Prime Software revealed that *S. digitata* is more closely related to the filarial nematodes with *Wolbachia* endosymbiont than *Wolbachia*-free filarial nematodes. Furthermore, BLAST2GO analysis was able to identify 6055 annotations and 95 metabolic pathways within the *S. digitata* genome. Hence, based on FASTA36 analysis and phylogenetic analysis, it can be concluded that ancestors of *S. digitata* were colonized with *Wolbachia* in the distant past, and suspected gene transfer may have brought *Wolbachia* DNA into the *S. digitata* nuclear genome prior to endosymbiont loss.

Keywords: *Setaria digitata, Wolbachia, NGS*

ID 242

Cytotoxicity and Anticancer Activity of Few Garcinol Associated Metal Systems on BHK-21 and RD Cell Lines

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The biological activity and solubility of phytochemicals can be enhanced by combining with metals. Garcinol is a well-known phytochemical isolated from *Garcinia Quaesita* Pierre. Garcinol was combined with silver, titanium dioxide nanoparticles (AgNPs and TiO_2NPs) and Iron (Fe^{3+}) to form garcinol capped silver nanoparticles (G-AgNPs), garcinol coated titanium dioxide nanoparticles (G-TiO_2NPs) and garcinol Iron complex (G-Fe), respectively. In-vitro apoptosis studies were conducted by Baby Hamster Kidney (BHK-21) and Rhabdomyosarcoma (RD) cell lines with MTT assay, Griess nitrite assay and Ethidium Bromide Acridine Orange Staining. Cyclohexamide was used as the positive control. The EC_{50} values of G-AgNPs for BHK-21 (16.6±0.6 µg/mL) were lower compared to RD (58.8±0.2 µg/mL) cells. G-TiO_2NPs had EC_{50} values of 56.6±1.0 and 103.9±3.8 µg/mL for BHK-21 and RD cells, respectively. The G-Fe complex had an EC_{50} of 35.7±0.9 µg/mL for RD cells and 30.5±0.2 µg/mL for BHK-21 cells. Garcinol had an EC_{50} value of 95.3 µg/mL for BHK-21 cells and 68.9±0.2 µg/mL RD cells. In the BHK-21 and RD cells, nitric oxide production increased as the concentration of the treated compounds were raised compared to that of untreated cells in a dose-dependent manner. Treated cells demonstrated chromatin condensation, nuclear fragmentation, presence of apoptotic bodies and blebbing when stained with ethidium bromide acridine orange. This study suggests that garcinol has potential anticancer activity against RD cells compared to the tested nanoparticles systems. The anticancer potential was found to be due to induction of oxidative stress dependent apoptosis.

Keywords: *Garcinol, Silver nanoparticles, Titanium dioxide nanoparticles, Iron complex, cytotoxicity, anticancer activity*

ID 286

Identifying Factors for Sustaining the Zero Accident Vision: A Case of Tyre Company in Sri Lanka

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The goal of ZAV (Zero Accident Vision) is to encourage people to think and act in a way that supports the vision that all dangers are preventable. The objective of this study was to identify the factors which are enabling and impeding to sustain ZAV in a tire industry. Behaviour-based safety may be affected by providing good safety training, building a safe tyre and healthy work environment, offering safety incentives, and developing safety empowerment based on the literature. Primary data were used and gathered data by distributing the questionnaire. The sample size was 98 among 120 population of the company shop floor members who are the most knowing about their work environment and most subjecting to accidents. Descriptive analysis and multiple regression analysis were used by SPSS-22. Descriptive analysis was helped to identify the patterns of responding to employees. Multiple regression analysis was helped to identify factors and it's an impact to sustain ZAV. Pearson correlation was used to analyse the relationship between variables. All independent variables, safety training, work environment, safety incentives, and safety empowerment were significantly positively affected to sustain ZAV. Safety training and safety incentive were enabling factors which should be continued and, safety empowerment and work environment were impeding factors which should be developed further to sustain ZAV.

Keywords: ***z****ero accident vision, safety, behaviour*

ID 316

Spacial and Temporal Variation of Long-Distance Migratory Showbirds in Taleimannar, Mannar Island- A Key Wintering Ground for Central Asian Flyway

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Sri Lanka represents the southernmost location of Central Asian bird migratory Flyway that spans across Eurasia. Mannar island of Sri Lanka is considered an entry point of migrants to the country and holds critical wintering grounds for migratory shorebirds. These long-distance migratory shorebirds connect geographically separated areas during migration, hence act as global carriers of genes, microbes and pathogens. Therefore, understanding their migration ecology is critical for a global biological centre like Sri Lanka where large numbers of birds annually visit from Asia and Europe. Here we aimed to assess how the temporal distribution and moulting patterns of shorebirds of different origin change throughout the year within a key wintering ground in Mannar. Monthly shorebird surveys were carried out in the tidal mudflat and adjacent lagoon (~1 km^2), located at the base of Rama's Bridge, Talaimannar, from 2018 May to 2020 May. The birds were counted while recording their plumage characteristics in systematically placed point count stations (r=100m, 15mins each), at different day-time intervals (0600-0800h, 1000-1200h, 1300-1500h, 1500-1700h, 1700-1900h). The surveys were continued for an average of seven days per month, in a manner that covers each aforementioned time interval. Thirty-one species of shorebirds were observed throughout the period, out of which 19 most common species were selected to assess how the abundance changed throughout the year using monthly maximum count of each species in analysis. Five categories of shorebirds were recognized referring to Bird Life Data Zone based on their breeding origin; throughout arctic, eastern arctic, throughout temperate, western temperate and eastern temperate. Despite its breeding origin, birds of all categories arrived in Talaimannar between August – October and the numbers peaked during February – March. On arrival in August, 19% of birds remained in breeding plumage (81% in winter plumage) and by March, close to northward departure, 08% of birds regained breeding plumage. Though the numbers were less (~11% of the total), the summer loitering shorebirds were seen throughout May-July; 44% of them were in partial or full breeding plumage. An in-depth study of migration and wintering ecology of these shorebirds in Mannar is currently in progress, using bird banding, flagging and GPS-tracking.

