ABSTRACTS

OF

UNDERGRADUATE RESEARCH

SYMPOSIUM – 2015

Faculty of Science

University of Ruhuna

Matara

November 04, 2015

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Financial support provided through the grant, HETC/QIG-W2/RUH/Sci is acknowledged.

Message from the Vice-Chancellor

As the Vice Chancellor of University of Ruhuna it gives me a great pleasure in issuing a message for the 1st Undergraduate Research Symposium of Faculty of Science, University of Ruhuna organized by Ruhuna Science Research Circle. The main aim of the event is to provide an opportunity to the undergraduates to present and discuss their research findings in a scientific forum. This event will also facilitate students to drive their mental and physical powers towards finding solutions to the burning problems in the society through research.

I believe that organizing this type of event will also provide many opportunities for the undergraduates to improve their soft skills such as event organizing, leadership, communication, creativity and time management etc. which are very essential skills required to compete in today's global job market.

I wholeheartedly congratulate and wish the 1st Undergraduate Research Symposium of the Faculty of Science to be a success. I take this opportunity to thank all the students and academic staff members those who are involved in organizing this event.

Senior Professor Gamini Senanayake
Vice-Chancellor
University of Ruhuna
Matara.

Message from the Deputy Vice Chancellor

It is with great pleasure that I send this message to the first Undergraduate Symposium of Faculty of Science, University of Ruhuna organized by Ruhuna Science Research Circle on 4th November 2015. I wish that the symposium will be very helpful to enhance the research culture among students of the Faculty of Science.

It is further expected that Undergraduate Symposium will continue to foster young researchers in various fields. In addition, organising this type of event will help the students to look at the world more vividly and develop various soft skills which will be helpful for them to compete in the job market. I hope that this symposium will generate new ideas, solutions and concepts for various problems that society suffers.

I would like to take this opportunity to thank all the members of Symposium Organising Committee for their great effort. I commend those who have been working tirelessly to organize this symposium and wish the first Undergraduate Symposium of Faculty of Science every success.

Dr. A.M.N. Alagiyawanna
Deputy Vice Chancellor
University of Ruhuna
Matara

Message from the Dean, Faculty of Science

It is with great pleasure that I send this message for the proceedings of the First Student Research Symposium of the Faculty of Science. With the objective of giving the opportunity for students to develop their research skills, presentation skills as well as the teamwork, the Faculty Board decided to start Student Research Symposium. The responsibility of organizing the symposium is given to Ruhuna Science Research Circle with the guidance of its patron Prof. E.P.S. Chandana, which provided a great experience for students in organizing such activities.

I believe that the students' response was excellent in all aspects. Many groups have conducted very interesting projects with excellent outputs, some of which could be published in reputed journals after completing the work presented at the symposium producing a quality research paper. Most of the presentations were at very high standard. These projects have very well demonstrated the capabilities of students and the power of team work. I am very happy that I had the opportunity, to work with one of the volunteered groups of students in a project.

I appreciate the interest of all students who used this opportunity to gain their skills and knowledge, and the staff who devoted their valuable time supervising the students, especially, Prof. E.P.S. Chandana, who made a prime service for the success of Research Circle and the Symposium. I believe that more students and staff will get involved in the next year and produce results useful to the nation.

Senior Prof. W.G.D. Dharmaratna
Dean/Faculty of Science
University of Ruhuna
Matara.

Message from the Patron/Ruhuna Science Research Circle

Research and Development (R & D) is defined as a systematic activity combining both basic and applied sciences, and aimed at discovering solutions to problems or creating new goods and knowledge. In this regard Universities should play a pivotal role, especially training young undergraduates to conduct research. Development of a research culture among undergraduates, organization of the research symposium and discussion forums are essential to produce quality researchers. Ruhuna Science Research Circle took this initiative to organize the 1st Undergraduate Research Symposium in the Faculty of Science, University of Ruhuna. This will open up a new avenue in the Faculty where young undergraduates can develop many essential skills. I take this opportunity to thank the Vice Chancellor, Deputy Vice Chancellor and the Dean of Faculty of Science for their enormous and invaluable support extended towards this. I admire the effort taken by the organizing committee and the office bearers of the Ruhuna Science Research Circle. I wish this trend will gain more momentum and continue in the next year as well.

Associate Professor E. P. S. Chandana
Patron/Ruhuna Science Research Circle
Department of Zoology
University of Ruhuna,
Matara.

ABSTRACTS

Pg. 01 - Pg.32

P-01

Investigation of bioactive compounds present in two banana verities (Kolikuttu and Embul) in Sri Lanka

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Embul and Kolikuttu are two locally available banana (*Musa sp.*) varieties. Kolikuttu is generally known as a healthy banana variety, whereas embul is one of the most available varieties. Therefore, people consume Embul in higher amounts due to its availability than Kolikuttu. As there are no reports available on scientific investigation on these two banana varies, this study is focused on investigation of Embul and Kolikuttu for their chemical composition and nutrient values. Banana samples were obtained from a local fruit shop and they do not contain any post harvesting chemicals. Methanolic extracts of the two bananas were prepared using maceration and it was subjected to phytochemical and proximate analyses. Phytochemical screening showed the presence of tannins, and glycosides, flavonoids and phenols in both verities. Proximate analyses showed presence of 72.20%- moisture, 86.24% - carbohydrate, 3.63% - protein, 0.33% - crude fiber, 2.52% - ash and1.04% - fat in Kolikuttu and 74.59% - moisture, 84.41% - carbohydrate, 1.81% - protein, 0.25% - crude fiber, 2.40% - ash and 0.88% - fat in Embul, respectively. According to this study Kolikuttu shows slightly higher nutritional value than Embul.

