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Message from the Dean, Faculty of Science

It is with great pleasure that I issue this message for the 9th Science Symposium organized by the Faculty of Science. I am extremely happy to see the progress made by the faculty in this year uplifting the event to a national level and, especially, having participants from University of Jaffna. The main objective of the Science Symposium at its inception was to provide opportunities to initiate multidisciplinary collaborative research among scientists within the faculty, having presentations from all disciplines in science at one forum. This year we have broadened the scope by inviting scientists from other universities and research institutes to participate in the symposium, providing opportunity to initiate more collaborative research. The physics departments of Ruhuna and Jaffna universities and IFS have already started a collaborative research project on solar cells with the expectation of using solar power for future development of rural areas in north and south regions in the country.

As a developing nation, the scientists in Sri Lanka should play a greater role in research and development activities in the country, for the benefit of the society at large. The faculty has stepped up its research activities significantly during last two years, especially with the availability of funds through the Internationalization of Universities Grant (IUG). Several members of the staff have secured funds from IUG and after receiving research equipment ordered, there would be more opportunity to enhance the quality of postgraduate and undergraduate research in the faculty. Furthermore, with the funds available under the Quality & Innovation Grant (QIG) which the faculty won recently, the faculty has planned to increase industry related undergraduate research projects through the ITRCC (Industrial Training and Research Coordinating Centre) established in the faculty last year. With these developments, the staff and students would

undoubtedly be able to conduct high quality research, enhancing the recognition of the faculty locally as well as internationally.

As the only higher education institute of the South, the scientists of the university have an obligation to disseminate knowledge to the public and to support local industries by providing appropriate technology. Especially, there are many small industries in the region which need assistance to improve the quality of their products as well as to produce value added products from locally available raw materials. Furthermore, the rich indigenous knowledge exist in the region has to be explored and understood well, to incorporate in present research and development activities. I believe that the academics in the faculty have the capacity to address these issues in the future.

As the Dean of the Faculty, I take this opportunity to thank the Chairperson, Prof. Suneetha Gunawickrama, and all members of the organizing committee for their devotion and enthusiasm in organizing the 9th Science Symposium of the Faculty.

Prof. W.G.D. Dharmaratna
Senior Professor of Physics
Dean of the Faculty of Science
University of Ruhuna

Jan 09, 2013

Message from the Editor

The Ruhuna Science Symposium has been a reality since 2002 achieving the objective of providing the members of the faculty and the students a valuable stage for presenting and sharing their research findings. This year, the organizing committee decisively took a lead in opening the event for a wider scientific audience to bring together the academics/ research scientists and research students of Sri Lankan Universities and other higher educational institutes, and thereby to provide a national platform to share their scientific research findings, to build networks and professional connections with others in their field of interests and industrial partners invited.

As the Editor/ Chairperson of the organizing committee, it is with great pleasure that I issue this message to mark the proceeding of the ninth Ruhuna Science symposium with the participation of a large number of participants from the faculty itself and from other universities. I believe that this will be a landmark in the progress of the RuSciSym towards achieving a long-term objective of becoming a reputed national or even international level scientific meeting in the country. We have the human resources and the required mindset to achieve that long-term target.

I would like to appreciate the contributions from all the authors, and the support rendered by the internal and external expert reviewers that provided the core of this scientific event. I am especially grateful for the guidance provided by the Dean of the Faculty of Science, and the collective support rendered by the members of the organizing committee in making this event a success.

K.B. Suneetha Gunawickrama, PhD
Associate Professor in Zoology
Editor/ Chair person- 9th RuSciSym
Faculty of Science, University of Ruhuna

Advanced Technologies for Fertility care in Sri Lanka : the future challenges

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Infertility has been an area of special interest in the field of Reproductive Health Care for many decades. While the problem of affects many couples the contribution by male factor deficiency has assumed a greater prominence in recent times by affecting 55% to 65% of couples seeking treatment.

Sri Lanka has a proud record of providing free health care throughout life. Integrating fertility treatment into the structured health provision is a challenge. The technologically advanced nature of the treatment, the high cost in the more advanced types of care and the low return of investment contribute to the dilemma of providing this service to all strata of society. It is commendable that the country has been able to successfully complement the more basic and intermediate services with technologies for advanced infertility care during the past decade.

The treatment for infertility in general and the advanced facilities in particular are adaptations of basic physiology of reproduction. They are aimed towards supporting nature in the process of gamete development, follicular and ovum maturation, fertilization and implantation. These procedures therefore need meticulous adherence to details of laboratory and clinical procedures. While ART was originally meant to treat tubal factor infertility it has been adopted effectively for all indications of infertility. This is particular effective in infertility of unknown aetiology.