Keywords*: biological monitoring, connectivity, tidal mudflats, Sri Lanka*

ID 415

Promotional Instruments to Safeguard Product Quality Attributes in the Process of Production and Utilization of Organic Manure in Agri-food Value Chains in Sri Lanka

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Globally the production and trading of organic food and agricultural products have been increased remarkably over the past years. In this context, the specific objective of this study was to explore the most appropriate instruments to promote those stakeholder preferred quality attributes of organic manure in Sri Lanka. Multiple methods were adopted to gather both primary and secondary data. Personal interview-oriented survey was carried out (n=140) using a structured questionnaire, where the respondents were selected from various points in the agri-food value chains. To explore the information towards product quality, the attributes identified in prior were catalogued into three subsets, namely: 'search', 'experience' and 'credence'. It was found that most of the stakeholders were heavily concerned on the Credence attributes in organic manure; so, one needs to find promotional instruments targeting those. Exploratory Factor Analysis was employed to analyse the data of promotional instruments, which sorted out 20 statements explaining those instruments into 4 key factors, namely: 'self', 'market', 'government' and 'judiciary'. It reveals that producers, wholesalers, retailers, farmers, and extension service providers prefer "government-oriented" facilitations by the market-led institutions. Further, it highlights that the stakeholders, are in position to go for "self-action" if they are provided with a scheme of positive incentives, such as, financial, and regulatory support on storage. The outcome of analysis suggests the importance of having short- to long-term policy framework governing fertilizer production and use and need of solid monitoring and steering body to safeguard both farmer and national agriculture policy interests.

Keywords: *organic manure, promotional instruments, quality attributes, stakeholder preferences*

ID 421

Do Farmers Prefer Eco-friendly Technologies Over Chemical Fertilizer: A Perception Analysis on Economic Incentives

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Excessive use of Chemical Fertilizer (CF) had resulted in countless health and soil related problems in the paddy farming areas of Sri Lanka. In light of this, the specific objective of this study was to identify the most appropriate economic incentives to promote the Eco-Friendly Technologies (EFTs) developed in the form of Bio Fertilizer and Bio-Char amongst the paddy farmers in Sri Lanka. Both qualitative and quantitative techniques were employed to collect necessary information and data related to the economic research problem identified. The primary data gathered from 100 registered paddy farmers for this multi-stage project from Anuradhapura and Kurunegala districts by way of an in-depth semi-structured questionnaire-based personal interview and field visits, where each respondent was directed to score on 28 individual attitudinal statements explaining a range of economic incentives on a 10-point likert-scale. Confirmatory Factor Analysis techniques were employed to analyse the data. This helped to sort out those statements into 4 key factors, namely: Price, Materials, Services and Other. The respondents weighted the 'price' related factors as the "most important" to use EFTs against CFs followed by those specified as 'materials' and 'services'. Further, results highlight the fact that the end users: paddy farmers, are much concerned about the financial aspects to switch from CF to EFTs as they wish to mitigate the perceived risk on this phenomenon. Farmers are willing to adopt those EFTs as long as they are assured with a long-term fertilizer policy originated from the state and characterized by both regulatory: fines and facilitative: subsidies mechanisms. Overall, the outcome of analysis elaborates the importance of having a proper operational environment to regulate the fertilizer production and the need of constant monitoring and steady authorities for the assurance of both health and environmental safety.

Keywords: *chemical fertilizers, eco-friendly technologies, economic incentives, paddy farming*

ID 465

Polymorphism of Dopamine Receptor D4 Gene in Hill Swallows from Montane Human Settlements

