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Foreword

ISOLATION AND IDENTIFICATION OF A FLAVONOID RESPONSIBLE FOR UV PROTECTION FROM *Codiaeum variegatum* (L.) BLUME LEAVES.

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Focus Area: Basic Sciences, Emerging Technologies & Indigenous Knowledge

The photoprotective efficacy of *Codiaeum variegatum* (L.) Blume based on the Sun Protection Factor (SPF) was measured. The methanolic extract of the plant showed a mean SPF value of 16.52. The crude methanolic extract was subjected to the phytochemical screening and the results reveled that flavonoids present were mainly responsible for the ultraviolet absorption. In order to isolate the flavonoids the plant extract was partitioned using modified Kupchan's partitioning method. Three fractions were collected namely ethyl acetate, chloroform and hexane. All fractions were concentrated to dryness and re-dissolved in methanol to achieve 0.2 mg mL^{-1} concentration solutions. The UV absorption spectra of the samples were obtained in the range of 200 to 400 nm. SPF values were calculated by using the Mansur equation. The mean SPF values of the ethyl acetate, chloroform and hexane soluble fractions were 33.90, 14.13 and 10.69 respectively. Flavonoids were present only in the ethyl acetate and chloroform fractions. TLC analysis was carried out using the solvent system methanol: chloroform: acetic acid (5: 2.5: 0.5 –volume ratio). The ethyl acetate soluble fraction had only one component while the chloroform soluble fraction had many. Chloroform fraction (1.5223 g) was chromatographed. 60 fractions were collected using Column Chromatography over Silica gel Column (60-120 mesh) and eluted with a solvent gradient of hexane-ethyl acetate and then with a methanol-water gradient. The UV-visible, FTIR and GCMS analyses of the ethyl acetate soluble fraction and the fractions containing flavonoids which were collected from column chromatography were carried out. However, GC-MS analysis of the isolated compounds did not provide any evidence of a flavonoid, probably due to flavonoids' thermal labiality and very high boiling points. According to IR and UV-vis data it was concluded that the isolated compound which contributes to sun protection is a flavonol (Pendulin).

Key words: Pendulin, SPF, UV-vis Spectroscopy, Methanol, chromatography

LOW COST THREE-ELECTRODE POTENTIOSTAT FOR ELECTROCHEMICAL MEASUREMENTS

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Focus area – Basic Sciences, Emerging Technologies & Indigenous Knowledge

A potentiostat is an equipment which is fundamental to modern electrochemical studies using a three electrode system for investigations of reaction mechanisms related to redox chemistry and other chemical phenomena. Electrochemical measurements can be used in a variety of applications such as food industry, drug analysis, battery industry, wastewater treatment etc. However, the cost of a potentiostat is often more than $5,000 and the affordability is limited mostly to academic and research institutions in Sri Lanka. The main objective of this project is to develop a low cost potetiostat to monitor redox processes where the instrument can be later optimized to meet the needs of clients from industry.

The developed system consist of three main modules namely user interface, triangular voltage generator, and current to voltage converter. User inputs of scanning voltage range and scanning rate can be input through the user interface. Triangular voltage generator consists of four sub circuits such as Atmega 328p microcontroller based 8-bit step counter, digital to analog convertor (PCF 8591 8-bit DAC), difference amplifier and inverting summing amplifier. This module outputs triangular voltage in the range of -2.5 V to +2.5 V at a user given rate where it connects to the working electrode of the three-electrode system. Current to voltage converter takes input from counter electrode of the three electrode system. The output voltage of this circuitry inputs to the microcontroller for real time data acquisition. Overall nine operational amplifiers were used to construct the proposed circuit and it is powered with 12 V DC power supply.

The system constructed in this work can operate voltage range between -2.5 V to 2.5 V, where user can select the desired scan rate and input parameters

through a personnel computer interfaced to the instrument for only perform cyclic voltammetry. The current range measured using this system is 25 μA-2.5 mA. Performance of this system is compared with a commercially available potentiostat using $K_3Fe(CN)_6$ and $FeCl_3$ solutions. The three electrode system reported here consists of a Ag/AgCl reference electrode, a carbon working electrode, and a Pt working electrode with aqueous KCl as the electrolyte. Results are in good agreement with commercially available research grade potentiostats.

Keywords: Potentiostat; Three-electrode system; cyclic voltammetry; electrochemical measurements; digital to analog conversion;

MATHEMATICAL MODELLING OF ADSORPTION OF HEAVY METALS AND DYES ONTO WASTE BIOMASS USING FIXED BED ADSORPTION

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Focused area: Water

Fixed bed adsorption is a reliable and economical technique for the removal of the contaminants such as heavy metals and dyes from waste water. Breakthrough curves obtained from laboratory scale fixed bed columns provide data for design of industrial scale adsorption columns. Since conducting experiments is time consuming and expensive, mathematical modeling is more advantageous for predicting the behavior of adsorption systems. Several mathematical models such as Thomas model, Yoon Nelson model and BDST model have been introduced for describing the behavior of the adsorption systems. In this study, breakthrough curves obtained for adsorption of Pb, Cd & Cibacron Blue dye on to coir pith, were fitted to the above mentioned models and model parameters were calculated.

Effect of operating parameters; fixed bed height, initial solution concentration and flow rate; on the model parameters were studied. Adsorption capacity, adsorption rate constant and 50% breakthrough time values were estimated through above models. Yoon-Nelson, BDST and Thomas models provided satisfactory fits with the experimental data of all adsorption systems with high correlation coefficients in the range of 0.95-0.99. Adsorption of Cibacron Blue dye onto coir pith showed better correlation to the three models under study, compared to the adsorption of Pb and Cd onto coir pith. For adsorption of Cibacron Blue Dye onto coir pith, the column adsorption capacity decreases with the increase of the flow rate and the bed height. In the adsorption of Pb onto coir pith, adsorption capacity shows a reduction with the increase of the bed height.

Using these mathematical models it is possible to calculate the Model parameters and they can be used to predict breakthrough curves and hence design of fixed bed adsorption columns.

Keywords: Fixed bed adsorption; BDST model; Coir pith; Tea waste; Thomas model; Yoon–Nelson model

A NOVEL WAY FOR THE DETERMINATION OF THE EQUILIBRIUM CONSTANT OF SYSTEM $I_2 + I^- / I_3^-$ BASED ON AN ELECTROCHEMICAL METHOD

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Focus area - Basic Sciences, Emerging Technologies & Indigenous Knowledge

Determination of the equilibrium constant of the reaction $I_2 + I^- \rightleftharpoons I_3^-$ is a part of the laboratory curriculum for chemistry undergraduates. To calculate the equilibrium constant, one should measure the concentration of any of tri-iodide, iodide or iodine in solution at equilibrium. Then the equilibrium concentrations of the other two can be calculated from the initial concentrations of I_2 and I^-. The most common method is to partition iodine between dichloromethane and water. By titrating with $S_2O_3^{2-}$ the concentration of I_2 in the organic layer and the total concentration of free iodine and the complexed iodine in aqueous layer are determined and the equilibrium constant is calculated. This is a lengthy and time consuming method. This study proposes a novel method to determine the equilibrium constant with a single measurement of the electrode potential. For that, a carbon electrode was used as the working electrode and saturated calomel electrode (SCE) was used as the reference electrode. The equilibrium mixture was prepared with known initial concentrations of I_2 and I^-. From the measured I_2/I^- electrode potential and the Nernst equation one can get a value for $[I^-]^2/[I_2]$ at equilibrium. Since the initial concentrations are known the equilibrium concentrations of all three species can be calculated by solving a quadratic equation. Measurements were carried out at 288, 293, 298, 303 and 308K. Equilibrium constants determined by the chemical method and the proposed electrochemical method agree within 7% except at 288K. This is acceptable given the context of undergraduate research project. However, the electrochemical method provides an easy, inexpensive, faster and accurate method for the determination of the equilibrium constant. Such measurements and calculations can be extended to any similar reaction where some of the species involved in a chemical equilibrium form a redox electrode.

Keywords: Partition coefficient, electrode potential, saturated calomel electrode, carbon electrode, Nernst equation, tri-iodide

OPTICAL BRAILLE TRANSLATOR - COMMUNICATION TOOL FOR VISUALLY IMPAIRED PEOPLE

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Focus area – Basic Sciences, Emerging Technologies & Indigenous Knowledge

Visually impaired people are also important part of all societies and they, as everyone else, can perform an effective part in the development of the country. It is necessary to provide and support for those people with special systems and technologies to allow communication and interaction with each other and with non-blind people. Hearing and touch feeling are the two main senses used by the visual impaired people which are more advance and sensitive than for sighted people. The most famous paper communication system for blind people is the Braille system which depends on the sense of the touch of the finger.

However, for most of people in the society cannot understand Braille. Therefore paper communications between the visually impaired people and the people without vision problems has become a bottleneck that need to be addressed. Translating Braille into Sinhala or any other languages will be important to visually impaired people to improve their communication with the people without visual problems in society.