Ethical, religious, cultural and legal considerations have been brought into focus by the extensions of ART into Stem Cell Technology and Cloning. The need for regulation of these services and technologies has now been considered by the scientific community and the government so that draft legislation is in preparation. It is hoped that regulation by the anticipated authority would be supportive of the beneficial advances and not obstructive.

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The efficacy of tea extracts in inhibition of two strains of *Staphylococcus aureus*, and a preliminary phytochemical analysis

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Tea is a hot water infusion of the leaves from the *Camellia sinensis*. It is the most widely consumed drink worldwide. There are many different types of tea and among the most common types are black tea and green tea. In Sri Lanka, apart from these two types, people consume so called "factory discarded tea". The objective of this study was to screen the antibacterial effects of black, green and "factory discarded tea" against two *Staphylococcus aureus* strains. These strains are human pathogenic and antibiotic-resistant bacteria. The other objective was to characterization of chemical components which are responsible for antibacterial activity. Hot water infusions of black, green and "factory discarded tea" were used. Hot water infusion of "factory discarded tea" contained alkaloids, steroids and flavanoids. However, hot water infusion of both black and green tea showed the presence of cardiac glucosides as well apart from the above. None of the samples contained saponins. For the analysis of active ingredients of each tea, Soxhlet extracts were prepared using hexane, dichloromethane, ethyl acetate, methanol, and water as solvents. Phytochemical screening of Soxhlet extracts of "factory discarded tea", black and green tea in methanol showed the presence of alkaloids, steroids, cardiac glucosides and flavanoids. According to the preliminary screening of antibacterial activity against the two bacteria tested showed the highest inhibition for green tea followed by the black tea. The least inhibition was shown by the "factory discarded tea".

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Investigation of cytotoxity of *Fluggea leucopyrus* using Brine Shrimp Cytotoxity Assay

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This work presents the investigation of cytotoxic effect of the compounds present in leaves and bark of *Fluggea leucopyrus* (Katupila). *F. leucopyrus* belongs to the family Euphorbiacea, and leaves of the plants are known to possess some anti-cancer potential, and it is used as an alternative and complementary medicine in cancer therapy. The cytotoxity was assayed using Brine Shrimp lethality assay. The aqueous extracts of leaves and bark of *F. leucopyrus* was prepared and used in this assay. The tests were performed in multi-well cell culture plates in triplicates of 0, 25, 50, 100, 250, 500 and 1000 ppm concentrations of plant extracts. The second instar nauplii of brine shrimp were used, and after 24 hour of incubation period, number of survivals were recorded. The LC_{50} values were calculated for the bark and leaves extracts using EPA probit analyzer and both extracts of *F.leucopyrus* showed LC_{50} values of greater than 1000 ppm. The crude extracts were purified using column chromatography and the pure compounds were subjected to Brine shrimp lethality assay. It showed that the LC_{50} values for the all five compounds isolated were greater than 1000 ppm. According to these results, it gives primary indication that the compounds present in the leaves and bark of *F. leucopyrus* have no cytotoxic effects to the normal tissues.

Keywords: F.leucopyrus, cytotoxity, Brime Shrimp lethality assay, LC_{50}

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Antibacterial activity of different parts of *Pongamia glabra* (Pungu)

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Different parts of *Pongamia piñnata* (*glabra*) are used to treat various kinds of skin diseases by the traditional doctors such as healing wounds, eczema and other skin diseases. This study was carried out to see the effect of extracts of young leaves, roots and stem bark on four different bacteria by the agar diffusion method. The leave extract showed good effect against *Bacillus* than *Klebsiella*. The root juice gave less inhibition effect than stem bark in *Klebsiella*. But both stem bark extract and root juice gave similar effects against *Bacillus*. Leaf extract has very good antimicrobial effect against both *Bacillus* and *Klebsiella*. The effect of leaf extract against *Bacillus* is significantly higher than *Klebsiella* ($p < 0.05$).