Key words: Embul, Kolikuttu, phytochemicals, proximate

Supervisor: *Prof. (Mrs.)Vajira Bulugahapitiya, Department of Chemistry, Faculty of Science, University of Ruhuna, Matara.*

P-02

Characterization of wastewater from a local food processing industry

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Food processing is one of the most important industries around the world and generally, a huge amount of water is used in the production process. Wastewater generated needs to be treated before releasing to the environment. This research aims to characterize the wastewater released by a food processing industry located in Matara, Sri Lanka which processes spices including *Garcinia* (Goraka), Pepper, Turmeric, Mustard, Chili and Fenugreek. The raw waste and wastewater treated by conventional treatment were characterized for their pH, temperature, TDS, conductivity COD, BOD_5, and oil & grease content. The untreated wastewater was unusually acidic with pH of 2.35. Its conductivity and TDS were 1240μs and 477 ppm, respectively. Surprisingly wastewater was highly contaminated with COD over 3000 ppm and BOD_5 over 800 ppm. Very low pH value maybe due to the presence of acidic ingredients released by *Garcinia* waste.

Key words: Wastewater, Conventional treatment, *Garcinia*

Supervisor: *Dr. S. Wanniarachchi, Department of Chemistry, Faculty of Science, University of Ruhuna, Matara.*

P-03

Aligning customer & supplier perspectives: A service & value based approach

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The business service providers always find new ways and means to bring the business in competitive edge. On the other hand, customers get confused with the availability of many service providers for the same need. The aim of this paper is to provide a method for aligning customer needs with available services or goods provide by different suppliers and also to provide sharable understanding between both suppliers and customers. In this approach, customer needs are modeled using goal tree and supplier's products are modeled using Resource, Event and Agent (REA) ontology. New guidelines are proposed to match these two perspectives. The proposed method describes how to align customer needs by comparing attributes of particular product using MoSCoW method, and describes how to select core supporting and optional bundle products required for consuming a particular product. A case study from supply branch of university of Ruhuna is referred to evaluate the proposed method.

Keywords: Resource P-event-agent (REA), Goal oriented requirement Engineering, MoSCoW

Supervisor: *Dr. J. A. Jeewanie, Department of Computer Science, Faculty of Science, University of Ruhuna, Matara.*

P-04

Phytochemical investigation of leaves of *Gymnema sylvestre* (Masbedda)

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Gymnema sylvestre is a medicinal plant belongs to *Asclepiadoideae* subfamily and it is widely distributed in tropical Africa and Asia. In Sri Lanka, it is commonly known as Masbedda. Its leaves are widely used in traditional medicine to treat many diseases such as arthritis, anemia, osteoporosis, hypercholesterolemia, cardiomyopathy, asthma, constipation, microbial infections, indigestion, and anti-inflammatory diseases. This herb is widely used for its application on diabetes treatment as its leaves have identified to present sugar suppression effect. As there is not enough literature available on chemical investigation of Masbedda grown in Sri Lanka, this study is focused to investigate qualitative and quantitative phytochemical composition of leaves of *G. sylvestre*. The methanolic extract of leaves was prepared using maceration procedure. Preliminary phytochemical screening of methanolic extract showed the presence of variety of important phytochemicals such as alkaloids, tannins, saponins, glycosides, phytosterols and triterpenes, diterpenes, flavonoids and phenols. Subsequent phytochemical quantification showed the presence of 0.0222 g of alkaloids, 0.0944 g of saponins, and 0.1014 g of flavonoids in the methanolic extract of the leaves. According to this investigation, the leaves of *G. sylvestre* contains large amounts of important phytochemicals which may responsible for its medicinal value.

Key words: *G. sylvestre,* phytochemicals, qualitative and quantitative investigation

Supervisor: *Prof. (Mrs.) Vajira Bulugahapitiya, Department of Chemistry, Faculty of Science, University of Ruhuna, Matara.*

P-05

A literature survey results on Soursop as an effective cancer treatment strategy

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Annona muricata is a member of the *Annonaceae* family. It is also known as soursop, graviola or guanabana. This is an evergreen plant that is mostly distributed in tropical and subtropical regions of the world. During past several years, interest has been growing in using various underutilized fruits as medicines in the traditional system for treatment of various ailments of humans. Soursop fruit has a wide range of health benefits including cytotoxic, antileishmanial, wound healing, anti-microbial activity. It is also shown to have anti-carcinogenic and genotoxic effect according to the refereed research articles published in journals such as International Journal of Pharmacy and Pharmaceutical Sciences, Food Research International Journal- Elsevier, Journal of Agricultural and Food Chemistry, International Journal of Molecular Science. Different parts of the plant contribute to different ethno-medicinal activities. Due to this reason soursop plant is used in folk medicine. A comprehensive literature survey has been carried out to extract data on phytochemical analysis and antioxidant activities of the *Annona muricata* plant, in some of the selected peer reviewed journal articles. Based on the survey, most researchers were able to isolate various phytochemicals from the fruit and among them acetogenin is one of the major component present in the soursop plant. More than 100 annonaceousacetogenins had been isolated from leaves, barks, seeds, roots and fruits of A. *muricata.* Moreover, it has been reported that some of the phytochemicals present in the plant possess antioxidant activities, which protect the body from cell damage caused by free radicals and peroxides.

Keywords: Annonamuricata, health benefits, folk medicine, antioxidant activity, phytochemical

Supervisor: *Dr. (Mrs.) H. Manawadu, Department of Chemistry, Faculty of Science, University of Ruhuna, Matara.*

P-06

Heavy metal pollution around a landfill site

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Environmental pollution due to landfill leachate has given rise to a number of studies in recent years. Heavy metal is a source of environmental pollutant affecting the aquatic and terrestrial ecosystems. Main sources of heavy metal pollution are industrial waste, domestic sewage and landfills. Heavy metal in landfills affect the soil around sites. Wastes such as metal waste components(food cans and scrap metal), indiscriminate dumping of household hazardous waste and electronic waste such as batteries and old computers are in the landfills. The release of heavy metal to surroundings is a serious environmental concern and a threat to public health and safety. It is important to identify whether there is any risk of contaminating the environment due to heavy metals in landfill leachate. Therefore, the objective of this research is to determine the risk of soil pollution by heavy metals in landfill leachate produced by one of the municipal solid waste dumping sites in Weligama, Sri Lanka. Soil samples from the landfill site were collected, digested with conc. HNO_3 and analyzed for some heavy metals such as Zn, Ni, Cu and Pb using Atomic Absorption Spectrophotometry (AAS). The average lead content of the landfill site was 54.7 ppm, and that of the cultivated land was 52.8 ppm. The lead content of water samples collected from both sites varied from 0.18 to 0.50 ppm.