In this project a system was developed to translate imprinted Braille into selected language (Sinhala or English) text. This project was mainly based on the image processing technology and Optical Character Recognition (OCR) technology. The proposed work used several types of mathematical algorithms in MATLAB environment to extract imprinted Braille characters from an input image. Input images were RGB images of Braille documents. The developed system first identifies the Braille character regions automatically. Then the identified character regions reconstruct for better identification. Finally reconstructed Braille letters are translated into corresponding font based on the selected language either Sinhala or English. Here we introduce a novel method of identifying Braille letters based on binary numbers. This Optical Braille Translator (OBT) can identify most of Sinhala Braille characters, grade 1 English Braille characters and few grade 2 English Braille characters. Also this OBT can identify numbers and English capital letters in a sentence. Finally, identified Braille characters translated into given language (Sinhala or English)

and translated font file can open as a Microsoft Word document. A simple user interface was developed to access this Optical Braille Translator easily.

Keywords: Optical Braille, Visually Impaired People, Character Recognition, Image Processing, Segmentation
Acknowledgement: Financial assistance by University of Sri Jayewardenepura, Research grant ASP/01/RE/SCI/2017/13

DIVERSITY, DISTRIBUTION AND CHEMICAL COMPOSITION OF SOME SEAWEED IN JAFFNA, SRI LANKA

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Focus Area- Food, Nutrition and Agriculture

Seaweeds contain more than 60 trace elements, minerals (I and Br), proteins, vitamins and several bioactive substances of economic value. Seaweeds have been used since ancient time as food, fodder, fertilizer and nowadays as a source of medicine. However, there is not enough information available on seaweeds and its mineral compounds of Jaffna region. Therefore, the present study was conducted to investigate the nutritional composition of seaweeds available in Jaffna coastal region from January to April 2016. Quadrant was used to do the quantitative assessment. Proximate and mineral analysis was performed to evaluate the nutritional composition of sea weed species. A total of 47 species of seaweeds were used in the study. Among those, green and brown algae were highly distributed. *Padina minor* (Yamada), *Halimeda opuntia* (Linnaeus) J.V.Lamouroux, *Sargassum polycystum* C. Agardh, *Gracellaria edulis* S.G.Gmelin were highly distributed seaweed species. *Halimeda s*pecies had higher amounts of ash (69.5), with very low water content (1.90%). *Sargassum* spp (21.80%) and *Padina* spp. (22.60%) contained high amount of carbohydrates. According to the proximate analysis, *Padina* spp (15.40%) and *Sargassum* spp (25.43%) showed higher fibre content. *Sargassum* spp. (13.55%) showed the highest protein content indicating a potential to be used as a protein source. Further, there were significant variations in the chemical composition among species. According to the mineral analysis, *Halimeda opuntia* was the richest in Ca (53g/100g), K (6.354/100g), Na (0.63/100g), ash (15.41%) and Fe (0.15%) *Gracellaria edulis* (17.10 ppm) and *Sargassum polycystum* (12.51 ppm) exhibited significantly higher ($P<0.05$) amount of P. Given above, it can be concluded that some of the above studied algae can be used as a good source of carbohydrates, protein and a mineral source.

Key words: Seaweeds, *Halimeda opuntia, Sargassum polycystum, Gracellaria edulis*, *Padina minor*

ESTIMATING THE REPLACEMENT COST OF SOIL EROSION IN TEA SMALLHOLDINGS: A CASE STUDY IN RATHNAPURA DISTRICT

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Focus area – Food, Nutrition and Agriculture

The effort to reconcile the objectives of increasing agricultural production, reducing poverty and ensuring sustainable use of the natural resources has been a continuing battle in many developing countries, as they confronted with problems of increasing population pressure on existing land resource. Furthermore, soil erosion remains an intractable problem in developing countries like Sri Lanka, causing considerable economic damage to agricultural community by decreasing productivity of crops and increasing cost of production. It is a paramount threat to sustainable production on agricultural lands, especially on sloping lands with high intensive rainfalls, where tea is majorly grown. To formulate effective erosion control policies and achieve the sustainability, it is vital to identify the soil erosion in terms of its magnitude. Therefore, this study was conducted to examine the replacement cost of soil erosion by considering the fertilizer application into tea lands. Thirty number of tea smallholders were selected for the study in Rathnapura district (Low country-Wet Zone) and application of –N, P and K amounts were taken as a direct measurement for fertility depletion by on-site soil erosion. Related primary data were collected through structured pre-tested survey questionnaire and cost of erosion was calculated for small scale and large scale tea lands separately. Nutrient removal by erosion was calculated using the deviation between nutrients added by fertilizer application and nutrients removal by yield. Mathematical procedure was carried-out for the study and monetary value was incorporated to the erosion, considering the market prices of fertilizers. Results found that average erosion cost for large and small scale tea lands were 62,892 and 60,418 Rupees/ha/annum separately. Study suggests that reduction of long-term erosion cost needs to be effectively achieved through investing on sustainable land management practices.

Key words: On-site erosion, Replacement cost, Sustainable production, Tea smallholdings

SRI LANKAN TOURISM INDUSTRY AND FOREIGN EXCHANGE EARNINGS

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Focus area - Business and Economics

Tourism industry is growing at present with higher rate of arrivals in every year in Sri Lanka. It ranks third in terms of earnings in the service sector in the country. However there is a wide variation in the earnings from different regions and countries. Considering the global scale developments it becomes a challenge to Sri Lanka to keep the current momentum in the industry specifically with other competing destinations to Sri Lanka. Thus promoting tourism in countries where we can enhance earnings from the industry becomes an import issue. The objective of this study is to investigate from which countries Sri Lanka gets higher earnings. Identification of such countries is important in promoting tourism. Annual data from 10 countries that Sri Lanka receives highest number of tourist arrivals were collected for the time period of 2005-2015 as the sample. A regression model was fitted considering average spending of a tourist from a given country taking as the dependent variable. The independent variables are annual percentage of tourist arrivals from a given country, and a set of country dummies to identify ten countries in the model. Results from the model with country dummies indicate that Sri Lanka gets highest earnings per tourist from tourists coming from Australia. USA and Germany tourists take the second and third place in terms of earnings (spending by tourists) in Sri Lanka. The tourism policy in Sri Lanka can consider these findings in the promotion of tourism in various parts of the world as well as to develop strategies to get higher earnings from the tourists coming to Sri Lanka.

Keywords-Tourism industry, Tourist spending, Tourist arrival

ANALYSIS OF THE RESOURCE USE EFFICIENCY IN TOMATO PRODUCTION - A CASE STUDY OF BADULLA DISTRICT, SRI LANKA

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Focus area - Food, Nutrition and Agriculture

Tomato is a leading cash crop grown in Sri Lanka. The rapid escalation in the cost of production over the years is a major problem related to the tomato cultivation in Sri Lanka. Hence, this study was conducted to examine the current level of resource use efficiency of tomato farming in Badulla district. Multi-stage stratified random sampling technique was used to obtain data from 100 farmers. Descriptive, Partial budgeting and Cobb-Douglas stochastic frontier model were used in the data analysis. The results revealed that the majority of the farmers were more than 40 years old, however educated and had many years of farming experience. As per the cost- benefit analysis, the mean benefit cost ratio (BCR) was 3.12. According to the Cobb Douglas stochastic frontier model, the mean technical efficiency of the cultivation was 0.77, which implies that the tomato farming in Badulla district is 77% efficient. Farm size, seeds, agrochemicals and labor were significantly affecting in determining the technical efficiency. However, fertilizer affected negatively on the technical efficiency indicating that an increase in the level of fertilizer will decrease the level of yield. The results of the Marginal analysis exposed a negative efficiency coefficient (-0.7) related to fertilizer application, while seed, farm size, and labor received positive coefficients. Therefore, an extreme use of fertilizer will drop the profit of the cultivation. It can be concluded that under the given farming conditions the production of tomato can be increased by 23 percent. In addition, profit can be enhanced by increasing seeds, farm size and labor while decreasing the level of fertilizer. It is recommended to advice farmers by means of proper extension service on reducing the fertilizer usage and spending the money saved from reducing the quantity of fertilizer applied on purchasing seeds and more use of labor in order to maximize the profit.

Key words: Cobb Douglas, Resource use efficiency, Sri Lanka, Stochastic frontier model, Technical efficiency

A STUDY TO ASSESS THE USEFULNESS OF FULL FACE HELMETS TO REDUCE/PREVENT HEAD INJURIES AMONG MOTORCYCLE ACCIDENT VICTIMS

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Focus area - Health

In Sri Lanka there is a rapid rise of road traffic accidents among motorcyclists. The riders have high mortality rates which are mainly due to head injuries. Some motorcyclists believe that full face helmets give a better protection than open-face helmet in an accident. To assess the usefulness of full face helmets to reduce/prevent Head Injuries among motorcycle accident victims. The study was conducted among victims of motor cycle accidents, registered in Accident Services Unit, Colombo South Teaching Hospital using an interviewer administrated questionnaire. There was no statistical significance between presence of head injuries and the age, education level, valid driving license and consumption of drugs. But there was statistical significance between presence of head injuries and the sex and the consumption of alcohol. Among victims who had head injuries majority 66.32% were soft tissue injuries of the face. (92.4%) wore helmets and 93.93%worn it properly.28.4% had worn full face helmets and 99% worn it for safety. There was a statistically significant reduction of head injuries confined to the head and Face, among victims wearing Full Face Helmets. 94.00% of accident victims were not happy with banning of full face helmets. Wearing helmet is a major contributory factor for the severity of head injuries among motor cycle accident victims. Full face helmet provides greater protection, but the safety of the victim will depends upon the type and the way of using them.