Keywords: antimicrobial, *Bacillus*, *Pongamia glabra* (Pungu), *Klebsiella*

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Effect of CdTe layer thickness on the properties of CdS/CdTe solar cells

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Cadmium telluride (CdTe) is one of the leading materials fabricating low cost and high efficiency solar cells. In this work, a conventional structure of cadmium telluride solar cells was investigated and solar cell efficiency of 14.2% was achieved as a preliminary result using the hetero-structure of SnO_2/CdS/CdTe. In this study, cadmium sulfide layer was deposited using chemical bath deposition (CBD) method and cadmium telluride layer was deposited using close space sublimation process (CSS). Here, cadmium sulfide thickness was kept constant and the cadmium telluride layer thickness was varied to see the effect of CdTe layer thickness on cell properties. It was observed that the cell parameters such as open-circuit voltage and the fill factor improved considerably with increasing CdTe layer thickness and hence the cell efficiency showed a significant improvement. However, there was no considerable improvement in the short-circuit current density.

Keywords: Cadmium sulfide, cadmium telluride, hetero-junction, polycrystalline, photovoltaic

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Three-dimensional structural model of rRNA (guanine-N (2)-) - methyltransferase by homology modeling

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The biological function of a protein is largely determined by its three-dimensional structure. However, to date only ~16% of protein three-dimensional structures, from existing protein sequences, have been deposited in the PDB. This gap between existing structures and available protein sequences is due to the practical difficulties associated with use of conventional methods in structure determination such as X-ray crystallography and NMR spectroscopy. Homology modeling, which relates to computational chemistry plays an important role in determining protein 3-D structures. This method largely helps to fill the above gap between known sequences and known 3D structures. In this research we have used a computational method to model a three-dimensional structure of rRNA (guanine-N (2)-)-methyltransferase (rRNA-gN2Mtase) from Vibrio cholerae, which consists of 246 amino acids. This method uses software from Uppsala Software Factory (USF) such as O, SOD and MOLEMAN, and NCBI, PDB, BLAST, CLUSTALW databases. The crystal structure of UPF0341 protein yhiq from E.coli (PDB ID: 2PGX) was used as the template for modeling of the target protein sequence using above method. The obtained structural model rRNA-gN2Mtase mainly consists of two domains. The domain I, which is the catalytic domain, contains five α-helices and five parallel β-strands and two anti-parallel β-strands forming a β-sheet. The α-helices are wrapped around the both sides of the beta sheet. The domain II contains two anti-parallel β-strands and two α-helices. This structure also shows the common topology shown by other methyltransferases. We believe that this is the first structural model of rRNA (guanine-N (2)-)-methyltransferase and this will be much useful for biochemical studies of this protein and in the field of drug design.

Keywords: methyltransferase, rRNA (guanine-N (2)-)-methyltransferase, rRNA-gN2Mtase, 3D-structural model, homology modelling

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Variability of noise levels at the main bus stand at Matara, Sri Lanka: Preliminary results

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Noise levels at the main bus stand at Matara was investigated using IEC standardized B&K hand held Analyzer type-2250. A-weighted average sound pressure level, L_{Aeq}, and C-weighted peaks sound pressure level, L_{Cpeak}, were measured at four locations inside the bus stand where the traffic volume is around 120-125 buses per hour. The data were collected from 6.00 a.m. to 8.00 p.m. for fourteen days in the month of June, 2012. The average noise level, L_{Aeq}, for the day time, from 8.00 am. to 6.00 pm., was found to be vary between 79.0 ± 0.5 dB – 85.0 ± 0.7 dB and the average peak value, L_{Cpeak}, was between (103.0 – 107.0) ± 0.7 dB depending on the location. A maximum peak level of 118.40 ± 0.01 dB was found in one location at 5-10 m distance from the source. Highest noise levels were observed during the periods 1.00 p.m. to 3.00 p.m. and 4.00 p.m. to 6.00 p.m. on week days. The noise levels were lowest on Sundays as expected. The noises from engines, horns and speakers were found to dominate the noise level. The average noise level at all four locations were found to be higher than the level recommended by National Environment Act. No. 47 of 1980, for environmental noise, which is 70 dB for high noise level areas. There are several proposals that can be made to reduce the noise level. Firstly, the use of loud horns in buses within the bus stand can be reduced by educating the drivers. Secondly, the sound level of the sound system used in the bus stand can be reduced by using several low powered speakers. Thirdly, the noise level from engines of buses can be minimized by properly controlling the entering and leaving of buses with a suitable time lag.