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Personality can be partly determined by genes hence variation in personality associated with genes give rise to variation in personality among individuals within a population. DRD4 gene has been associated with a number of personality traits, such as, novelty seeking, early exploratory behaviour, boldness and weariness. Having these traits may be necessary in order to face the challenges presented by landscape alteration due to human activity, such as, urbanization. Hill Swallows (*Hirundo Javanica Domicola*) are aerial insectivores confined to the mountains of Sri Lanka, and India and are able to live and breed successfully in altered landscapes in close proximity to humans. Therefore, Hill Swallows provides an opportunity to understand how anthropogenic landscape alteration affects animal personality/behaviour at a molecular level. We explored how the genetic diversity at DRD4 gene in Hill Swallows varies along a gradient of human activity. Hill Swallows were captured using mist nets from seven locations in the central highlands in Sri Lanka. Two individuals from each location were captured and a blood sample was obtained. DNA was extracted from the blood and target regions, intron1 (283bp) and exon 3 (543bp) of the DRD4 gene was amplified using PCR and sequenced. Nucleotide diversity and Tajima's D values were obtained to determine the genetic diversity and demographic processes of the population. An urbanization index was calculated for each location to obtain the level of human activity according to which the degree of human activity increases in the order of Hortan Plains, Ambewela, Ohiya, Pattipola, Idalgashinna, Boralanda and Haputale. While the sequenced region of the third exon was polymorphic, nucleotide diversity values varied from 0.00184 (Haputale and Boralanda) to 0.00341 (Horton Plains). Nucleotide diversity in the DRD4 gene declined as the degree of human activity increased. However, Tajima's D value of an urban population did not provide evidence of selection or other demographic processes. Here we showed how habituation to human settlements has an eroding effect on the genetic diversity in a personality related gene in Hill swallows.

Keywords: *personality, DRD4, human activity, genetic diversity*

ID 466

Sentiment Analysis Models for Effective Prediction: A Case Study on Colombo Stock Market

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Stock market is highly unpredictable as it is influenced by high fluctuated matters and opinions of public responses. Sentiment Analysis is an innovative development in machine learning with the use of natural language processing techniques to derive emotions as positive, negative and neutral from public opinions in information. Based on the past tweets, current research examines the effectiveness of various machine learning techniques, such as, K Nearest Neighbor, Decision Tree Model, Support Vector Machine, Logistic Regression and Multinomial Naïve Bayes machine learning algorithms combined with sentiwordnet lexicon approach and Using Count Vectorizer to convert text into tokens/features to predict stock market indices. Mentioned algorithms were trained and tested through 80% of the data was used for training and 20% was used for testing. Observations of selected dataset show that Logistic Regression and Naïve Bayes perform well in all types of testing with the accuracy score of 72.352941 for LR and 71.764706 for NB. SVM at the next with 70.588235 of accuracy score. Decision tree classification is with accuracy score of 64.117647. As of the result KNN scores lowest with 52.941176 of accuracy level. According to this research work Logistic regression and Naïve Bayes models are performing respectively better in sentiment analysis and predictions. Traditional statistical predictions on stock market are possible to optimize by using exact sentiment analysis applications into better decisions as Sentiment Analysis to ensure the specific decisions.

Keywords: *stock market, sentiment analysis, machine learning*

ID 517

Enhancement of Growth and Yield of Maize (*Zea mays* L.) Using Co-compost Pellets with Biochar

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Waste generation and complexity is increasing due to urbanization and absence of proper solid waste management systems in developing countries. Co-composted organic fractions of Municipal Solid Waste (MSW) with Dewatered Fecal Sludge (DFS) has a high potential to use as an agricultural resource in Sri Lanka. Oil palm Empty Fruit Bunches (EFB) has become a rising environmental and economic problem and it is a potential source for biochar feedstock. This study was focused on utilization of EFB as a biochar in amending sandy loam soil and evaluating performance of maize (Zea mays L.) fertilized with co-compost pellets (CCP). The experiment was carried out at the Sustainable Agriculture Research and Development Centre, Makandura. The growth and yield characteristics of maize plants were used to assess the effect of pelletized forms of different CCP. Randomized completely block design with four blocks and seven treatments namely MSW+DFS CCP with 100% available Nitrogen (T2) and 30% available Nitrogen (T3), MSW+DFS+Biochar CCP with 100% available Nitrogen (T4) and 30% available Nitrogen (T5), MSW+DFS+Mineral enriched CCP (T6) and MSW+DFS+Biochar+Mineral enriched CCP (T7) were compared with mineral fertilizes recommendation by Department of Agriculture (DOA) Sri Lanka (T1) as control. Significantly higher yield could be obtained under stress weather conditions with T2 against the control. The yield was increased by 22% over current mineral fertilizer recommendation of DOA. It could be concluded that harvest of 4.5 to 6.3 tons ha-1 could be achieved by amending soil with 42 tons ha-1 of MSW+DFS CCP with 30% available Nitrogen.

Keywords, *biochar, co-compost, pellets, Zea mays L.*

ID 584

Performance Evaluation of Coconut Estates: Developing an Index to Evaluate Performance of Coconut Estates Managed by Kurunegala Plantations Ltd

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Coconut industry plays a vital role in the economy of Sri Lanka and in rural livelihood. Over 497,000 ha of lands are cultivated with coconuts in Sri Lanka. The estate sector accounts for 25% of the land area for coconut cultivation and it contributes to 40% of the national production. The rest is represented by the smallholders' sector. Coconut production by both smallholders' and plantation companies' estates show a high variation in their performance. In this study, the performance evaluation of coconut estates was conducted by developing an index. This facilitates to compare the performance of coconut estates of Kurunegala Plantations Ltd (KPL) which holds a mature coconut area of 3,124.60 ha. Ten variables were identified as the most vital associated with estate performance. Weights for each variable were through direct interviews with five plantation experts in KPL. Ten years data for each variable were collected from all seven area estates and average values were taken for analysis. Results revealed that Narammala area estates have excellent performance in profit per ha, field work, agronomic and other management practices and in immature coconut extent. The estate exhibited well in density per ha, net sales average, cost of production and progress of office work. Even though estate has done good in many variables, yield per ha and nuts per palm are only in satisfactory level, however, yield per ha is the 2nd highest in all area estates. With all performances, Narammala area estates rank no. 1 in KPL, but need to improve in diversification, yield per ha and nuts per palm.