Key words: Motorcycle accident victims, head injuries, full face helmets

KNOWLEDGE ON COMMON CHILD PSYCHIATRIC DISORDERS AMONG PRESCHOOL TEACHERS IN MAHARAGAMA AREA AND THEIR REFERRAL PRACTICES

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Focus area - Health

Child psychiatric disorders are on the rise and it is important to identify them as early as possible to ensure that they will lead a normal life. Preschool teacher are the first outsiders that interact with the children other than the family. They have a duty to identify and refer children with behavioural abnormality. For that they should have adequate knowledge regarding common child psychiatric disorders. To determine the level of knowledge and to assess referral practices about common child psychiatric disorders among preschool teachers in Maharagama area. It was a cross sectional study carried out in Maharagama area. Participants were preschool teachers in registered preschools in Maharagama area. Study instrument was a self-administered questionnaire which was provided in both Sinhala and English languages. Data was collected from 120 preschool teachers who were selected by systematic random method. Level of knowledge and referral practices was assessed according to the answers given to the questionnaire and analyzed using SPSS version 16 application. The study was done from March 2016 to June 2016. In this study it was found that 61.7% (74) preschool teachers had poor knowledge on common child psychiatric disorders while 75% (90) teachers had poor referral practices. There was a statically significant association between having a good knowledge and having participated in some sort of training program which included about common child psychiatric disorders. Both the knowledge and the referral practices on common child psychiatric disorders were poor among preschool teachers.

Key Words: Child psychiatric disorders, Pre-school teacher, knowledge, referral practices

THE EFFECT OF THE PICTORIAL HEALTH WARNING ON CIGARETTE PACKET ON SMOKERS

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Focus Area - Health

This research was undertaken to assess the effect of the pictorial health warning (PHW) on the cigarette packet on smokers and to assess the knowledge of smokers regarding the adverse effects of smoking, to assess the reduction of number of cigarettes after introduction of the pictorial health warning and to assess the sale of cigarettes after introduction of the pictorial health warning. This was a descriptive cross sectional study which was carried out in 2 phases in the Boralesgamuwa MOH area for a period of 12 weeks. In phase 1, the study population was current smokers and ex-smokers (303 participants) and phase 2 included the cigarette sellers (50 shops). Interviewer administered questionnaire was used to collect data after gaining verbal and written consent. Collected data was analysed by SPSS. Majority (96.6%) of the participants were current smokers. Among the study population 68.6% have a good knowledge of adverse effects related to smoking. Among the 303 participants, 298 smokers have seen the (PHW), 76.8% of them have paid attention and only 31.2% (n=93) was influenced by it. Two thirds of the influenced people had fear about the adverse effects but there were only one fifth who had an urge to quit. The results provide evidence that 16.7% (n=38) out of the participants who have paid attention to the PHW have reduced or quit smoking purely due to the message conveyed by it(p=0.000) this is 12.5% out of the total population. The findings indicated that 62% of the cigarette distributors sell 1-5 number of cigarette packets and 4% of the shops sell more than 10 packets per day. Mean value of cigarette selling per day is 5.8 (SD ± 4.025).The study results provide evidence that in a majority (70%) of shops the sales remained same after the introduction of the PHW. The results indicated that the association between paying attention to PHW and cessation or

reduction of the consumption of cigarette smoking is significant ($p<0.05$), although this is not corroborated by a reduction of sales in cigarettes.

Key words: Knowledge, adverse effects, number of cigarettes, influence, sales

ASSESSMENT OF THE EFFICIENCY OF COCONUT KERNEL RESIDUE IN REMOVING DYES FROM TEXTILE WASTEWATER

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Focus area - Water

This research was aimed at assessing the efficiency of Coconut Kernel Residue (CKR) in the adsorption of pollutant dyes present in textile wastewater. The adsorbent coconut kernel residue was chosen owing to the many factors which make it particularly suitable for the purpose. CKR is an abundant waste material in Sri Lanka. Households as well as some industries produce large quantities of CKR as waste. The presence of cellulose, hemicellulose and lignin make CKR a particularly good adsorbent for many compounds. The methodology was aimed at further enhancing the adsorption capacity of CKR through several strategies and reagents such as hexane and sulfuric acid.

The study was performed with the objective of evaluating CKR in terms of parameters which predominantly characterize adsorbents. Variation of adsorption capacity has been identified as a key parameter in this respect. A secondary objective of the study was the characterization of the adsorbent.

Reactive yellow, a commonly used dye among industries, was chosen as the adsorbate. A time series analysis was performed to calculate the adsorption capacity of CKR where the capacity at equilibrium was 30 mg/g. The time taken for the adsorption to reach its equilibrium was determined to be 20 minutes after which the rate of adsorption significantly dropped. The functional groups responsible for adsorption were revealed to be C=O, CH-OH, $-CH_2$ and $-CH_3$ by Fourier Transform Infrared (FTIR) spectroscopy.

Keywords — biosorbent, adsorption, reactive yellow, functional groups, adsorption capacity

CURRENT STATUS OF MANGROVES AND MANGROVE ASSOCIATES IN MAHILADYTIVU ECOLOGICAL SENSITIVE SITE OF BATTICALOA DISTRICT

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Focus area - Environment

Mangroves are productive eco system located in the intertidal zone. Mangrove environments provide habitats for variety of flora and fauna species. Mangroves provide multi beneficiary environments to the surrounding livelihood too. Though mangroves are extremely valuable resources they are facing serious threats due to destruction. Present study was carried out to assess the current status of mangroves and mangrove associates in an Ecological Sensitive area of Mahiladytivu in Batticaloa district during February 2016 to August 2016. Data was collected through random visual field examinations and point-quarter sampling method. The study investigates presence of 13 true mangrove species along with 11 species of mangrove associates belongs to 16 families. *Excoecaria aggalocha* L. is predominantly distributed among the 13 true mangrove species. Distribution of *Lumnitzera littorea* (Jack) Voigt which declared as critically endangered species in Sri Lanka, distribution of *Sonneratia alba* J.Smith , *Xylocarpus granatum* König which declared as endangered species in Sri Lanka and *Nypa fruticans* (Thunb.) Wurmb which declared as vulnerable species in Sri Lanka were recorded. Mahiladitivu Ecological sensitive site facing serious threats due to anthropogenic activities. Land utilization for Shrimp farming over 30 years has declined significant amount of mangroves in the study site. Operation of shrimp farms have been reported as the reason for the extinction of *Bruguiera gymnorhiza* from the study site. Further considerable amount of mangrove destruction has caused by the construction of Manmunai West Bridge. Activities as landfilling, firewood consumption and brush pile fisheries pave the path for the mangrove destruction. Based on the study it's proposed to carryout immediate conservation actions and protecting methods to protect the existing system and to educate the stakeholders of the society on the need to protect the existing mangrove ecosystem.

Keywords: True mangroves, Destruction, Endangered, Vulnerable, Species, Anthropogenic, Shrimp farms

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TAXONOMIC COMPOSITION OF BUTTERFLY SPECIES AND THEIR PRESENT STATUS IN SELECTED SITES OF BATTICALOA DISTRICT.

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Focus area - Environment

Butterflies are living organisms that are integral part of our ecosystem. Butterflies provide valuable environmental services as pollinators, natural pest controllers, indicators of environmental quality. The distribution of butterflies in Sri Lanka is largely determined by climate, topography and the underlying geology of land. The present investigation carried out to assess the current distribution of butterflies in Unnichchai, Urukamam, Vakarai, Vantharumoolai, and Kaluvankerni in East coast of Batticaloa during May 2015 to April 2016, based on a weekly random survey method. The butterflies were collected by "sweep sampling method". During present study a total of 41 individuals belonging to 05 families were reported, out of 05 families Nymphalidae was the most dominant family in terms of number of species and it was represented by 18 species, other families were Pieridae (12), Papilionidae (06), Hesperiidae (03), Lycaenidae (02).Highest number of individuals were recorded in Vantharumoolai as 31, While Unnichchai (28), Urukamam (26), Vakarai (21), and Kaluvankerni (24). Family Nymphalidae was found as the dominant family almost in all the study sites. According to the taxonomic status 35 Least concern butterfly species reported along with 04 Vulnerable species, 03 Near threatened species, and 01 Endangered species. The species of Least concern 15 species from Nymphalidae family, 06 species from Papilionidae and 10 species from Pieridae . *Ideopsis similis* (Blue glassy tiger) of family Nymphalidae was identified as "Vulnerable species" and *Thirumala septentrionis* (Dark blue tiger) was identified as a "Near threatened species", *Appias galena* (Sri lankan lesser albatross) of family Pieridae was identified as an " Endangered species". Rapid urbanization and development activities in past few years had a major impact on several species of butterflies in East coast. Further studies need to be conducted in more sampling sites incorporating different microhabits, and considering seasonality in order to ensure the checklist.