Keywords: Vehicle noise, Sound pressure level, Background noise, IEC standards

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Effect of submerged and exposed aeration on dissolved oxygen in soaking water and germination of paddy grains

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Rice is the staple food grain in Sri Lanka and therefore 34% of the total cultivated land is under paddy. About 70% of people in Sri Lanka consume parboiled rice and the cold water soaking in parboiling process utilizes about 1,300 L of water per tonne of paddy. Paddy soaking water has higher BOD values (950–1300mg/L), and usually millers discharge it into environment without treatment causing environmental pollution and the traditional submerged cold water soaking produces anaerobic conditions in the soaking tank leading to bad odours in rice as well as in the environment. Therefore, introduction of a simple aerated soaking method is vital to resolve this issue. Aeration, under exposed or submerged conditions, would increase paddy hydration and Dissolved Oxygen (DO) concentration in the soaking water, which in turn could stimulate paddy germination. Therefore, this experiment was conducted to study the effect of aeration, under exposed and submerged conditions, on DO concentration and paddy germination and to compare it with conventional cold water soaking process. Two simple water circulation units were made for the exposed and submerged aeration tests and similar unit was used without water circulation to represent conventional cold soaking. Water circulation and aeration was done using a 12V DC pump at a frequency of 10 minutes operation and 20 minutes resting based on the results of observation trials. After 30 hours of soaking, the DO level in soaking water in exposed aeration reduced to 1.4 mg/L, 1.1 mg/L in submerged aeration and 0.1mg/L in submerged traditional soaking. Paddy samples were taken after 36 hours of soaking and kept for standard germination test. Highest percentage of paddy grain germination (50%) was found in exposed aeration, 2% for submerged aeration and 0% for conventional soaking within 30 minutes after taking samples. Therefore, aeration had an impact on DO, which in turn affects paddy grain germination.

Keywords: Aerated soaking, Dissolved Oxygen, Paddy germination

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A study on the effect of some factors on rooting and plantlet regeneration of *Chirita zeylanica* and *C. walkeri* leaf cuttings

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Chirita zeylanica and *Chirita walkeri* (Gesneriaceae) are endemic wild flowering plant species found in Sri Lanka having an exploitation potential within commercial floriculture. Both species can be propagated by seedlings, soft wood cuttings, and leaf cuttings. Seedlings and soft wood cuttings are not entirely efficient methods of mass propagation as these methods cannot produce a large number of plants within a short period. But, one *Chirita* leaf can produce a cluster of plantlets within 3-4 weeks. Therefore, this study was conducted to determine the most suitable rooting medium, method of placement of the leaf cutting in the medium, and effect of exogenous Indole butyric acid (IBA) for successful rooting and higher rate of plantlet regeneration in *C. zeylanica* and *C. walkeri* leaf cuttings. Sand only and sand and compost, 1:1 media were used with three methods of leaf cutting placements; only leaf petiole dipped in medium (A), entire leaf on the surface of the medium (B) and petiole and half of the leaf dipped in medium (C), with and without IBA application. The treatments were arranged in a factorial experiment using a randomized complete block design (RCBD) with 6 replicates. The mean number of primary roots, root length, and number of plantlets were recorded after 60 days. For both species, sand medium was significantly effective on rooting. For *C. zeylanica*, the effect of placements A and B gave significantly high rooting and number of plantlets in the sand medium. For *C. walkeri*, cutting placement B was significantly effective on rooting. For both species IBA treatment showed no significant effect. Plantlets formation could not be observed in *C. walkeri* leaf cuttings even after 60 days.

Keywords: *Chirita zeylanica, Chirita walkeri,* IBA, leaf cutting placement, plantlet regeneration

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Recolonization of anuran amphibians in the Knuckles Mountain Forest Range in Sri Lanka: A success story

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The vast majority of the virgin forest in the Central Region in Sri Lanka, including that in the Knuckles Mountain Forest Range (KMFR), has been cleared for agricultural purposes. As a result of these uncontrolled anthropogenic agricultural practices, the sub-montane forest in the KMFR is now highly fragmented and drastically reduced in area. To investigate whether the secondary forests facilitate the conservation of amphibians and to study patterns of recolonization of anurans following forest habitat alteration, we undertook field research in the KMFR. Using 10 sites for each of the virgin forest, on-going tea plantations, and three successional stages following abandonment of tea plantations, we investigated how the secondary forests have influenced patterns of recolonization of anurans following forest habitat alteration. Our investigations, conducted from April 2008 to April 2009 and incorporating two monsoon and two inter-monsoon seasons, resulted in us encountering 237 post-metamorphic anurans representing 21 species arrayed among the families Bufonidae, Microhylidae, Nyctibatrachidae, Ranidae and Rhacophoridae. The lowest species richness (three species) was encountered at sites currently in production, for all seasons. Six and eight anuran species were recorded from the middle and late successional stages (secondary forest habitats) respectively. The species richness of anurans was highest (eleven) in the sub-montane virgin forest for all seasons. Our secondary successional studies revealed a high incidence of recolonization of abandoned agricultural lands by anurans, and accordingly our results indicate that the secondary forest might play a substantial role in the conservation of biodiversity in tropical areas, and in particular in the KMFR. Furthermore, the positive relationship between anuran species richness and the successional stages of this study reveals that this mountain range has to be managed carefully. Prevention of further destruction and close regulation of human impact on the undisturbed virgin forest in the area are called for. In light of evidence of recolonization patterns of anurans in abandoned tea plantations and the recovery patterns of the vegetation, our study emphasizes the importance of conserving these diminishing and invaluable habitats, and hopefully will prompt further research on the wildlife of this area.