Keywords: *coconut, estate sector, performance index*

POSTER PRESENTATIONS

ID 10

Production of Single Cell Protein from Papaya (*Carica Papaya*) Peel under Liquid State Fermentation System

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Protein deficiency has been a major challenge for the growing world population. It is important to focus on new, alternate, and unconventional protein production in order to produce enough food and feed to meet the global nutritional demand. A large quantity of fruit waste is generated in the country which goes into waste creating several environmental issues. Fruit waste can effectively be utilized as a substrate to produce single cell proteins. Of fruit wastes, papaya peel is one of the major wastes generated in large quantities in the country. Therefore, this study aimed at producing single cell proteins from locally available papaya peel using natural palmyrah (*Borassus Flabellifer*) toddy yeast under the liquid state fermentation system. Papaya (*Carica papaya*) peel was collected, cleaned, washed, blended and filtered by using Whatman No 1 filter paper. Physiochemical properties, such, as Total Soluble Solids (TSS), pH, moisture, protein, fat and ash contents were determined using standard methods. The extract of papaya peel was filtered and diluted to 10% with distilled water and autoclaved. The sterilized papaya peel extract was kept in a sterilized conical flask and inoculated with 5 mL natural palmyrah toddy yeast ($(1.625\pm0.15)\times10^6$cells/mL) in triplicate and allowed for fermentation in a shaking incubator at 100 rpm for 48 h. The sediment was collected by centrifugation at 4000rpm, oven dried and then the dry weight and protein content were determined. Papaya peel contains 6.5% TSS, 61.3 g/L reducing sugar, 91.6 ± 0.2% moisture, 6.4 ± 0.4% ash, 1.1 ± 0.1% fat and 11.3 ± 0.6% protein. The mean cell biomass was 11.7 ± 0.8 g/L and the crude protein content was 52.4 ± 0.4% (both on dry weight basis). It can be concluded that papaya peel waste could be used as a substrate for the production of protein-rich cell biomass using fermentation by natural toddy yeast of palmyrah.

Keywords: *liquid state fermentation, palmyrah toddy yeast, papaya peel waste, single cell protein*

ID 46

Forecasting Inflation Rate of Sri Lanka Using Probabilistic Models

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Probabilistic models can be used to forecast future values and it gives high accuracy when forecasting within a short time. In this study, we used probabilistic models to forecast the inflation rate in Sri Lanka by using 30 years of inflation data. Initially we used 362 data points for model building and the last six data points were used to compare the accuracy of the forecasted values. The main objective of this study was to identify the best fitted model among the AR, MA, $ARMA$, and $ARIMA$ models for forecasting inflation rates and to estimate the most suitable smoothing parameters for the different curve smoothing techniques, such as, Exponential, Double Exponential, Spline, Lowess and one kernel smoothing methods. "Akaike Information Criteria (AIC)" was used to find the order of the $ARIMA$ models. Smoothing curves gave a better prediction than the non-smoothed curve. Lowess smoothing method was selected as the best smoothing method to smooth and forecast the data set because it gives minimum root mean square error.

Key Words*: inflation, probabilistic models, time series, smoothing, ARIMA*

ID 113

Genetic Changes and Biomarkers Associated with Follicular Lesions of the Thyroid Gland

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Follicular lesions of the thyroid gland include hyperplastic nodule (HN), follicular adenoma (FA) and follicular carcinoma (FC). HN and FA are benign lesions whilst FC is a malignant neoplasm. Differential diagnosis of benign and malignant nodules in this group is clinically consequential yet challenging in certain instances due to ambiguous morphological characteristics. This study attempted to identify molecular markers which may aid in reaching accurate diagnostic decisions in such cases. Four formalin fixed paraffin embedded thyroid tissue specimens, representing HN, FA, FC, and healthy thyroid tissue, were assessed for molecular profiling. Genomic DNA extracted from each sample was examined via PCR-RFLP and AS-PCR assays to detect point mutations in *N-RAS*, *K-RAS* and *EZH1* genes. The mRNA expression levels of three selected genes (*CPQ*, *TFF3* and *PLVAP*) were relatively quantified via RT-qPCR. The *NRAS*^{Q61R} mutation was detected only in the FC. *EZH1*^{Q571R} mutation was detected only in the HN. The quantified gene expression levels revealed that *CPQ*, *TFF3* and *PLVAP* genes were noticeably under-expressed in the malignant tumor (FC) compared to the two benign nodules (HN and FA). Furthermore, the HN, which is a non-neoplastic nodule, had an expression pattern comparable to that of the normal thyroid tissue. Although solid conclusions cannot be drawn due to the inadequate sample size, the observed genetic variations are in accord with the trends projected in literature. Furthermore, the findings of the study demonstrate the potential utility of molecular profiling using a panel of genes pertaining to thyroid nodules.