Keywords: Butterfly Species, Dominant, Endangered, Least concern, Microhabitat, Seasonality, Taxonomic status, Vulnerable.

Acknowledgement: Authors wish to extend to their sincere thanks to the Department of Zoology, Faculty of Science, Eastern University of Sri Lanka for providing microscopes, butterflies identification guides and travelling arrangements. Further extend to their heartfelt thanks to those who are involving in the field work.

KNOWLEDGE REGARDING LYMPHEDEMA IN THE COMMUNITY AND COMPLIANCE TO LIMB CARE IN LYMPHEDEMA PATIENTS IN SELECTED CLINICS OF COLOMBO DISTRICT

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Focus area - Health

This study compares the knowledge regarding causes and management of lymphedema between the community and patients and assesses the compliance to limb care in patients of Colombo district.

A descriptive cross-sectional study was conducted for seven months. 100 Patients and 100 controls were chosen from Boralesgamuwa MOH, Dehiwala MOH and Infectious Disease Hospital, Kolonnawa.

The knowledge was graded by assessing the awareness on etiologies of lymphedema, management options available, conservative measures taken and that if treated early the condition was reversible. Accordingly only 23% of patients and 7% of the controls had high knowledge on lymphedema. There was a significant association between patients with low knowledge and high knowledge but overall the knowledge in both parties was poor.

When analyzing regarding etiologies of lymphedema: 92% were aware of Filariasis. However, 61.5% considered trauma, 53% Cellulitis, and only 19% knew that treatment of malignancy causes lymphedema. There were no similar studies found in which knowledge on lymphedema had been assessed.

The compliance to limb care was graded by assessing the hygiene of the affected limb using clean water, gauze, antiseptic agents and comfortable slippers. Conservative measures such as multilayer bandages, elevation of the affected limb, avoiding trauma, exercise and maintaining ideal bodyweight were included. Accordingly 59% of patients had high compliance. In a study done on lymphedema management and morbidity control in 2003 in Gampaha district, Sri Lanka a higher percentage (66%) was compliant to foot care. No other studies were found regarding this area.

The overall knowledge on lymphedema is poor within the public and patients alike. This should be overcome to reduce stigma related to this condition and to emphasize that lymphedema is not uncommon, anyone can be affected, but if detected early and treated adequately it is reversible.

Even though adequate knowledge is given at clinics compliance to foot care is not proportionately adequate. Thus proper referral systems, guidelines, home visits and personalized care seem necessary to provide comprehensive education to improve the compliance in patients. This would be an investment as irreversible lymphedema causes crippling disability and morbidity control is a huge economic burden to Sri Lanka.

Key words: Lymphedema, Knowledge, Compliance, Stigma, Referrals

A PRELIMINARY SURVEY OF SEAWEEDS IN EAST COAST OF SRI LANKA

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Focus area – Food, Nutrition, Agriculture

Present study aims to survey the species distribution of the seaweeds found in selected 8 locations of East coast during the period from August 2016 to March 2017. The prime objective of this study was to assess the species composition of seaweed in East coast of Sri Lanka and to determine the impacts on their current distribution. Qualitative method was used to analyze the data in monthly basis. Eleven species of seaweeds belong to 10 genera were recorded during the present survey including 4 species of green algae (*Valonia utricularis, Ulva lactuca, Halimeda discoidea, Bryopsis pennata*), 4 species of brown algae (*Sargassum crassifolium, Eucheuma sp, Padina sp, Laminaria sp*) and 3 species of red algae (*Gracilaria edulis, G. verrucosa, Halymenia durvillei*). *S. crassifolium* was the dominant species and it was observed in all sampling sites. Less dominant species was *v. utricularis* and it was recorded only in Pigeon Island. Comparatively the highest number of species distribution seen in Pigeon Island such as *S. crassifolium*, *Euchema sp, V. utricularis*, *U. lactuca*, *H. discoidea*, *B. pennata, Padina sp, G. edulis, G. verrucosa and Laminaria sp and* second in Pasikudha such as *S. crassifolium*, *Euchema sp, U. lactuca*, *H. discoidea, Padina sp, G. edulis, G. verrucosa and Laminaria sp* were recorded due to optimum saline condition. Major threats identified in selected sites were beach seining and tourism. For the future studies, must be incorporated long term investigation, seasonality and other micro habits and also percentage cover of seaweed with quadrat sampling and calculation of species richness and diversity indices of each site could be recommended with additional environmental parameter data to get clear picture on distribution.

Key words: Beach seining, Distribution, East coast, Sea weed, Species composition

Acknowledgement: Authors wish to extend to their sincere thanks to the Department of Zoology, Faculty of Science, Eastern University of Sri Lanka for providing necessary arrangement and facilities for collecting and identification of seaweed. Further extend to their heartfelt thanks to those who are involving in the field work.

HOSPITAL ACQUIRED INFECTIONS IN INTENSIVE CARE UNIT PATIENTS AT COLOMBO SOUTH TEACHING HOSPITAL

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Focus area: Health

Hospital acquired infection (HAI) is an infection acquired in a hospital by a patient who was admitted for a reason other than that particular infection. The epidemiology and microbiological characteristics of these infections are very important for appropriate management. HAIs at Intensive Care Units (ICU) of Colombo South Teaching Hospital (CSTH) had not been studied earlier. The objective of this study is to describe the characteristics of HAIs in CSTH ICUs and give recommendation to improve the quality of health services. The study was carried out for 12 weeks in the medical ICU and surgical ICU of CSTH which consisted of 5 and 8 beds respectively. Out of 93 patients who stayed in the ICU for more than 48 hours, 17 patients (18.2%) acquired 1 or more infections. Total number of infections among them (17) was 39, which consisted of 28(71.8%) lower respiratory tract infections (LRTI), 6(15.4%) bloodstream infections, 3(7.7%) urinary tract infections (UTI) and 2(5.1%) skin and soft tissue infections. Commonest organism causing LRTIs was coliforms (50.0%), followed by *Acinetobacter* spp (28.6%).Highest percentage of resistance of *Acinetobacter*spp was found to be for ceftazidime and gentamycin (88.9%). Highest percentage of resistance (87.6%) of coliforms was for coamoxiclav, cefotaxime and ceftazidime. Usage of steroids/immunosuppressant was a statistically significant risk factor for all the ICU acquired infections (P=.012). While being on a ventilator showed statistically significant association with LRTIs (P=0.032). Adhering to strict infection control methods and avoid using invasive procedures as much as possible are emphasized to prevent development of ICU acquired infections and also rational use of antibiotics is recommended.

Key words: Causative organism, risk factors, antibiotic

THE USE OF INTERNET FOR MEDICAL PURPOSES BY INTERNET USING NON-MEDICAL PERSONNEL BETWEEN THE AGES 20-50 YEARS

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Focus Area: Health

The rapidly developing field of information communication technology has had a profound impact on every aspect of the life of modern man. And health care has been no exception. This research focuses on how the internet has changed the way non-medical personnel seek health care, who is most likely to use internet for health care and the wide variety of purposes served by the internet in this field and their attitude. Following a pilot study conducted among 20 employees at University of Sri Jayewardenepura, the contents were thematically analysed to develop a self-administered questionnaire for a descriptive cross sectional study. This was distributed among 200 males and females of executive grade in the age group of 20-50 years in selected companies in Colombo district. An inclusion criterion of use of internet more than once weekly was employed. From the respondents, 91.5% claimed that they use the internet for medical purposes and an association was seen ($p<0.05$) between their age and educational level for this tendency, while there was no such association for sex and occupational level. Searching side effects of drugs (78%), determining an illness they think they are having (76.5%), finding additional information regarding an illness (83%) and e-channelling (57%) were the most popular purposes served. A small but significant amount of respondents admitted to using internet to finding alternative medication (46.5%) and to determine the accuracy of a diagnosis given by a doctor (31.5%). Only 23.5% of the respondents had a poor attitude regarding the information found while the rest said it was fair, good or very good. People of higher educational level and of a younger age group tend to use the internet for medical related purposes more. Many of them turn to the internet to gain further information on illnesses and medication. Also the majority of people who use internet for medical purposes have a positive attitude towards its use. Therefore it's quite clear that this habit of using the internet for medical purposes is an emerging trend and it is bound to improve further in the future with the rapid development of telecommunication facilities throughout the world. With the increased accessibility to information through the internet patients will be better educated regarding their illnesses and the treatment

provided to them. Medical personnel should recognize that this will invariably change the way patients perceive and accept their advice and treatment and make necessary changes to provide good, wholesome healthcare. Since the reliability of these accessed sites poses a major influence towards the quality of information gained medical personnel should enlighten non-medical personnel regarding this issue. Also more research can be done of the available websites to determine the ones that are reliable and useful. We also found that searching for alternative medication and accuracy of diagnoses given to them are growing trends on the internet; we believe that the reasons for these trends should be assessed and studied so as to improve health services in our country.