Key words: Landfill leachate, heavy metals, soil, water, pollution

Supervisor: *Dr. K.R. Fernando, Department of Chemistry, Faculty of Science, University of Ruhuna, Matara*

P-07

Comparison of fuel properties of some selected biomass

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Department of Chemistry, University of Ruhuna, Matara

Industrial waste management is an important and difficult task that needs to be handled very carefully by any industry. Geocycle process in Holcim Lanka (Pvt.) limited provides the best solution for industrial waste management in Sri Lanka. Various industries produce sludge during waste water purification processes, and they should be destroyed in a proper manner. At Holcim, this sludge is destroyed in kilns. However, as sludge contains high level of moisture, rice husk and saw dust are mixed with sludge to reduce moisture in the preprocessing stage, before put them in the kiln. Market availability of these two materials is low due to high demand from other industries. The main objective of this project is to find economically viable, effective and readily available biomass sources to replace rice husk. The study was carried out for seven plant materials; dry coconut branches, tea waste, paddy straw, *Pinus sp.* needles, *Panicum sp.* leaves, *Casuarinasp.* leaves and *Gliricidia sp.* leaves. Fuel properties such as gross calorific value, net calorific value, moisture content, volatile matter content, ash content and sulphur content were determined. By considering effectiveness, availability fuel properties and economical factors, coconut branches are selected as the most suitable biomass source to replace rice husk.

Key words: Biomass, fuel properties, sludge, rice husk, coconut branches

Supervisors: *U. Jayakody and A. Piyathilaka, Geocycle, Holcim Lanka (Pvt.) Ltd., Putlam, Sri Lanka*

P-08

Optimized patient care flow management: A process mining approach

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Department of Computer Science, University of Ruhuna, Matara.

Optimization of patient care-flow processes is vital to provide better healthcare facilities to patients. Hence, management of patient care-flow process is essential. In this research work, mining approach is carried out to obtain meaningful knowledge about these care-flows. The research demonstrates the applicability of process mining using a real case of a cardiology treatment process in Sri Jayewardenepura General Hospital. Using a variety of process mining techniques, the healthcare process was analyzed from three different perspectives: the control flow perspective, the organizational perspective and the performance perspective. In control flow perspective, a process model was derived for all cases, clustering techniques were applied to divide a process logs and the big cluster was selected as the most frequently used paths. In organizational perspective, on social network mining was elaborated to provide insights into the collaboration between departments in the hospital. In performance perspective, treatment handling problems of care flow was found by using the results which is obtained from the control flow perspective. In order to do so, relevant event logs were extracted from the hospital's information system and were analyzed using the ProM framework. DISCO software was used to visualize the insight care paths. Finally, a model was built for the optimized patient care flow based on the results of these three major perspectives. The model shows that process mining can be used to facilitate the customized and optimized care flow management.

Keywords: Process mining, Care flow management, ProM

Supervisor: *Dr. J.A. Jeewane, Department of Computer Science, Faculty of Science, University of Ruhuna, Matara.*

P-09

Reducing viscosity of sludge by emulsification

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Wastewater and sludge from industries have become a serious problem in developing countries as industrialization and urbanization keep on increasing. Managing sludge is a problem for many industries in Sri Lanka due to the inadequate space to dispose them. At present the typical ways of sludge disposal include landfill, agricultural disposal, anaerobic digestion, sludge compost and incineration. But these methods are subjected to strict regulations and also likely to produce potential secondary pollution. In Geocycle Holcim Lanka (Pvt) Ltd, sludge is co-processed in the clinker manufacturing process. Co-processing is highly efficient and there are no residues, hence, it does not affect the quality of cement. In order to reduce the moisture content of sludge, it is mixed with saw dust in 1:1 ratio in Geocycle process. Then it is co-processed as solid, but the sludge volume would be increased. This project was undertaken to convert semi solid sludge into a liquid form, so that it can be co-processed as a liquid. Heating, blending, and emulsion formation are the most common methods used in converting semi-solid to liquid form and the progress of which can be monitored by viscosity measurements. Emulsion formation is the most convenient method of all. In this project Sodium Lauryl Sulphate(SLS) was used as the emulsifier and heavy polar crude oil was used to stabilize emulsification process. Best ratio of sludge to surfactant was determined to be 200 to 1.

Key words: Sludge, emulsification, viscosity

Supervisors: *U. Jayakody and A. Piyathilaka, Geocycle, Holcim Lanka (Pvt.) Ltd., Putlam, Sri Lanka*

P-10

Representation of mental state of agents in agent oriented software engineering

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Agent-oriented software engineering (AOSE) paradigm represents an interesting means of analyzing, designing and building complex, distributed and intelligent software. However, most of the AOSE methodologies have several issues to be improved such as adaptability, mobility and mental state. The objective of this research is to propose a model to represent the mental state of agents using goal modeling concepts according to the Business Motivation Model (BMM). This model would help agents to make decisions by considering all the background factors, when they are selecting relevant tasks to achieve a goal. The concepts of the Toulmin argumentation model are also used to improve the decision making criteria of the artifact. Finally, proposed model would be applied to a small case study for the evaluation.

Keywords: AOSE methodology, Business Motivation Model, Toulmin argumentation model

Supervisor: *Dr. Tharaka Illayperuma, Department of Computer Science, Faculty of Science, University of Ruhuna*

P-11

Modeling service quality factors to support description of restful web services

M.A.N.D. Sewwandi
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REST is a lightweight architecture for designing networked hypermedia applications. Currently, REST is only focusing on providing functionalities rather than considering the quality of services it provides. But when web services are used for businesses or day to day purposes, it is very useful to know about qualities which are provided by web services. In this research, a set of convenient quality factors are presented for REST by categorizing them into two main categories as business and system perspective. A Meta model is presented representing those factors descriptively with both human and machine readable way, making it easy for the developer to implement the description of the web service. This qos description helps the service consumer to select the most suitable web service according to his requirements among many web services which provide the same service.