Keywords: *thyroid nodules, RAS mutations, EZH1, gene expression profiling*

ID 182

Isolation of Peptides from Sri Lankan Demosponge *Axinella Donnani*

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Axinella donnani (Demospongiae (class), Axinellida (order), Axinellidae (family)) is a marine sponge which has shown significant activity in various bioassays, such as, antibacterial assay, brine shrimp cytotoxicity assay, microalgal lethality assay, larvicidal assay and ichthytoxicity assay. *A. donnani* has a high endosymbiotic bacterial count and some of these bacterial strains exhibit significant activity against shrimp and human pathogens. The focus of this study was to discover novel chemicals compounds from *A. donnani* with potential as drug leads. Presently, three peptides A, B, and C of 3-4 kDa size were isolated from the methanolic extract of *A. donnani* collected from coastal water in Wennappuwa, Sri Lanka. Peptides were purified using RP-HPLC (Reverse Phase High Performance Liquid Chromatography). The mass spectroscopic analysis using MALDI-TOF (Matrix-Assisted Laser Desorption/Ionization- Time Of Flight) revealed monoisotopic masses of peptides A,B and C 3885.93 Da $[M+H]+$, 4325.40 Da $[M+H]+$, and 4883.25 Da $[M+H]+$ respectively. The number of disulfide bonds were identified as 2, 4 and 5, respectively in peptides A, B and C after reduction and alkylation. Peptide A was subjected to microdilution assay (Strömstedt et al, 2017) against *E. coli* (ATCC 25922), *S. aureus* (ATCC 29213), and *P. aeruginosa* (ATCC 27853). Peptide A inhibited growth of *E. coli* at a minimum inhibitory concentration (MIC) value 100 µM. The study will continue with peptide sequencing by MSMS, structure elucidation by NMR and further screening of other potential bioactivities of the isolated peptides.

Keywords: *marine sponges, peptides, Axinella donnani*

ID 202

Manipulation of Histone Modification Using Hydroxamic Acid Derivatives: An Implication of Ramachandran Plot

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Histone deacetylase (HDAC) inhibitors are a new class of anti-cancer agents that play an important role in epigenetic regulation. There are many HDAC inhibitors in different stages of clinical development for the treatment of cancer. The overall quality of the HDAC enzyme can be given by geometry, stereochemistry, and other structural properties. The Ramachandran plot shows the distribution of the backbone dihedral angles, ϕ (phi) and ψ (psi). The angle values of the enzyme structure can be used for structure validation. The effects of hydroxamic acid derivatives on amino acids of the histone deacetylase like protein (HDLP) enzyme were compared by computing the positional stability of individual amino acids. These stability studies may develop a molecular-level description of the inhibition efficacy of an inhibitor. The molecular dynamics (MD) simulation was carried out for the selected hydroxamic acid derivatives, such as, Suberoylanilide hydroxamic acid (SAHA) as a reference drug, N-hydroxy-3-(pyridine-2-yl)propanamide (drug 1), and N-hydroxy-3-(1H-pyrrol-2-yl) propanamide (drug 2). The trajectory analysis showed that the ϕ and ψ angles of amino acids are changed during the MD simulation. The LEU26 amino acid showed a favorable structure when the dihedral angles of ϕ and ψ are nearly -100^{o} and 25^{o}, respectively. This observation is reflected in the Ramachandran plot, which LEU26 presents in the favourable region with SAHA and drug2. The results o the Ramachandran plot indicates that the complexes of SAHA and drug2 are more stable than the wild type HDLP. Therefore, these drugs are showing enough potent to stabilize the HDLP. The complexes of SAHA and drug 2 were showing a more significant number of residues in the favorable region than drug 1. Therefore, the drug 2 has equal potential to inhibit the deacetylation process in histone as reference drug SAHA.

Keywords*: histone deacetylase (HDAC), Ramachandran plot, histone deacetylase like protein (HDLP), dihedral angle, MD simulation*

ID 235

Prediction of Tourist Arrivals in Sri Lanka: Comparison of Time Series Models

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Tourism in Sri Lanka is an enormous area that impacts the economy of the country. The rise in income and job opportunities are the main advantages gained from this sector. Thus, it is important to identify the behavior of the arrivals of tourists. The main objective of this study was to compare different time series models using Auto-Regressive Integrated Moving Average (ARIMA) methods to determine a better model to be used in the prediction of tourist arrivals. It is also aimed to evaluate the performance of the models through Normalized Root Mean Squared Error (NRMSE) and Mean Absolute Percentage Error (MAPE) and to recognize the satisfaction of model diagnostics. Following the stationary of the transformed data, the Webel-Ollech overall (WO) test indicated the feature of seasonality. Therefore, the ARIMA model was extended with seasonality behavior using Seasonal Auto-regressive Integrated Moving Average (SARIMA) models with different seasonal lags of 3, 6 and 12, which were detected using Autocorrelation (ACF) and Partial Autocorrelation (PACF) plots. The ARIMA$(0,1,0)(2,1,1)_{[12]}$ model had the lowest Akaike Information Criterion (AIC) value. However, among all the models it had the highest NRMSE and MAPE values. The lowest NRMSE of 0.878 was in the model ARIMA $(1,1,11)(2,1,3)_{[3]}$ with the MAPE of 0.22. In addition, it satisfies all the assumptions of model diagnostics in SARIMA. Therefore, the best model that can be used in the forecasting tourist arrivals is ARIMA $(1,1,11)(2,1,3)_{[3]}$. This work benefits as an indicator to make vital decisions and plans for future demand in the industry of tourism.