Keywords: Internet, Medical Purposes, Non-medical personnel

VIEWS ON ORGAN DONATION AND FACTORS ASSOCIATED WITH IT AMONG GENERAL PUBLIC OF COLOMBO SUBURB – DEHIWELA

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Focus area - Health

The organ donation is a donation of biological organ of the human body from a living or dead person to a living recipient in need of a transplantation. Comparing Sri Lankan population to the world, registered organ donors are a minority. Due to this we are unable to save a lot of patients whom otherwise can be saved or whose quality of life can be improved by organ transplant. There must be many reasons such as lack of knowledge, religious beliefs and personal, social, mythical, legal factors which account for the inability to donate. This study is carried out to describe the views and factors associated with organ donation among general public of Colombo suburb- Dehiwela Sri Lanka. The research was carried out as a descriptive cross sectional study among 355 people residing in 5 selected Grama Niladari divisions in Dehiwala using cluster sampling method. Data was collected by self-administered pretested questionnaire. Data was analyzed using SPSS16.0 version software. Descriptive data was presented as numbers and percentages. Among the respondents, majority were females (51.8%), following Buddhism (43.1%), age ranging from 20-25years (18.7%), educated up to G.C.E. Advanced Levels (32.1%) and married (66.5%). Moreover majority of the respondents are willing to donate (78.9%), with the reason that it amounts to saving someone‘s life. The majority who educated up to Advanced Levels (55.5%), employed (66.7%) and following Islam (56%) are not willing to donate organs. Most of the general public are willing to donate organ. The factors that play a role in determining the view of organ donation are female sex, unmarried and religion. Educational level and family support plays major role in decision making on organ donation. We recommend this research to be carried out island wide. Moral education on organ donation and awareness of general public regarding it should be enhanced.

Keywords: Organ transplant, Views, Factors, Sri Lanka

KNOWLEDGE, ATTITUDES, AND PRACTICES REGARDING THE RUBELLA VACCINE AMONG FEMALE ADVANCED LEVEL STUDENTS IN THE COLOMBO DISTRICT

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Focus Area: Health

After two unfortunate deaths following rubella vaccination in the year 2009, it has been suggested that there is widespread phobia and misconceptions regarding rubella vaccination which may result in reduction of vaccination in Sri Lanka. The aim of the study was to determine the knowledge, attitudes, and practices regarding the rubella vaccine among female Advanced Level students in the Colombo district and in selected five girls' schools. A descriptive cross sectional study was carried out in randomly selected five female Government schools. Study population included four hundred girls equally taken from all the main Advanced Level streams. Data was collected by the use of a self-administered questionnaire. The data was entered to SPSS version 16 and descriptive and cross tabulations were done. The significance was taken at 0.05. The results indicated that the majority of the study population (56%) was aware that they have been vaccinated for rubella and nearly two thirds have been vaccinated at school. Among those not vaccinated (18%) the prevailing misconceptions were identified as the major cause. Almost all (93%) knew about rubella infection and majority of them (42%) received information from parents and school respectively. Overall knowledge was favorable, which is similar with the results to a study conducted by Samaranayaka in 2000 among female garment factory employees. No significance was found in relation to the A/L stream, school or parents' occupational field. Out of the overall population who had been vaccinated, a small percentage (3.5%) claimed that they experienced some form of adverse reaction following administration of the rubella vaccine but no life threatening adverse reaction was reported. With a positive overall attitude regarding vaccination a significant relationship was found in relation to students' school and parents' occupational sector. This study calls for a community based health education program to eradicate myths

in order to promote rubella vaccination status in the community with the need of the comprehensive assessment of the area of study.

Key words: Deaths, Misconceptions, Descriptive, Adverse reactions

GENETIC ABNORMALITIES IN SUSPICIOUS AREAS FOR PAPILLARY THYROID CARCINOMA IN PATIENTS WITH HASHIMOTO'S THYROIDITIS

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Focus area - Health

The association between papillary thyroid carcinoma (PTC) and Hashimoto's thyroiditis is a hot topic among cancer biologists. This study conducted from April 2016 to November 2016 attempts to find a correlation between the two conditions by analyzing point mutations in *BRAF* and *NRAS* genes by polymerase chain reaction-restriction fragment length polymorphism (PCR-RFLP) and level of expression of thyroid-stimulating hormone receptor (TSHR), manganese superoxide dismutase (MnSOD) and c-RET (a receptor tyrosine kinase) complementary DNA (cDNA) by real-time PCR relative quantification in suspicious areas for PTC of six formalin-fixed paraffin embedded (FFPE) thyroid tissue samples from patients with Hashimoto's thyroiditis.

In the detection of *BRAF*V600E mutation, 5 out of 6 samples (83%) tested positive for the mutation in both the test (suspicious) and control (non-suspicious) areas and similarly in the detection of *NRAS*Q61R mutation, 5 out of 6 samples (83%) tested positive for the mutation. In the quantification of cDNA, 1 out of 5 samples (20%) showed an increase in TSHR level, 4 out of 5 samples (80%) showed an elevated MnSOD level in either test or control areas. Elevated c-RET level was detected in 3 out of 5 samples (60%) in the test areas relative to the control areas and 1 out of these three tested positive for the presence of RET/PTC3 rearrangement. It was observed that the samples that showed no difference in TSHR in the test and control areas were either heterozygous or homozygous for the *BRAF*V600E mutation. It is quite evident from the results that tumourigenesis in the test areas requires the elevation of MnSOD. This indicates that the presence of *BRAF*V600E mutation most likely causes overexpression of TSHR, which together with elevated thyroid stimulating hormone (TSH) signaling in Hashimoto's thyroiditis patients, promotes tumourigenesis and suggests that in the absence of *BRAF*V600E and presence of *NRAS*Q61R, tumourigenesis still can take place. The sample number must be expanded in order to definitely coin a relationship between Hashimoto's thyroiditis and PTC.

Keywords: FFPE, reverse transcription, oncogene-induced senescence, TSH signaling, tumour biomarkers

Acknowledgement: Department of Chemistry, Faculty of Science, University of Colombo

DEVELOPMENT OF COCONUT SHELL POWDER FILLED HIGH DENSITY POLYETHYLENE COMPOSITES FOR ROOFING APPLICATIONS

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Focus area - Health

Reinforced thermoplastics, commonly prepared with inorganic fillers, are used as an alternative material to conventional roofing materials. The use of natural filler like coconut shell powder (CSP) will be an advantage as it is renewable, biodegradable, low cost, and especially is a waste having high strength to weight ratio. This study was carried out to develop CSP filled High Density Polyethylene (HDPE) composites to use as a roofing material, and was conducted over a period of 10 months. The objectives of this study were to develop composites with untreated and alkali-silane treated CSP at different loadings, to identify the optimum CSP loading, and to investigate the effect of treatment on mechanical properties and water absorption. With incorporation of untreated CSP to HDPE, tensile, tear and impact strengths dropped significantly due to poor adhesion between CSP filler and HDPE matrix; hardness and flexural strength increased while water absorption decreased. Tensile, tear and impact strengths further decreased with the CSP loading. However, the decrease was drastic from CSP loading of 40% suggesting that the incorporation of CSP loading was limited to 30%. Composites with treated CSP at every CSP loading demonstrated enhanced tensile and impact strengths, compared to those with untreated CSP due to enhancement of filler-matrix adhesion. Water absorption was also further decreased with treated CSP. Hardness and flexural strength were decreased due to partial removal of CSP constituents during treatment. Scanning electron microscopy images confirmed a better filler-matrix adhesion with treated CSP. Of the properties studied, impact, tensile and water absorption, the major properties for roofing materials, showed optimum values at 20% loading of treated CSP. Therefore, treated CSP can be recommended to use in developing reinforced HDPE for roofing applications.

Keywords: Sliane treatment, Natural filler, Reinforced thermoplastics, Morphology, Mechanical properties

A PILOT STUDY TO ASSESS THE EPIGENETIC BIOMARKERS FOR ORAL AND OROPHARYNGEAL CANCER IN SRI LANKA

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Focus area - Health

Oral and oropharyngeal cancer (OOPC) is the most common anatomical localization of head and neck carcinoma in Sri Lankan men. Detection of early asymptomatic stages of OOPC may increase the associated 5-year survival rate and the quality of life. Tobacco smoking, alcohol drinking and betel quid chewing are the main established risk factors for the development of OOPC. Exposure to these risk factors may increase the predisposition for genetic and epigenetic alterations, such as DNA methylation. Hypermethylation of cytosines in CpG-rich islands of the promoter regions of tumour suppressor (TS) genes has been discovered as a common mechanism of gene silencing during OOPC carcinogenesis. The current study, carried out from August 2016 to January 2017, aimed to investigate whether the DNA methylation of CpG islands in the promoter regions of $p16^{INK4a}$ and RASSF1A TS genes in saliva-derived DNA, can be used as a surrogate biomarker panel to discriminate healthy controls (n=60) from patients with OOPC (n=60) in Sri Lanka. Using a sensitive methylation-specific polymerase chain reaction (MSP) assay, the current study implicated that this dual-marker panel can detect OOPC in patients compared to healthy controls with an overall accuracy of 81%, at 81% sensitivity and 82% specificity. Higher concordance value (κ=0.62) represented an outstanding overall agreement between the presence of OOPC and a positive dual-marker panel outcome. Test panel also performed well in the accurate detection of sites of tumour initiation, early stages of tumour progression and characteristics of OOPC tumours. Furthermore, $p16^{INK4a}$ and RASSF1Ahypermethylation exemplified as better targets for potential risk prediction tests in high-risk groups in Sri Lanka, *i.e.* in smokers and betel quid chewing groups. In conclusion, this study established that the $p16^{INK4a}$ and RASSF1A epigenetic dual-marker panel was useful in detecting promoter hypermethylation events in saliva derived DNA as a non-invasive diagnostic test for OOPC.