Keywords: REST, quality of service, Meta model

Supervisor: *Dr. Tharaka Illayperuma, Department of Computer Science, Faculty of Science, University of Ruhuna, Matara.*

P-12

Hybrid model for web testing

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Web development is one of the fastest growing techniques in IT field. To ensure error and bug free web product it should be tested thoroughly. If both Manual and Automated Testing Techniques (MATT) are used concurrently, this goal can be accomplished. When MATT is considered individually, there are positive and negative factors. In this paper, a keyword driven technique is proposed which helps to bring MATT together to solve the problem of "How to ensure the quality of modern web projects at low cost?".According to current literature, manual testing is essential to ensure error and bug free web product while automated testing fulfills the time target of quality assurance process. The main objective of this research is to propose a keyword driven web testing method to ensure error and bugs free web product. The proposed method should work for every modern web development technique, it also should adaptable to future changes of web industry. To ensure those qualities in proposed method, four modern web sites have been tested (requirements are known) using proposed method. The tool developed here takes 6-8 seconds average time for one activity and tester can easily identify the errors of test scripts while other automation tool takes 4-6 seconds and does not provide capability to identify test script errors. For manual testing, this value is around 300 seconds.

Keywords: Automated Testing, Manual Testing, Web testing

Supervisor: *Ms. W.A. Indika, Department of Computer Science, Faculty of Science, University of Ruhuna, Matara*

P-13

Low cost customizable monochromator with a moving slit

I.K.G.G. Lakmal, M.D.M. Chathuranga, Y.G.B.D.K. Dharmarathna and N.A.A.K. Sanjaya
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Monochromators are used in scientific fields when scientists have to isolate a single wavelength from visible or any other region of the spectrum. A tunable excitation light source has many uses in optical characterization of semiconducting materials. Thus, building of a low cost and electronically tunable monochromator is the most important part of this research. Optical dispersion by a diffraction grating is used to obtain the spectrum. The color selection will be done by moving the exit slit to the desired position. A Halogen bulb is used as the light source. Input white light is collimated and rays were directed towards a fixed diffraction grating in order to obtain the first order spectrum of visible light. All the processing work is done using a PIC microcontroller based system to position the light-exiting slit when the desired wavelength is entered by a user using a numerical keypad. A "worm wheel" system coupled to a stepper motor is used to drive the light exiting slit to improve the stability and it is another outstanding feature of this monochromator compared to conventional ones.

Keywords: monochromator, diffraction grating, stepper motor

Supervisors: *Dr. H. A. D. S. D. Perera and Mr. S. S. Abeywickrama, Department of Physics, Faculty of Science, University of Ruhuna, Matara*

P-14

Behavioral effects of laboratory rats (Albino Wistar) exposed to sub-chronic noise

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Department of Physics, University of Ruhuna, Sri Lanka

This study aimed at investigating behavioral effects of laboratory rats, Albino Wistar, exposed to sub-chronic noise. Tested rats were kept in a double walled, acoustically insulated wooden cage. Noise was produced by a speaker, driven by pure-noise generator (1–40kHz), installed 20 cm above the cage floor and monitored by a digital sound level meter. In the first test, six adult Albino Wistars were exposed to sound frequencies of 1 – 40 kHz, at intervals of 1 kHz at L_{Aeq} of 70-80 dB for 5 minute periods and their behavior was recorded. In the second test, 4 adult female rats were randomly divided into control and test groups. The test animals were exposed to pure tones of 7, 8, 9 &10 kHz for 4 hrs daily for 8 days period. The control group of rats was kept in the same room for the same period of time without exposing to the sound. Locomotors activity in rats was assessed by open field test (OFT) while anxiety and depressive behavior was monitored by elevated plus maze (EPM) and tail suspension (TST) tests. The increase of defection and reduction of both social and non-social activities of noise stressed rats were identified from the first test. At the beginning of exposure, all rats were huddled in a group and then some were frozen into a motionless stance. A difference behavior of rats (continues scratching of ears and neck) was observed in frequencies of 7-10 kHz and 22-27 kHz. A less time spent and less number of entries in open arm was noticed in test sample compared to the controls in the EPM test. A tendency to move to open field compared to controls was identified in OFT. The TST revealed a significant increase in immobility time, which indicates a depression like behavior of noise stressed rats compared to controls. The test sample exhibited a 55.66% increase in immobility compared to controls.

Keywords: Albino Wistar rats, Behavirol Effects, OFT, EPM and TST tests

Supervisors: *Dr. J.A.P. Bodhika, Department of Physics & Prof. E.P.S. Chandana, Department of Zoology, Faculty of Science, University of Ruhuna, Matara.*

P-15

Analysis of physical parameters affecting noise level and the frequency spectrum of traffic noise

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The noise causes annoyance and health problems to humans. Vehicular traffic noise mainly depends on type of vehicles, traffic volume, speed of vehicles and environmental parameters. The dependence of L_{Aeq} (A-weighted equivalent continuous sound pressure level) on vehicle speed, wind speed, atmospheric temperature, humidity and surface temperature of the road, and frequency spectrum of L_{Zeq} for different types of vehicles were studied separately taking measurements at a straight portion of A24 road (Akuressa road) after the exit of Southern Expressway at Godagama. A linear correlation between L_{Aeq} and physical parameters were not observed for measurements taken for bulk of vehicles. This may be due to the fact that the measured values were averaged out. Highest noise level were recorded due to vehicle horns at low frequencies (f <300 Hz). The frequency spectrum of traffic noise qualitatively has the same shape as at high frequencies, 900 < f < 20000. According to noise level spectrum analysis, vehicles could be categorize into three classes; buses-high noise, lorries, vans, three-wheelers, jeeps and cabs-medium noise and cars and motor bicycles-low noise. This study proposes to use a function of the form $L_{Aeq} = a + b\ log_{10}(QH + w \times QM + v\,QL)$ to model noise produced by bulk of vehicles, where a, b, w, and v are constants to be determined by fitting data and QH, QM and QL are the number of vehicles in noise classes, high, medium and low, respectively.