Keywords: *tourism, seasonal auto-regressive integrated moving average, akaike information criterion, performance criteria*

ID 268

Exploration of Guava Varieties in Sri Lanka for their Geological Distribution and Phytochemical Compositions

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Sri Lanka is rich with many guava varieties; nevertheless, information on their distribution and the studies on phytochemical compositions have not been documented enough. Therefore, this study is aimed on exploration of guava varieties namely, *Psidium pomiferum* (Apple-pera), *Psidium guineense* (Embul-pera), *Psidium guajava* (Getta-pera) and hybrid varieties of *Psidium* "kanthi'' (Kanthi), *Psidium* "pubudu" (Pubudu) and *Psidium "*costorican" (costorican) for their phytochemical profile and the distribution in Sri Lanka with the purpose of producing a library/ repository to be used for the scientific community and general public. The literature survey was conducted to locate their availability in Sri Lanka and then leaves were collected from those places after authentication. The chemical constituents of air-dried guava leaves were extracted by maceration and phytochemical profiles were analyzed qualitatively and quantitatively using standard protocols. The results revealed the presence of a vast array of phytochemicals in all guava varieties. Interestingly, quantitative analysis showed higher percentages of saponin in Pubudu and Kanthi (13.6767±0.2902, 13.1033±0.1721% respectively) than other varieties. Furthermore, Getta-pera showed the highest percentage of alkaloids (9.1733±0.2413%) whereas the lowest alkaloid content was present in Costorican guava (3.4233±0.1222%). This study produces the phytochemical profile of different varieties of guava which shows some variation among varieties. In addition, a map including locations of these guava cultivations in Sri Lanka has also been documented. This study has become the first to explore different guava varieties for their phytochemical profile and their distribution, and hence this study will be instrumental and will make the path for novel research of Guava. Acknowledgement: Authors thank AHEAD-DOR o 05 project for financial support

Key words: *P. guajava, P. pomiferum, P. guineense, hybrid guava, phytochemicals*

ID 296

Forecasting Colombo Open Market Retail Prices of Big Onion Using Feed-forward Neural Networks

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The cultivation of vegetable crops plays a major role in the Sri Lankan economy since it provides a great opportunity to farmers in rural areas. This study is focused on modelling and forecasting the monthly Colombo open market retail prices of big onion using a Feed-forward Neural Network (FFNN) because the local big onion prices were increasing rapidly around September 2019. Even though many researchers have predicted different commodity prices, published research on forecasting monthly retail prices of big onions of Colombo open market were unable to find. In the FFNN model, moving averages & lags of open market retail prices of big onion along with additional variables have been used as the inputs. Network parameters such as epochs, learning rate, combination coefficient have been adjusted to get the optimum performance of the network. Root Mean Squared Error (RMSE) and Normalized Mean Squared Error (NMSE) were used as performance measures to detect the best model. The network was trained using the Levenberg-Marquardt backpropagation algorithm and the 'trainlm' function. There were 2 hidden layers with 3 and 1 hidden neurons in the best model. The optimum values for the combination coefficient, learning rate, and epochs were 0.001, 0.01, and 1000, respectively. The FFNN network which contained the minimum RMSE and NMSE of 6.9184 and 0.0695 was selected as the best-fitted model for forecasting the open market retail prices of big onion. This study may benefit the decision-makers and stake holders who are interested in the price fluctuations of big onion.

Keywords: *feed forward neural networks, root mean squared error, big onion*

ID 305

A Study of Forehand Overhead Smash in Badminton: Relationship with Upper Body Anthropometrics

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This paper examines the speed of forehand overhead smash in badminton. Technological advancements in biomechanics have led to more accurate measurements in analysis of smash speed, yet not focused on the relationship of height and upper body anthropometry on smash performance, specifically with shuttle velocity. It has been observed that taller players perform powerful smashes compared to short players. The primary motivation of the paper is therefore to investigate possible influencing factors, and to assess their impact on varying smash speed. Player height, upper limb length, elbow angle at shuttle contact, average racket/shuttle speed and racket movement angle were measured on players. Data were collected from 54 university level badminton players with the aid of racket sensor, video captures and other measurements. Correlation analysis and multilevel modelling for repeated measures were used as statistical tools for the analysis. Multi co-linearity identified between two independent variables guided towards a principal component analysis. Findings of the study includes (i) factors observed have a positive correlation with smash speed except the racket movement angle, (ii) increment in racket movement angle creates a slower smash, (iii) multi co-linearity between racket movement angle and average force creates significant impact on smash speed, (iv) players with reduced racket movement angle will be more benefited and (v) players with improved height, longer upper limb length and extended elbow angle can perform faster smash strokes. This study would provide an opportunity to explore Sri Lankan badminton players' performances and to accommodate the players tactfully.