Keywords: Carcinogenesis, Saliva, Tumour-suppressor genes, DNA methylation, Promoter hypermethylation

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SMART NOTICE BOARD

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Focus area – ICT & knowledge area

Maintaining notice boards in a large educational institute such as a university is a difficult task. There are number of notice boards available inside university premises. To display a notice, someone has to manually create and print those notices and put them on each and every notice board on time. This is a time-consuming task. To create those notices, lots of resources are required such as printers, printing materials etc. And also, people who read those notices should be aware of new notices every time. Therefore, this is not an efficient way to publish a notice. Nowadays everything changes with the new emerging technologies but notice boards have not seen any improvements over the time. Using new technologies, vast changes can be made to notice boards and improve the processes such as how the notices are posted, notice management, check on new notices instantly. Improving the traditional notice board will save lots of resources and time.

A smart notice board system was developed using augmented reality technology. There are two main users of this system. Those are, administrators and listeners. Administrators manage the smart notification system and post new notices. Listeners can view those notices using their mobile devices via an Android application.

With the increase of data communication speeds augmented reality has become a reality. This system can save time, money and equipment usage. Also, augmented reality technology has unlimited possibilities therefor, this system can also be integrated with many projects.

Key words: - Augmented Reality, Vuforia, Android, image targets, 3D

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Acronyms
CSS – Cascading Style Sheet
HTML – Hypertext Mark Up Language
MySQL – My Structured Query Language
UI – User Interface
SDK - Software Development Kit

IDENTIFYING POTENTIAL FUNGAL DEGRADERS OF LOW DENSITY POLYETHYLENE

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Focus area - Environment

Municipal Solid Waste (MSW) is becoming a significant threat to the environment in Sri Lanka. Low density polyethylene (LDPE) is one of the most important constituents of waste generated, since the time taken for its natural degradation is long. Therefore, this study mainly focused on identifying efficient fungal degraders of LDPE.

In order to isolate the fungi capable of degrading polyethylene, LDPE films were collected from garbage dump sites in Kaduwela area. Those were surface sterilized and placed on streptomycin incorporated potato dextrose medium (PDA). Three fungal species were isolated and purified. For biodegradation studies, these fungal isolates were inoculated on streptomycin incorporated ¼ strength PDA which comprised 20 micron LDPE film and five replicates were used. After 90 days of incubation microscopic and scanning electron microscope (SEM) images of LDPE films were analyzed along with gravimetric analysis in order to determine whether there exist, any potential LDPE degrading fungi among isolates used.

According to one-way Analysis of Variance, the mean values for control and *Penicillium* sp. (P=0.000), control and *Fusarium* sp.KC-2010ba (P=0.031) and control and *Penicillium* sp.x9 (P=0.010) were significantly different. SEM and light microscopic observations revealed the presence of fungal colonization indicating surface erosion, cracks, folding and firm fungal attachment. The fungal isolates were identified as *Fusarium* sp. KC-2010ba, *Penicillium* sp. and *Penicillium* sp. X9 by analyzing the ITS region sequencing. It can be concluded that the fungal species *Fusarium* sp. and *Penicillium* sp. are capable of colonizing and degrading LDPE and has the potential to be developed into an inoculum for expedited LDPE degradation.

Keywords: MSW, Biodegradation, *Penicillium, Fusarium*

PERFORMANCE OF TWO CHAMBER MICROBIAL FUEL CELL WITH ANODE ELECTRODE SURFACE AREA AND NATURAL RUBBER MEMBRANE

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Focus Area: Energy

Microbial fuel cells (MFCs) have attracted much attention as a new technology for simultaneous wastewater treatment and electricity generation. The existing MFCs demonstrate low performances and have expensive core parts like membranes. Therefore, an efficient, cost-effective MFC should be developed. In this study, two chamber MFC was used to analyze the variation of MFC parameters with anode electrode surface area. The MFC used was designed as an anaerobic anode and aerobic cathode, separated by a natural rubber proton exchange membrane (PEM). The electrodes used were made from 99% carbon. Four MFC set-ups were run by changing the anode electrode area; 166, 332, 498, and 664 cm^2 and cathode electrode area was fixed at 332 cm^2. The substrate for all the MFCs was dairy wastewater, artificially made by mixing 100 g of dairy milk and 55 g of yogurt with water to get a total volume of 3 liters and 1 g of dry yeast *(Saccharomyces cerevisiae*) was used as the biocatalyst. Closed circuit voltage was measured across a 1kΩ external resistance. The initial and final anolyte chemical oxygen demand (COD) was measured to evaluate the efficiency of wastewater treatment. The maximum volumetric voltage and power density produced were 7.37 Vm^{-3} and 24.58 μWm^{-2}, when anode area was 664 and 166 cm^2 respectively. The maximum COD reduction of 73 % was observed when MFC was run for 20 days using 166 cm^2 anode area. The maximum coulombic efficiency of 0.034 % was achieved using 664 cm^2 anode. The results showed that the volumetric voltage and current intensity increased while power density was decreased with the anode area. Although, the generated power in this work was low, innovative research could lead the way in producing high performance MFCs, in which both alternative energy generation and wastewater treatment can be achieved.

Keywords: Bioelectricity, Wastewater treatment, Anaerobic process, Electrode, Natural rubber membrane

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HAPLOTYPE ANALYSIS OF THE MYOTONIC DYSTROPHY TYPE 1 (DM1) LOCUS AMONG THE HEALTHY TAMIL AND MOOR POPULATION OF THE COLOMBO MUNICIPAL COUNCIL AREA

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Focus area- Health

Myotonic dystrophy, a multisystemic disorder affecting the nervous, musculoskeletal and endocrine systems is caused by unstable Cytosine-Thymine-Guanine (CTG) trinucleotide repeat expansion in the 3' untranslated region of the *Dystrophia Myotonica Protein Kinase* (*DMPK*) gene in chromosome 19. In normal individuals the repeat is highly polymorphic, with a repeat number ranging from 5 to 35. The disease is more prevalent in Western European and Japanese populations but it is rare or absent in other populations. It is hypothesized that the expanded $(CTG)_n$ alleles are originated from the group of larger sized normal alleles.

The objective of this study was to develop a polymerase chain reaction (PCR) assay for the diagnosis of DM1, assess the frequencies of CTG repeat allele distribution among the Tamil and Moor population in Colombo municipal council (CMC) area and compare the frequencies with other described populations. The CTG repeat allele distribution in the selected population was determined by a Polymerase Chain Reaction based assay in blood derived from 252 healthy Sri Lankan individuals representing Tamil and Moor ethnic groups.

In the study, a total of 18 different sized $(CTG)_n$ alleles were found which ranged between 5-25 repeats. The $(CTG)_{15}$ allele was the commonest in both Tamil and Moor populations. In both populations, majority of the alleles ranged between $[(CTG)_{13\text{-}16}]$. Of the alleles in the Tamil population, 26 were found to have greater than 18 CTG repeats $[(CTG)_{>18}]$ while in the Moor population it was 17. Using CTG 18 repeats as the cut-off point, the results of the ANOVA analysis of these data showed a statistically insignificant frequency of greater than 18 alleles in the studied Sri Lankan population living in the Colombo Municipal council area ($p>0.05$).

The distribution of CTG repeat alleles in both Tamil and Moor populations showed a similar pattern of distribution to Kuwaiti, Thai, Iranian and Indian populations but different to European and some Middle Eastern populations. The low frequency of large normal DM1 alleles among the Sri Lankan Tamil and Moor individuals predict a lower prevalence of DM1 in this population. This test can also be used to confirm or refute the diagnosis of DM1 in suspected patients in Sri Lanka and avoids the need to send samples abroad for testing.