Keywords: Modeling Traffic Noise, Noise Pollution, Vehicle Noise Spectrum

Supervisors: *Prof. W.G.D. Dharmarathna and Dr. J.A.P. Bodhika, Department of Physics & Prof. L.A.L.W. Jayasekara, Department of Mathematics, Faculty of Science, University of Ruhuna, Matara.*

P-16

Effects of water quality on the avoidance behavior of earthworms under laboratory conditions

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Avoidance behavior test with the earthworms (ISO 17512-1:2008) is a rapid screening test for evaluation of soil and the influence of pollutants and chemicals on the behavior of earthworms. Polluted water makes adverse effects on beneficial soil organisms and ultimately change soil equilibrium. Soil quality is determined using physical, chemical & biological factors. Indicator organism such as earthworms can be used as a biological method to indicate conditions in soil. The purpose of testing is to determine the avoidance behavior of earthworm (in this case *Eisenia andrei*) which is used as an organism for composting and occur naturally in soil. Water from University Canteen, Zoology laboratory pond and University pond were used as Polluted waters. Test substrates (natural soil) were prepared mixing with polluted water sources. Earthworms (n=10, 3 replicates) were exposed to different soil types with different contaminants in the environment in two chamber system kept under tropical conditions (26 ± 2 0C, 48 h). Net avoidance response values were determined. Highest avoidance response of 26.66% in Zoology lab pond water suggests that it is least preferred. The reason could be eutrophication. Avoidance response (-20%) in Cl2 free tap water (control) suggests that it attracts earthworms and makes no adverse effects on soil biota. 20% and 10% avoidance response in Canteen and University pond waters, respectively, mean that they too are less preferred. Overall results indicate that the test could be used as an initial screening test to investigate water quality on the avoidance behavior of earthworms.

Keywords: Avoidance behavior, polluted water, earthworms, avoidance response

Supervisors: *Prof. P.M.C. de Silva and Ms. M.A.D.G. Samanmalee, Department of Zoology, Faculty of Science, University of Ruhuna, Matara.*

P-17

A survey on spiders at selected habitats

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Spiders belong to Phylum Arthropoda, Class Arachnida and are ecologically very important group of animals as they are natural enemies of many insect pests feed on insects and occupy different niches. However, spiders are less studied in Sri Lanka. Lack of knowledge might lead to the destruction of these animals. Hence, the objective of this study was to identify spider species at University premises and "Kirala Kele" sanctuary and domestic places with respect to habitat features. Selected transects were studied three times each and spider specimens were collected and photographed. Reference collection of known spider species was prepared. Specimens were compared with the reference collection. Matched specimens were classified to the relevant family and confirmed by standard keys. Eleven species from University of Ruhuna, five species from "Kirala Kele" and seventeen species from domestic areas were identified during the study. *Arctosa* (Lycosidae), *Menemerus, Hasarius, Plexippus, Thiania, Epocilla & Hasarius* (Salticidae), *Peritraeus* (Thomisidae), *Trematocephalus* (Linyphiidae), *Neoscona, Herennia, Argiope & Gasteracantha* (Araneidae), *Epocilla, Trematocephalus, Pardosa* (Lycosidae), *Artema* (Pholcidae), *Leucauge* (Tetragnathidae) *Theridion* (Theridiidae) were the species recorded during the study. *Sparassidae, Theridiidae, Pholcidae, Hersiliidae, Linyphiidae* and *Oxyopidae* were the other families recorded. Eighteen spider species were not identified as taxonomic literatures were not sufficient. Further studies are required for identification of the unidentified species.

Keywords: Spiders, Ruhuna University premises, "Kirala Kele", Salticidae

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Water purification using *Terminalia catappa* dried husks

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Terminalia catappa (tropical almond) is widely grown in tropical regions of the world as an ornamental tree and has high economical value. The fruit has a hard endocarp and fibrous inner layers. Therefore, dry fruits may not decay as fast as other fleshy plant materials when added into water. This research, was conducted in two pilot experiments to determine the effect of dried *T. catappa* husks on water quality parameters such as conductivity, TDS and salinity of brackish water.In the first experiment, husks were separated from fully ripe fresh *T. catappa* fruits, washed and oven dried to remove moisture. In the second pilot experiment husks were separated from fully ripe old *T. catappa* fruits, washed and oven dried to remove moisture. In each experiment 5 g & 10 g portions of dried husks were added into glass beakers each contained 1000 ml of brackish water. Control was set with only 1000 ml brackish water. 100 ml water samples from each beaker was filtered and tested for conductivity, TDS value and salinity after every 24 hour period. Salinity was significantly reduced ($p<0.05$) in the first experiment indicating a clear effect of *T. catappahusks* on salinity. Conductivity and TDS did not show any significant reduction ($p>0.05$). Old husks did not exert any significant effect on brackish water. Husks of fresh fully ripe *T. catappa* fruits can be used to reduce the salinity of brackish water up to greater extent. Therefore, husks of *T. catappa* may be further studied as a water purifying agent.

Keywords: *Terminalia catappa*, water quality, dried husks, brackish water, salinity

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Preliminary assessment of ground water quality in agricultural areas in Padalangala, Suriyawewa

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Ground water is defined as water that seeps through the soil or rocks underground. In Sri Lanka,33.4% of households use tap water, 55.3% use water from dug wells and 6.2% use water from tube wells. Water quality is partly blamed for the spread of Chronic Kidney Disease (CKD), especially in farming communities in Sri Lanka. CKD is prevalent in North Central Province and now can be detected in Uva and Southern provinces as well. In this regard, it is important to determine quality of water sources in vulnerable areas. Hence, the objective of the present study is to conduct a preliminary assessment on ground water quality in Padalangala farming area in Suriyawewa, Embilipitiya. Farmers of the study area use 5 to 10 times more fertilizer beyond the optimum requirement believing that it would result a better harvest. This excess use of fertilizers may contaminate water sources in these areas. Temperature, conductivity, TDS, nitrates, salinity and hardness were measured in selected twenty water sources including dug and tube wells. Analysis shows that some water sources are not qualified for human consumption as they exceed maximum permissible level of salinity, conductivity and hardness. Salinity exceeded farthest the recommended level. (0.25ppt). Most of water sources fall in the category of medium hard water (75-150 mg/L). Further studies and continuous monitoring of these water sources are required to prevent human consumption of contaminated water.