Keywords: *smash speed, principal component, repeated measures*

ID 366

Phytochemical Analysis and Antioxidant Activity of Vegetatively Propagated *Cinnamomum Zeylanicum* Varieties in Sri Lanka

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Cinnamomum Zeylanicum (true cinnamon or Ceylon Cinnamon) is indigenous to Sri Lanka and comparatively rich in chemical composition. Parts of the plant are used in folk medicine as well as in modern drug industries. Most of the Cinnamon species around the world are cross pollinated and the pharmacological properties of such species are challenging. The aim of this study was to investigate the phytochemical composition in leaves and bark of vegetatively propagated varieties of Cinnamon in Sri Lanka (Sri Gamunu [G] and Sri Wijaya [V]) and determination of their antioxidant properties based on maturity (>5 years [M_1], 2.0-2.5 years [M_2], and 1.5-2.0 years [M_3]). The findings from phytochemical screening revealed the existence of secondary metabolites viz. alkaloids, flavonoids and polyphenols. It was revealed that bark of G1 comprised alkaloids (7.94±0.06 mg/100g), flavonoids (3.01±0.36 mg/100g), and polyphenols (5.51±0.45mg/100g). GM1 leaves contained flavonoids (3.77±0.89 mg/100g), saponins (24.74±0.92 mg/100g) and polyphenols (3.90±0.16 mg/100g). DPPH assay elicited the radical scavenging activity that varied in order of GM_1>GM_2>GM_3 in bark and leaves of Sri Gamunu, and VM_1>VM_2>VM_3 in bark and leaves of Sri Wijaya. The highest IC_{50} values were noted in bark as 0.27±0.03 and 0.22±0.06 respectively in GM_3, VM_3 and 0.27±0.07 and 0.37±0.01 respectively in GM_3 and VM_3 leaves. Results confirm that vegetatively propagated Ceylon Cinnamon of Sri Gamunu and Sri Vijaya are rich with phytochemicals and exhibit higher anti-oxidant properties.

Keywords: *Ceylon Cinnamon, vegetative propagated, phytochemicals, DPPH assay*

ID 388

Detect Diabetic Retinopathy Using Machine Learning Approaches: A Systematic Literature Review

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Eyes perform an important role in our everyday lives. The main blessings that we find in retinal eyes, the retinal vessel parameters and accurate estimates are considered as critical issues in the image process. Diabetic retinopathy is one of the most dangerous diabetes complications due to severe vision loss when treatment is delayed. To detect the diabetic retinopathy severity stage many of the researchers have used different kinds of datasets, pre-processing techniques, and classification types. To identify the current status and research gap of the above domain worldwide, a systematic literature review was carried out through the several key search terms being diabetic retinopathy, neural network, deep learning, and machine learning. Most of the research have done their research to classify only two stages. Mainly three databases were searched to seek out relevant studies in the domain with-in the period 2014-2019. Initially, 135 studies were considered and finally, 15 studies were selected for detailed analysis. Findings show that in most of the research, Kaggle, Messidior, and DIARETDB1 have used a CLAHE histogram to get the better contract retinal images and using Convolutional Neural Network for classification the diabetic retinopathy into different stages. Alexnet CNN model architecture has been used to get the best accuracy and sensitivity rather than other classification methods such as Support Vector Machine. The study makes a significant contribution by providing a systematic and up-to-date literature review on the selected domain.

Keywords: *convolutional neural network, machine learning techniques, contrast limited adaptive histogram equalization*

ID 425

Nutritional and Physicochemical Properties of Lotus (*Nelumbo Nucifera*) Root

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Lotus root (*Nelumbo Nucifera*), a well-known medicinal plant in Sri Lanka is rich in dietary fiber and various bioactive compounds. However, the potential of lotus roots in functional food formulation has not been revealed enough. This study was conducted to analyze certain nutritional and physicochemical properties which need to be elaborated to evaluate the potential of lotus root in functional food industry. Quantification of total starch, dietary fiber, amylose and amylopectin were conducted under nutritional properties and water holding capacity, oil holding capacity, swelling power and water solubility of flour obtained from lotus roots were analyzed under physicochemical properties. Total starch and dietary fiber present in lotus root (g/100g DM) are 21.38±1.07 and 14.33±1.02 respectively. Amylose content of the starch of the lotus root was 55.19%±0.85 and amylopectin content was 44.81%±0.17. When considering physicochemical properties of lotus root flour shows that swelling power and water solubility as16.46%±1.61 and 3.27%±0.01, respectively. Further the lotus root shows 5.32 ±0.02(g/g) of water holding capacity and 1.98 ±0.02 (g/mL) of oil holding capacity. Lotus roots are starchy based food containing significant amount of dietary fiber which is widely important in functional food formulation. Nutritional, physicochemical and functional properties of lotus root should be carried out further to enhance the availability of lotus root based functional food products for human consumption.

Keywords: *functional food, lotus root, Nelumbo nucifera,*

ID 434

Polyphenols and Antioxidant Capacity of Edible Flowers

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Edible flowers have been a part of cookery from ancient times owing to their aesthetic value. Recently they have gained attention as sources of biologically active compounds which could deliver potential health benefits to humans. This study aims to investigate the polyphenolic content and antioxidant capacity of eight different species of edible flowers. The hydro methanolic extracts of the flower samples were analyzed for total phenolic content, total flavonoid content and total anthocyanin content and their antioxidant capacity was evaluated using DPPH radical scavenging assay, ferric reducing power, and total antioxidant capacity assay. Based on the outcomes of the study a wide range of variation was observed in the polyphenolic content of different flower extracts. Extracts of *Ocimum Sanctum* exhibited the highest total phenolic content and total flavonoid content whereas *Punica Granatum* exhibited the highest anthocyanin content. Among the investigated flowers extracts of *Calotropis Gigantea* (76.03%), *Ixora Coccinea* (74.72%) and *Jasminum Sambac* (70.91%) exhibited quiet higher radical scavenging ability compared to the other flowers. Extracts of *Punica Granatum* exhibited the highest ferric reducing power whereas extracts of *Jasminum Sambac* and *Vinca Rosea* exhibited comparatively higher values of total antioxidant capacity. The investigated flowers are good sources of phenolic compounds with significant antioxidant capacity which could be utilized for pharmaceutical and functional food development.