Period of the study: January 2016-January 2017

Keywords: Triplet expansion disease, Congenital, DMPK

Acknowledgements: Department of Chemistry, Faculty of Science, University of Colombo

DEVELOPMENT OF PHOTODEGRADABLE POLYMER FILM HAVING ANTIBACTERIAL ACTIVITY

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Focus area - Environment

Bitter truth is that polymers; plastics and rubber, have become indispensable to mankind because of their extraordinary properties and low cost. Currently, their applications vary from day-to-day simple purposes like a plastic cup to high-end sophisticated applications like gene delivery or rocket science. It was reported that the world production of plastic in the year of 2015 was about 325 million tons.[1] The problem arises when all these products end as trash. Polymeric waste causes serious environmental problems because of their lack of degradability, and as a result they tend to accumulate in the environment. Our attempt here, is to report the development of an environmentally degradable novel polymer film having antibacterial activity. This study was focused on preparation of photodegradable copolymer; polystyrene-co-cinnamaldehyde, where cinnamaldehyde acts as a photosensitizer. Commercially available cinnamon oil was used as the source of cinnamaldehyde. The oil was characterized by FT-IR and GC-MS analysis. 75% (w/w) commercially available cinnamon oil incorporated styrene-co-cinnamaldehyde copolymer was synthesized by free radical polymerization and was characterized by FTIR spectroscopy and DSC analysis. Both outdoor weathering and accelerated tests were performed to evaluate the extent of photo degradation of synthesized copolymers and those were assessed by FTIR spectroscopy, percentage weight loss and morphological changes. FTIR analysis showed the appearance of new peaks of carbonyl and hydroxyl groups with increasing radiation exposure time. Results confirm the photodegradable mechanism of copolymer film as Norrish I, Norrish II and photo-oxidation. Extreme weight loss was observed at outdoor weathering with 33.9% weight loss for 75% (w/w) cinnamon oil incorporated copolymer with respect to 2.2% weight loss for the reference polystyrene homopolymer. Embrittlement and color variations of 75% (w/w) cinnamon oil incorporated copolymer were higher than that of polystyrene homopolymer with radiation exposure time. Surface cracks were clearly observed in SEM micrograph of 75% (w/w) cinnamon oil incorporated copolymer after exposing for 2 months in outdoor weathering which confirm the

photodegradable nature of the novel copolymer film. Furthermore, it was discovered that the synthesized copolymer has antibacterial activity against *Escherichia coli* and *Staphylococcus aureus* following overlay diffusion test by observing inhibition zones for 75% cinnamon oil incorporated copolymer. According to all the results, it is confirmed that synthesized copolymer films are photodegradable and also possess antibacterial activity. The developed copolymer could have potential applications in high end medicinal submissions such as medicinal packaging, devices or instruments.

Key words: Polymer, Photo degradation, Photosensitizer; Cinnamaldehyde; antibacterial activity

Acknowledgement: Financial assistance by University of Sri Jayewardenepura, research grants ASP/06/RE/SCI/2013/10

AWARENESS ABOUT DIETARY INTAKE AND DIETARY HABITS WHICH ARE EFFECTING ON IRON DEFICIENCY ANAEMIA DURING PREGNANCY, IN DIFFERENT SOCIO ECONOMIC CONDITIONS; A STUDY ON PREGNANT WOMEN IN BADULLA MEDICAL OFFICER OF HEALTH (M.O.H.) AREA 2016

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Focus area: Health

Iron deficiency anemia is a major problem in Sri Lanka. Majority of pregnant women and children suffer from iron-deficiency anaemia. Iron deficiency can be influenced by wrong food habits and wrong dietary intakes. This research is to examine the awareness of pregnant women on dietary intake and dietary habits which are effecting on Iron deficiency anaemia during pregnancy under different socio economic conditions. Population for this study was 735 pregnant women who had registered in Badulla M.O.H. area in the period from May-July 2016. 100 pregnant women who were in their second trimester of pregnancy had selected as the sample. This research has been done as a community based cross sectional study using the survey method. Structured questionnaires had used to collect data. 86% of the pregnant women were within the age group of 18-35, while 14% of the pregnant women were in the age group above 35. 84% of pregnant women had above 11 g/dl level of haemoglobin (Hb), while 16% of pregnant women had 7-10.9 g/dl level of Hb.57 % of pregnant women had their body mass index (BMI) between 18-24.9 and 31% of pregnant women had BMI between 25-29.9%.Only 5% of pregnant women had above 30 BMI.7% of pregnant women had BMI below 18. 71% of pregnant women had income level between Rupees (Rs.) 20,000-50,000 and 10% of pregnant women had their income level above Rs.50, 000.Only 19% of pregnant women had their income level below Rs.20, 000. 92% of pregnant women had consumed large sea fish while 87% of pregnant women had consumed small fish varieties, which had identified as iron enriched fish.27% of pregnant women had consumed beef and 26% of pregnant women had consumed liver ,which had identified as iron enrich meat.91% of pregnant women had consumed spinach as iron enriched green leaves. Out of 16% pregnant women who had their Hb level between 7-10.9 g/dl, 11 % were had income level between 20,000-50,000.11 % of them had more than one child. Out of 16% women who had their Hb level between 7-10.9 g/dl, 4 % were Islamic pregnant women who had consumed all types of fish and meat; specially beef. Out of the total 100 women, 95% of pregnant women had not practiced the habit of having tea soon after

meals. This habit decreases the iron absorption to blood. 88% of pregnant women had the habit of consuming at least small amount of meat or fish with every vegetarian meal. This habit increases the iron absorption of the blood.86% of pregnant women had known that it is harmful to reduce level of iron in blood for both mother and baby.86% of pregnant women had known consumption of some types of food reduce the iron absorption to blood.87% of pregnant women had known some wrong food habits cause to reduce iron absorption to blood.87% of pregnant women had got information about causes, effects, dietary habits and dietary intakes about IDA from friends and relatives.77% had got information from attending clinics. Only 24% had got information from internet. Research out comes can be used to gain knowledge when making successful policies in public health arena.

Key words: Anaemic conditions, diet, complications in pregnancy, health

CHARACTERISTICS OF ANTI-TUBERCULOSIS DRUG INDUCED HEPATITIS PAT IENTS IN COLOMBO DISTRICT

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Focus area - Health

Tuberculosis is a prevailing disease in Sri Lanka with an estimated detection rate of 65 cases per 100 000 population. It's a disease, which can completely be cured wit h proper administration of drugs for 6months, but drug-induced hepatitis (DIH) is f ound to be the major side effect. The objective of the study was to estimate the pr oportion of anti TB DIH among TB patients and describe the characteristics of thos e patients in Colombo district during 2013 – 2015. The study was conducted as a d escriptive cross sectional study at the Central chest clinic, Borella using the medical records of 102 TB patients who have developed DIH within the time period of 2013 -2015. Elevated liver transaminase levels, three times above the upper limit of nor mal, (at 2 weeks after the commencement of the drug regime), was the diagnostic criteria for DIH. A data extraction sheet was used as the study instrument. The stu dy revealed that out of 6866 TB patients who were on anti TB treatment only 102 p atients have developed during their treatment (1.4%). The following results were o btained from those 102 patients. The majority were less than 55 years (60.8%) wit h the mean of 48.1 years. The mean weight was 52.9kg and 56.9% were found to b e males. Only one patient was having past history of hepatitis. Majority were havin g pulmonary TB (53.9%), smear positive (63.4%), treated with category I (92.2%) an d have developed DIH after 14 days. 63.7% of them were overdosed with pyrazina mide which was calculated using the body weight and required dose per 1kg. Majo rity of the patients were not having any co morbidity, consuming alcohol or abusin g drugs. The prevalence of anti TB DIH in those registered at the central chest clinic in 2013-2015 is 1.4%. From those DIH patients majority was found to be ≤55years, weight >55kg, male, PTB, smear positive, treatment duration >14days and pyrazina mide over dosed.

Keywords: anti TB DIH, rifampicin, pyrazinamide, isoniazid, ethambutol, prevalence

GENDER BASED VARIATIONS IN RISK FACTORS, CLINICAL SYMPTOMS AND OUTCOMES IN PATIENTS WITH ACUTE CORONARY SYNDROME

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Focus area - Health

Acute Coronary Syndrome (ACS) is a medical emergency that require prompt and proper medical intervention in preventing death and disability. Thus it is important to diagnose these patients correctly at the time of presentation. Gender plays a significant role in this regard as it was observed that associated disparities exist in accordance with risk factors, presentation, and outcomes following Acute Coronary Syndrome. This study is carried out to evaluate gender based disparities in risk factors, presentation and outcomes within 48 hours following Acute Coronary Syndrome. A descriptive cross sectional study was performed incorporating a total of 181 patients in the age group of 40-80 years diagnosed with ACS, selected by a non-probability convenient sampling technique. Study setting included the medical and cardiology wards of Colombo South Teaching Hospital and Sri Jayawardenapura Teaching Hospital, during the period of 08/02/2016 to 04/08/2016.Data was collected by an interviewer administered questionnaire. There was statistically significant association between gender and ECG changes. When taken in to consideration most men presented with ST elevation in comparison to women (37.5% vs 18.7% p=0.016). Gender and diagnosis of ACS - ST Elevated Myocardial Infarction (STEMI), Non-ST Elevated Myocardial Infarction (NSTEMI), and Unstable Angina (UA), clinic follow up, and duration of pain had a strong positive relationship which was not statically significant. Diabetes Mellitus, hypertension, dyslipidemia, past history of ACS, and family history of ACS did not show any significant association with gender.