Keywords: Groundwater, Salinity, Hardness, Padalangala, Suriyawewa

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P-20

The effect of "Pinso" detergent on Poecilia reticulate (Guppies)

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Detergents are blamed for their harmful effects on aquatic organisms. "Pinso" is a detergent which is available in local markets in certain areas of Sri Lanka. It is widely used by rural folks as a detergent and its toxicity to mammalian skin has been shown previously. However, effect of "Pinso" detergent on aquatic organisms such as freshwater fish species has not been reported. *Poecilia reticulate* (Guppies) are widely used in aquatic toxicological studies. Under this project we sought to study the effect of "Pinso" detergent on Guppies. Original concentration (100%) of "Pinso" was prepared according to the manufacturer`s instructions. Five water containers namely, C, C1, C2, C3 and C4 were prepared and C1-C4 contained 10%, 50%, 75% and 100% (v/V) "Pinso", respectively and there were three replicates for each concentration. C container was not treated with "Pinso" and served as the control. Eighteen healthy guppies of same size were added to each container. *Pistia sp.* was put in equal amounts as their food source. Number of living Guppies was counted in all containers after every 24 hours. Mortality percentage was plotted against concentration gradient and LC50 (Lethal Concentration) was calculated. LC50 of "Pinso" was 87.5 % for the Guppies tested in this study. These data indicates "Pinso" might exert a toxic effect for aquatic organisms at working concentrations.

Keywords: Detergents, "Pinso", Toxicity, *Poecilia reticulate,* Guppies, LC50

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Assessment of the BIFLEX® TC toxicity on compost worm (Eiseniaandrei) using earthworm avoidance test

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Terrestrial avoidance behavior, an alternative for earthworm acute toxicity test and reproduction test, is considered as a rapid screening tool to assess soil contamination and habitat functions. Excessive use of pesticides is known to affect earthworms. Avoidance tests were performed with *Eisenia andrei* as the standard species, using the test chemical Biflex® TC which is a termiticidal concentrated formulation containing active ingredient Bifenthrin. It is used as a public health pesticide to control termites in tropical soils. In this study, the earthworm avoidance tests were performed to investigate the effect of Biflex® TC on earthworm avoidance behavior. The experimental process was performed based on ISO guidelines for earthworm avoidance studies (ISO/DIS 17512). Four groups of 10 earthworms per dose level were exposed to Biflex® TC at 1, 3, 10, 30, 100 and 300 mg a.i/kg dry soil together with controls in a two chamber system under tropical conditions (26±2 °C, 48 h). Natural soil was used as test substrates. Net avoidance response values were determined. According to the results high non avoidance was recorded in 1mg/kg dry soil and high avoidance was recorded in 30mg/kg. But in 100mg/kg dry soil, mortality was there. Few were survived. In 300mg/kg, 100% mortality was recorded.-27.5%, -7.5% and 17.5% net response corresponds to concentrations 3, 10 and 100 mg a.i /kg dry soil, respectively. Avoidance behavior is a valuable, simple tool for environment toxicity assessment of pesticides on earthworms. It can be used in investigating effect of termiticide on earthworms in contaminated soil.

Keywords: Biflex® TC, Earthworm, Avoidance behavior, Pesticide

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P-22

A survey on life style and farming practices of farmers in "Suriyawewa" area

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Recent health and research reports indicate that Chronic Kidney Disease (CKD) is spreading among Sri Lankan farmers. Most studies had been conducted on farmers in North Central Province, but CKD is known to be spreading to Uva and Southern provinces as well. Study of life styles and farming practices of communities who are not affected might reveal any vulnerability to develop CKD. In this study, a farming community in Suriyawewa area in Southern Sri Lanka was surveyed. To study life styles, farming practices and associated risk factors in this community, farmers were interviewed based on a questionnaire. Results indicate a regular food pattern among farmers, mostly consuming red raw rice and yams. Majority does not consume instant food. 60% of the farmers chew betel while only 28% of farmers smoke. Farmers have no proper knowledge on safety measures in handling of agrochemicals and disposing empty cans. Some farmers apply prohibited agrochemical "Illuk Oil" (Counter) and 50% of them are not aware of effects on over using chemicals. Though officers recommend proper doses, majority applies more believing that it would enhance the harvest. Symptoms such as frequent thirst, loss of concentration, hiccups and loss of appetite are seen commonly among farmers. These conditions should be further monitored. Majority uses indigenous medicine, *"Koththamalli, Pathpadagam"* instead of pain killers. 4% of the framers have relatives suffering from kidney disease. 44% of the farmers were not aware of CKD. Young generation of the studied community refrains from farming indicating possible negative effects on future agriculture.

Keywords: Life style, Farmers, Suriyawewa, CKD

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Life style of school children in Matara urban area

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Prevailing education system in Sri Lanka is blamed for the life style changes among school children. General perception is that physical and mental growth in schoolchildren are unhealthy due to life style changes. Hence, objective in this research was to study life style of school children in Matara urban area. Four schools, Mahinda Rajapaksha., St. Servatius, Rahula and Mahamaya Balika were selected for the study. Randomly selected samples of children were surveyed based on a questionnaire with respect to key questions such as food habits, time management, study habits, social interactions, daily routine, chronic and acute illnesses. Data were analyzed using SPSS software. Majority of students eats rice and curry for breakfast and lunch, but lacks variation in composition. About 20% of the surveyed students suffer from symptoms of gastritis indicating disturbed food habits. The average amount of drinking water per day is considered as about 3L, and only 21.3% of students drink the required amount. Majority of students wake up at 5 a.m. 30% of the students do not engage in extracurricular activities and those who engage do sports. Almost all students go to extra classes. Majority prefers to watch sports programs, movies and tele-dramas on television and does not prefer educational programs. 43% are having both their parents occupied and they do not have enough time to interact with parents. More than 60% students are outside the standard BMI range, indicating serious health implications in the future.