Keywords: e*dible flowers, polyphenols, antioxidant capacity*

ID 583

Assessment of Total Phenolic Content, Total Flavonoid Content and 2,2-Diphenyl-1-Picrylhydrazyl Radical Scavenging Ability of Selected Underutilized Fruits Available in Sri Lanka

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A greater deal of research currently focuses on identification of bioactive compounds in dietary sources for the development of functional food products which may supplement body's antioxidant capacity. There is much extent to research on underutilized food crops, such as, Star Gooseberry -*Phyllanthus Acidus*, Sour Orange - *Citrus Aurantium*, Yaki Naran - *Atalantia Ceylanica*, Bullock's Heart - *Annona Reticulata*, Canistel – *Pouteria Campechiana* in this regard. The objective of this study was to assess the Phenolic compounds of methanolic extracts prepared from freeze dried flesh parts of selected crops. Crude extracts were analyzed for Total Phenolic Content (TPC), by DPPH radical scavenging assay and for Total Flavonoid Content (TFC) using UV/VIS spectrophotometric methods. The highest radical scavenging ability (74.50 ± 0.32 %) was recorded for *Annona reticulata* methanolic extract. The highest total phenolic content (TPC) was recorded for *Atalantia ceylanica* (976.75 ± 53.50 µg GAE / g dry weight). The lowest TPC (61.45 ± 4.80 µg GAE / g dry weight) was recorded for *Annona Reticulata* flesh. However, all fruit extracts recorded high amounts of total flavonoid content (TFC) in terms of Rutin equivalents. The lowest among them was reported by *Pouteria campechiana* fruit extract (0.30 ± 0.06 mg RE / g dry weight). The potential phytochemical compounds should be further investigated using novel techniques prior to product development.

Keywords: *flavonoids, DPPH radical scavenging, underutilized crops.*

ID 588

Effect of Vermicompost with Biodynamic Formulated Biochar on Carbon and Nitrogen Mineralization in Ultisols and Alfisols

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Organic amendments provide good nutritional input to the soil maintaining environmental sustainability. Soil salinization for Alfisols and soil acidity for Ultisols are the major issues for crop cultivation in Sri Lanka. This study is aimed to assess the effect of vermicompost, biochar and biodynamic formulated biochar on carbon and nitrogen mineralization of Alfisols and Ultisols, the main soil types that cover the land area in Sri Lanka and the world. Vermicompost and biochar with and without biodynamic formulation were applied to soil types separately according to the specific ratios. After incorporating the amendments, pH, EC, nitrate-N, ammonium-N and CO_2 evolution were determined up to 63 days according to a completely randomized design with four replicates. Statistical analysis was done using SAS statistical software. According to the results, pH of Ultisols showed a lowering at the initial stage, however it was not significantly different with control. Inoculated and non- inoculated biochar with vermicompost in Alfisols decreased the EC significantly ($p<0.05$) in later stages reducing the salinity. In Ultisols and Alfisols, nitrate-N increased significantly ($p<0.05$) in both treatments. The evolved CO_2 was significantly high ($p<0.05$) in microbial inoculated soil treatments when compared to non-microbial inoculated soil treatments in both soil types ($p<0.05$). It can be concluded that the nitrogen and carbon mineralization pattern varied among the treatment in Ultisols and Alfisols. Soil amendments have both long term and short-term effects. Therefore, it is recommended to do further studies to evaluate the long-term effect of organic amendments.

Keywords: *biochar, mineralization, vermicompost*

ID 603

Development of the 400m Running Performance of Under Sixteen Male Athletes

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Running is one of the essential fundamental motor skills for many compound movements in late specialization sports. It is essential to improve both speed & endurance. This study's prime aim was to develop the 400 m running performance of the selected five, 15-year-old male athletes within twelve (12) weeks training period. Pre-test & Post-test Experimental Research Design was used to determine the pre- and post-performance level of the study sample. Those tests were conducted in two methods, divided 400 meters into 4 sets of hundred meters, and calculated the time spent to complete each set of 100 meters. The other approach was to measure the performance of cardiovascular endurance, Muscular strength, Muscular endurance, and flexibility components. According to the findings, the training program improved the overall speed (P value 0.006), but was unable to improve the athlete's running rhythm. After the treatment it was also able to achieve significant improvement in their cardiovascular fitness (P value 0.025) and flexibility (p value 0.003) and a slight improvement in muscular strength and muscular endurance. Regular data collection was done by using consent forms (written) and testing (pre-test, post-test). At the beginning athletes lack in maintaining the correct running posture when they were running, but with the treatment it was proven by Kinovea video analysis that there was a development in the technique of the study sample.

Keywords: *400m run, cardiovascular endurance, muscular strength, muscular endurance, flexibility*

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