Keywords: Gender based, variations, acute coronary syndrome, risk factors, clinical symptoms.

RISK FACTORS ASSOCIATED WITH RECURRENCE OF ISCHEMIC STROKE OR ACUTE CORONARY SYNDROME IN PATIENTS PRESENTED TO COLOMBO SOUTH TEACHING HOSPITAL

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Focus Area: Health

The objective of this study is to describe factors associated with an occurrence of ischemic stroke or acute coronary syndrome (ACS) in patients who have had a previous history of either cerebrovascular diseases (CVD) or coronary artery diseases (CAD). A descriptive cross sectional study was conducted on 200 patients from ages of 35 to 75, presenting to Colombo South Teaching Hospital from February to June 2016 for a period of 5 months, using an interviewer administered questionnaire. Seven factors were noted in the study - presence of hypertension, diabetes mellitus, high total serum cholesterol levels, habit of smoking, physical inactivity, a family history of CVD or CAD and being overweight or obese. Occurrence of either of ischemic stroke or ACS in less than 5 years from the previous event of CVD or CAD was statistically significant in those with hypertension (p=0.007), high total serum cholesterol levels (p=0.000), habit of smoking (p=0.005), a family history of CVD or CAD (p=0.002) and those overweight or obese (p=0.002). Occurrence of either of ischemic stroke or ACS in less than 5 years from the previous event of CVD or CAD is likely associated with hypertension, high total serum cholesterol levels, habit of smoking, and being overweight or obese. This brings to focus the need to maintain normal blood pressure, total serum cholesterol levels, optimum body weight and giving up smoking.

Keywords: Prevention, Lifestyle, Smoking, Obesity, Hypertension

DEVELOPMENT OF WAVE ENERGY CONVERTER FOR SRI LANKAN COAST

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Focus area - Energy

Sri Lanka is rich in the swell like ocean wave energy along the 1340 m coastline, which provides 20 kWm^{-1} of power density. Nevertheless, Sri Lanka is largely depending on hydro-electric and thermal power generation methods to cater its emerging electricity demand. Thus, the country is yet to explore the Wave Energy Conversion (WEC) technology as a reliable renewable energy conversion method that suits to its geographic position. This research study introduces a novel wave energy converter design named Kotelawala Defence University Wave Energy Converter (KDU-WEC), which is suitable for extracting wave energy from the Sri Lankan coastline for electrical power generation. In order to develop this design, the effectiveness of the existing designs available in the various geographic regions in the world, the manufacturing and maintenance costs and the suitability of them for the current context of use were analysed. Among the various WEC technologies available, this design used the standard hydraulic WEC technology with certain modifications, aiming for locating it near the coastline to minimise the drawbacks of deep water or underwater instalments. For the selected context, coastal instalments help reducing the difficulties of installation and power extraction, and the frequency of maintenance, which is paramount for WEC designs. A prototype of the preliminary KDU-WEC was developed and it was tested to initiate the extensive measuring program, which will establish the background for an optimal design.

Keywords: KDU-WEC, Renewable Energy, Hydraulic WEC

LEAF POWDER OF *Pimenta dioica* AS AN ECO-FRIENDLY GREEN PESTICIDE FOR POST- HARVEST INSECT PEST MANAGEMENT

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Focus area – Environment

A significant loss of storage legumes and pulses occur globally due to the catastrophic insect pest, *Callosobruchus maculatus* (Coleoptera: Bruchidae) which is considered the most destructive insect pest of storage legumes. Therefore, reduction of post-harvest losses of grains has been considered as one of the most essential necessity to increase global food availability and accessibility to ensure food security in the world. As botanical insecticides are very highly desirable and promising alternatives to synthetic chemical insecticides for managing storage insect pest infestations, an attempt was made to evaluate the bio-efficacy of medically and culinarily important plant *Pimenta dioica* (Allspice), with the view of suppressing *C.maculatus* populations. A modified single-choice cup bioassay technique was used to evaluate the potential contact and fumigation repellent properties of leaf powder. In both repellency tests, laboratory reared one day old adult weevils (20) were exposed to five doses (1,3,5,7,9 g) of leaf powder separately. Repelled insects were counted after three hour exposure. Observations on both contact and fumigation repellency of *P.dioica* leaf powder exhibited exceptionally high repellency effects of 99% at the highest dose (9 g). Also, the highest dose of the leaf powder elicited extremely higher oviposition deterrence effect (23.60±7.00) on female *C.maculatus* and highly reduced egg hatchability (11.18± 4.72) compared to those of the control (90.35 ± 14.72; 83.80 ± 15.07) respectively. Volatile organic fraction extracted from the leaf powder of *P.dioica* for the first time by HS-SPME technique combined with GC-MS for the revealed Eugenol, cayophyllene and 1, 8 cineole as the major chemical constituents which may have considerable insecticidal properties. The overall results of the present study strongly indicate that *P.dioica* leaves could be utilized successfully as a highly effective candidate to replace hazardous synthetic insecticides with the longstanding objective of developing ecologically sound and farmer friendly green pesticides to suppress *C.maculatus* infestations.

Key words: *Callosobruchus maculatus, Pimenta dioica,* repellency, oviposition deterrence, egg hatchability

ASSESSMENT OF THE KNOWLEDGE OF MOTHERS REGARDING THE CARE OF THE INFANT IN BORALESGAMUWA MOH AREA

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Focus area - Health

The research was conducted to assess the knowledge of mothers regarding the care of the infant in Boralesgamuwa MOH area, Sri Lanka during January 2016 – June 2016. The objectives were to determine the socioeconomic factors, level of knowledge among mothers of 6-12 months old infants and the care given for the infants. A descriptive cross sectional study was done using cluster sampling. A self-administered questionnaire was distributed among 200 mothers of 6-12 month old children attending child welfare clinics in Boralesgamuwa MOH area. The knowledge was assessed by a scoring system later converted to percentage values, and were graded as good knowledge (>75%) and poor knowledge (<75%). The ethical clearance was obtained from the Ethics Review Committee of the Faculty of Medical Sciences. Out of 200 respondents 82% (164) had good knowledge regarding nutrition, 101 (50.5%) had a good knowledge regarding cognitive development and 97.5% (195) of the respondents had good knowledge regarding immunization. Among the subjects who had good overall knowledge 66.4% were educated up to G.C.E O/L and there was a positive significant association (p=0.000) between knowledge and educational status. Out of the employed group majority (79.2%) had a good overall knowledge, and there was a significant association (p=0.002). A significant difference (p=0.000) of ability to grasp good overall knowledge was seen depending on mother's monthly family income. Out of mothers with good overall knowledge, 64.1% mothers had >Rs.30 000 income, this may be due to increase accesses to advanced resources of knowledge. Majority of the mothers in Boralesgamuwa MOH area had good overall knowledge about the infant care. Educational level, occupation and income had significant impact on knowledge. All antenatal and postnatal mothers should be educated about fundamental principles and issues related to the care of the infant.

Key words – nutrition, immunization, cognitive development, socioeconomic

STUDY THE EFFECT OF THE HUMAN ACTIVITIES FOR DEGRADATION OF THE SWAMP IN "KIRALA KALE" SRI LANKA.

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Focus area - Environment

Swamps are identified as an environmental system with the highest bio diversity in the world. But now it is being faded continuously. The reason is that the human activities as well as the climate changes. The effect at the man has become a great threaten. Therefore, the main aim of the research was to study the anthropogenic impacts on degradation at the "kirala kele" wet land in Matara District. Our next aim is to find out the significance of the swamp. The extent of the swamp is 300 hectares around the eleven Gramasewa divisions and the study of the research is depending on the quantitative and qualitative methods. When collecting primary data field observation and interviews has become the main thing. Other information was gathered from the internet, magazines and books. When analysing the data we used "SPSS" software. The data collected by interviews and direct observation analysed as qualitative method. Bar charts, notes, photos and maps are used to present the data. When analysing the results we can see how the human activities such as filling the low land, cutting down trees, constructing buildings, making new roads, putting garbage, fire and illegal fish production are affected to the "kirala kele" swamp. Then now there is a big disaster in that land. The degradation of the wet land happens according to above reasons. It has influenced to the bio diversity in that area. Therefore most of the wet lands and mangrove eco system are faced the grate threaten as a result of this endemic fauna and flora such as Kirala, kerankoku, watakeiya, birds, reptiles, mammals, fish are endangered. The main bio divesting feature in that area are mangroves, water born animals, birds, Mammals, reptiles, and amphibious . Now those features are treated mostly in this wet land "kirala kele". So now this land has Stalinization and the plats related to that area has destroyed and the invasive plants are spreading in that area. Not only that putting wastages to that area has increased and both land and the animals in that area are destroying According to above reasons man and the human activities affect the balance of the physical environmental system.

Key words: Sri Lanka, Matara, Kirala kele, Human effects, Bio diversity.

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