Keywords: Urban school children, Life style, Food habits

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P-24

English skills and academic performance of students in the Faculty of Science, University of Ruhuna

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English is the main medium of lecture/practical delivery in all faculties in the University of Ruhuna except in the Faculty of Humanities and Social Sciences. Hence, it is important to explore how students are using and improving English knowledge and skills during their university education. Further, how English language skills affect students' academic performance, in particular, students in the Faculty of Science was explored in this research study. A detail questionnaire consists of questions relating to the study was given to male and female senior students (2nd year and above) in all faculties during one month period. Data were collected from total of about 600 undergraduates with 152 from the Faculty of Science. SPSS. 16 software was used for analysis. At the entrance to the university, A/L results of General English of female students are better compared to male students in all faculties. Current GPA of students shows a similar trend. The detail analysis done using data from science students revealed that students with better English skills have higher GPA, female students attend English classes and use the language more often than male students. Male students do not seem to make much effort in improving their English skills, which reflects in their lower GPA values.

Key words: English skills, Ruhuna undergraduates, GPA, chi square test

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P-25

Anti-acid properties of Kahipiththan (*Cyclea peltata* Hook. f. & Thoms)

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J.C.M. Gamage. W.A.P.U.A. Weerarathna,
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Cyclea peltata (commonly known as Kahipiththan) is believed to have many medicinal values. Leaves of C. *peltata* are reputed remedy for stomach hyperacidity. However, there are no reports on anti-acid properties of C. *peltata* leaves in the accessible literature. Knowledge on the activity of these plants will be helpful to develop useful effective and cheaper anti-acid formulations. Currently people spend lot of money to treat stomach hyperacidity. Traditional plant based medicines can be developed to earn an income or to save foreign revenue from import of drugs. Hence, present study aims to reveal the reaction of water extraction of *C. peltata* leaves with different acid. About 20 fully grown leaves of C. *peltata* was ground with 150 ml of de-ionized water and filtered. Filtration was tested with HCl and H_2SO_4. When mixed with 0.1M HCl *C. peltata* extraction coagulated into pellets. At 0.0001M to 0.01M HCl concentrations pellets were not formed indicating specific reaction with 0.1M HCl. With H_2SO_4 *C. peltata* extraction did not form pellets instead dissolved indicating specific reaction with H_2SO_4. With these observations it can be postulated that *C. peltata* might be good to relieve symptoms of stomach hyperacidity. Pellet formation might act as a protective coat in the stomach preventing HCl reacting on stomach epithelium. Further investigation is required for better understanding of *C. peltata* activity.

Keywords: "Kahipiththan", *Cyclea peltata*, anti-acid properties

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P-26

A preliminary survey on quality of small scale food products in Matara Area

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Different types of foods produced by small scale enterprises are abundantly available in open markets. However, quality of these food products is often uncertain and there are no published reports on this. In this context we sought to conduct a preliminary study on the quality of small scale food product in open markets in selected places in Matara area. Several food outlets were visited in convenient basis and different food items such as spices, bakery products, milk products and snacks were collected. Labels of the products were examined to reveal the production date, date of expiry, ingredients, registered number etc. Packing quality was also tested. Spices were dissolved in water, filtered and pH of the filtrate was determined. Homemade spices were taken as controls. Majority of the food items surveyed were substandard and can be categorized as not suitable for the human consumption. Poor packing, lack of proper labeling, contamination and rancidity were frequently observed among collected food packets. Many spices return strong acidic solution when they dissolved in water, compared to the normal homemade items. More rigorous monitoring mechanism is required to regulate the small scale food production. Public, manufacturers, responsible authorities and retailers should be educated on this.

Keywords: Small scale food products, spices, bakery and milk products, Matara,

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P-27

Declining academic performances by male undergraduates of University of Ruhuna

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Results of graduating students in the last several years revealed that female graduates had been performing better than male graduates in all faculties, except in the Faculty of Engineering of which male/female student ratio is about 4:1. In all other faculties, percentage of female undergraduates is more and vary between 55% - 65%. This study aimed at uncovering reasons behind declining academic performance by male students. A detailed questionnaire was prepared and distributed among senior students (2nd year or above) in all faculties and total of about 600 data sheets were collected with about 152 from faculty of Science. Data were analyzed using the SPSS 16.0 software. Majority of female students show current GPA of over 3.0 whereas majority of males have GPA of less than 3.0. A comprehensive analysis was carried out using data collected from Faculty of Science. Lecture/practical attendance and assignment submission of female undergraduates in the Faculty of Science is at a much higher satisfactory level than that of male undergraduates and a very strong correlation was found between those two categorical variables and GPA of male undergraduates with chi square test ($p<0.05$). Also, the analysis revealed that number of subjects (or credits) to repeat is higher for males than females. Thus, we may conclude that poor lecture attendance, not submitting assignments and not getting through the examinations at first attempt, are some of the major reasons for males not performing better.

Key words: Academic performance, Ruhuna undergraduates, GPA, chi square test

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A survey on weed problem associated with selected agrarian areas of Suriyawewa, Embilipitiya

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Widespread use of some weed killers has created variety of new agricultural, biological and public health problems in Sri Lanka. Present agriculture practices have been blamed for the escalated weed problem and associated issues. Lack of knowledge on nature and magnitude of the weed problem in agricultural areas affects implementation of weed management strategies. Scientific understanding is important to control weeds in an environmental friendly manner. Hence, the objective of this study was to analyze the weed problem in a selected farming community in Suriyawewa, in southern Sri Lanka. A questionnaire aiming to reveal the cultivated crops, duration of farming, use of fertilizers, available weeds, methods used to control weeds, use of Glyphosate and other weed killers, were given to farmers. Most of the farmers have been involved in farming for 25 years. Only 4% of farmers have newly involved in to farming community, which may also indicate lack of interest in farming in younger generation. Common fertilizers used were urea, ammonium sulfate, Triple Super Phosphate (TSP), Muriate of Potash (MOP) and mixed fertilizers. There were no reports of using compost fertilizer. Wishnukanthi, Pita sudu, Ashwawaliga, Thunassa, Jabara, Ginihirassa, Walthanakola, Iluk, AmbuAtawara, Yaapalu, Suluputta, Gendha, Batadhalla, Diyaberaliya, Yodhanidikumba, Nagawalli,Diya siyambala, Pathniya and Kudamatta were the highly abundant weeds in the study area. Some of these weeds are used by farmers for medicinal purposes. There was some evidence that farmers use Glyphosate which is linked to wide spread of kidney disease in most areas.