Keywords: Abandoned agricultural fields, Anurans, Recolonization

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Estimation of growth parameters for tropical *Scomberoides lysan* (Carangidae)

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The present study was carried out to understand the growth parameters of the tropical double spotted queen fish, *Scomberoides lysan*. Growth parameters of *S. lysan* such as asymptotic length, growth coefficient and age at zero length were estimated based on length frequency data using FiSAT II software. A total number of 1115 samples were collected weekly from the commercial catches in the Northern waters of Sri Lanka during January 2010 to December 2011 and sexes were separated by observing the gonads. The von Bertalanffy growth parameters for male *S. lysan* were $L_\infty =$ 87.96 cm, K= 0.41 $year^{-1}$, t_0 = -0.1582 $year^{-1}$ and for females, L_∞ = 88.85 cm, K= 0.40 $year^{-1}$, t_0 = -0.16195 $year^{-1}$. The growth coefficient (K) of both male and female indicates that this species shows faster growth. The Powell-Wetherall plot gave a Z/K value of 2.174 for males and 1.964 for females, where Z is the total mortality. The estimated growth performance index (Ø) for male and female were 3.5013 and 3.4993. The inverse von Bertalanffy equation shows that 50 % of males attained maturity at age 2.266 years (55.4 cm total length) and females at 2.712 years (60.7 cm Total length). Estimated longevity (t_{max}) for *S. lysan* calculated from Pauly's equation was 7.317 for males and 7.338 for females. The results give fundamental data for the population dynamics and stock assessment studies of *S. lysan*.

Keywords: Age at maturity, growth coefficient, longevity, *Scomberoides lysan,* tropical fish

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Monthly changes in gonad, muscle and liver lipid of female *Scomberoides lysan* from Northern waters of Sri Lanka

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The present study was carried out to assess the monthly fluctuation of lipid content in gonad, muscle and liver tissues of *Scomberoides lyan*. Monthly fish samples of 442 adult female fish captured from the northern waters of Sri Lanka in 2010 and 2011 were used. Tissues of ovary, liver and muscle were taken from each fish for lipid extraction by Bligh and dyer (1959) method. Tissue lipid contents in fish showed temporal fluctuations that correspond to lipid storage and utilization processes. The highest amount of lipid content in ovary was observed in June and September of both years. Lipid content (% dry weight) from the ovarian tissues of fish collected in June and September months for year 2010 were 34.72 ± 13.36 and 29.01 ± 9.66, respectively whereas it was 26.13 ± 3.77 and 35.00 ± 10.36 for year 2011. Lipid content in muscle tissues was discernibly ($p < 0.05$) lower when compared to that in liver and ovarian tissues. Significantly ($p < 0.05$) increased amount of lipid content in liver tissues was recorded in May and August, and decreased thereafter. Liver lipid content attained the lowest amount in June and September months. Liver and gonad lipid showed a considerable monthly fluctuation during the two year period, while the changes in the amount of muscle lipid were much smaller. Understanding the lipid changes in gonad, muscle and liver tissues of *S. lysan* can predict the time of spawning (June and September), which would help to develop a management plan for this species in Sri Lanka.

Keywords: Liver tissues, muscle, ovarian lipid, *Scomberoides lysan*, Temporal variation

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Information geometry of mean-field approximation for third-order classical and quantum Boltzmann machines

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We apply the concepts of information geometry to study the mean-field approximation for a general class of quantum statistical models namely the third-order quantum Boltzmann machines (QBMs). The states we consider are assumed to have at most third-order interactions with deterministic coupling coefficients. The totality of such states can be shown to form a quantum exponential family and thus can be viewed as a smooth manifold. In our work, we explicitly obtain naive mean-field equations for the third-order classical and quantum Boltzmann machines and demonstrate how some information geometrical concepts, particularly, exponential and mixture projections are useful in this case. It is obvious that our results for third-order classical Boltzmann machines (CBMs) and QBMs emphasize the validity and the importance of information geometrical point of view for higher dimensional classical and quantum statistical models.