Keywords: Weeds, Farmers, Suriyawewa, Glyphosate

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The effect of *Panicum sp.* leaves on soil quality

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Currently, artificial fertilizers are used by farmers in abundance to obtain a good harvest. This practice is expensive and leads to various ecological problems. Hence, use of compost fertilizers is encouraged with naturally degrading materials. *Panicum sp.* (Iluk) is a invasive weed and occupies abundantly in useful lands. Conversion of these weeds into useful fertilizer will offer dividends economically and ecologically. In this research we opted to study the effect of *Panicum* leaves on soil quality. Tender *Panicum* leaves were collected and cut into small pieces. Four control containers (400g of soil only), four containers of 400g of soil and 100g of leaves and four containers of 400g of soil and 150g of leaves were prepared. *Panicum* leaves were thoroughly mixed with the soil and kept for three weeks. Soil moisture, soil pH, organic matter, nitrates and phosphates were measured according to the standard methods. Organic matter and soil moisture were significantly increased in treated soil samples ($p<0.05$). Soil profile indicates the rich organic matter in *Panicum* treated soil. pH of the treated soil decreased indicating the effect of accumulating organic matter in the soil. Soil nitrate level of treated soil decreased while phosphate significantly increased ($p<0.05$). Further experiments are required to study the effects of *Panicum* leaves on soil condition.

Key words: *Panicum* leaves, soil, nitrate, phosphate, pH, organic content

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P-30

Life style of school children in selected rural schools in Matara division

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With the rapid change in social environment, eating patterns of school children changes drastically affecting their psychological wellbeing. However, there is no extensive research done on this topic in Sri Lanka. Lack of data hinders monitoring and implementing management or awareness programmes. Hence, the objective of the present study was to investigate life styles of rural school children in some selected schools in Matara division. A questionnaire was prepared to collect data. 85 children within the age limit of 13-16 years were selected. Data collected from children in this research would help to understand their ground situation with respect to their life style. 60% of the students took extra meals. 50% of the students did not take the required amount of water and fruits. 50% of students have their families taking medical advice for chronic illnesses. 50% of students had at least one parent a diabetic. Majority of students did not show flexibility and physical fitness required for this age range. With respect to the BMI value, majority of students were underweight. Majority of students slept the required number of hours and had fairly good relationship with their parents. Social interactions of students were very low. This study indicates the need of proper awareness programmes for students to improve their wellbeing. A monitoring mechanism and awareness campaigns can be implemented based on these data.

Keywords: Matara, Rural area, School children, BMI

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Analysis of water quality, zooplankton and phytoplankton at selected habitats of "Kirala Kele" sanctuary, Matara

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Pollution of water in wetlands impedes their vital ecological functions. Therefore, it is important to study impact of water pollution and implication to wetland biodiversity. The Kirala Kele(KK) wetlands associated with Nilwala river basinis located nearby Matara town. Distinct loss of biodiversity has been noted in the habitats of KK and low water quality has been suspected as the crucial factor. Water canals form a network inside KK and that provides water to many habitats. No comprehensive study of water budget and water quality of KK has been carried out. Hence, the present study investigates water quality at selected sites of KK water canals. Water samples were taken at selected sites at three times (Sep/Oct 2015). Conductivity, pH, TDS, dissolved nitrate and dissolved phosphate were measured using standard methods. Zooplankton and phytoplankton were sampled using standard nets and were identified using standard keys. Water feeding system of KK was studied. Dissolved phosphate levels decreased from 80 to 21 mg/L at study sites, with higher values in the first day of sampling and lower values in second and third sampling days whereas nitrate levels increased from 0.1 to 2.2 µg/L over the sampling period and the change could be due to heavy rains. TDS had increased with heavy rains, pH varied from 6.2-6.9 and conductivity ranged from 200-450 µs. Sites did not indicate any significant difference with respect to measured water quality parameters. Average abundance of zooplankton and phytoplankton were 20/L and 12/L, respectively. Data indicates that water quality was degraded in KK water bodies.

Keywords: Kirala Kele, Nitrate, Phosphate, pH, TDS, zooplankton, phytoplankton

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Status of Biogas units in southern province

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Biogas is the mixture of gas produced by methanogenic bacteria when act upon biodegradable materials under anaerobic condition. Sri Lankan government established many projects to alleviate waste/garbage problem through some government and non-government organizations (NGO) and many biogas plants were introduced in southern province under one such project. Recently, it has been noted that many plants are malfunctioned or abandoned and it is essential learn causes for malfunction or break down of biogas units. Hence, the objective of this study was to reveal problems associated with biogas plants in selected localities in southern Sri Lanka. A questionnaire was prepared to survey 24 biogas unit owners through interviewing in each district, Matara, Galle and Hambantota. Data were analyzed using descriptive statistics. Number of malfunctioned biogas units was 196, 83 and 84 in Galle, Matara and Hambantota districts, respectively. The major utility of units was to supplement fuel for gas cookers in all districts. Only three units had been properly functioning for more than ten years. Majority of units had stopped working within two years. Causes for malfunctioning were technical errors (45%), farm break down (17%), lack of raw material (10%), land errors (17%) and personal errors (7%). The main technical errors are leakage of gas, breakdown of walls of units and crack of gas tubes. Change of residence, landslides and improper establishment of units were treated as land errors. Inadequacy of bio degradable materials such as cow dung, leavings and hay caused malfunctioning. Infections and lack of time management were treated as personal errors.

Keywords: Biogas units, southern Sri Lanka, technical errors

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