Keywords: mean-field theory, quantum statistical model, information geometry, quantum relative entropy, quantum exponential family

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Wireless Multiple Choice Question/Answer evaluation system for classrooms

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Multiple Choice Questions (MCQs) have become a routine question answering method to assess student readiness for lectures in a classroom. The task of developing a wireless system to do such a testing procedure has been attempted. A radio frequency 433.92 MHz (RF) module is used to communicate between the sender (student) and the receiver (teacher). Using this system, the student is able to answer the MCQs and the teacher or the system is able to grade the answers. The sender module consists with both alphanumeric and additional keys, while the whole unit is about 10cm x 10cm x 6cm in size. This system can be developed to obtain student attendance in a classroom as well, with some minor changes. Visual basic 6.0 has been used to develop the database. PIC16F877A microcontroller is the main CPU used in the sender and receiver hardware.

Keywords: Wireless, microcontroller, sender, receiver

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An Improved Method of Kernel Smoothing with Boundary Corrections in Nonparametric Regression Analysis

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Besides the classical parametric regression methods, the nonparametric regression is a widely used alternative method of which any predefined functions of finite number of parameters are not required. In nonparametric regression, the well known kernel smoothing techniques are of practical significance in variety of fields such as, image processing, video reconstruction, weather forecasting, modelling stock market data etc. due to their flexibility in fitting curves. However, an inherent drawback of nonparametric kernel smoothing techniques in regression is the inconsistency of the boundaries of the estimated curves, which is known as the boundary effects. Several methods have been developed to minimize such effects in density estimations, such as reflection method, boundary kernel, transformation method etc. However, the investigations for boundary corrections in nonparametric kernel smoothing in regression analysis are rare in the literature. This paper introduced a new method introducing a boundary kernel function to avoid the boundary effect of the non-parametric kernel smoothing in fitting regression curve. In this consideration, the result appeared in the series of publications for boundary correction in kernel density estimation is taken in to account for the construction of new method as an analogous extension. In this investigation, we restrict ourselves the data sets to equidistance deterministic designs (i.e. equally spaced response variable data) together with Nadaraja-Watson Smoothing Kernel Estimations. To observe the improvement of the novel approach, the simulations are presented with particularly chosen static data as a test example. In the simulations, classical parametric regression curve, regular kernel regression and the new boundary kernel estimator are employed separately for same data to compare and to examine the validity and versatility of the new boundary kernel smoothing approach. Finally, a number of graphical illustrations are used to produce some concluding remarks.

Keywords: Nonparametric Regression, Kernel Smoothing, Boundary Effects.

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Risk factors of the childhood asthma in the Colombo Municipal Council area: Bayesian approach on logistic regression model

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Asthma is one of the most common chronic diseases in the child-hood in both developing and developed countries. The objective of this study was to examine the relationship between the childhood asthma and the risk factors among children aged 5-12 years in the Colombo Municipal Council area using Bayesian inferential method. In Bayesian inferential methods Gibbs sampling algorithm was used to select samples from posterior distribution of logistic coefficient under non-informative prior using WinBUGS 1.4 software. In checking convergence "live trace plots" of sample of parameters were obtained. Also the simulation was run until the Monte Carlo error for each parameter of interest is less than about 5% of the sample standard deviation. Then mean standard deviation Monte Carlo error and some percentiles of posterior distribution were computed. According to the study, asthma was more likely to occur among boys than girls (Odds Ratio [OR] =1.48, 95% Credible Interval [CI] =1.09 to 1.98). Children those who do not have allergies (OR=0.59, CI=0.39 to 0.90) and children those who have had no family history of asthma (OR=0.27, CI=0.19 to 0.36) have a lower risk of having asthma. If the parents' income is high then possibility to getting exposed to diseases becomes low. Children, who used mattresses to sleep, have a possibility of getting exposed to disease asthma. If children live with more number of persons in the house, the possibility of occurring disease is low.

Keywords: Bayesian inference, Gibbs sampling, Logistic model, WinBUGS 1.4.

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Analyzing persistence of life insurance policy using survival model

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Persistence of life insurance policy has always been a worldwide concern. The objective of this study is to identify the risk factors those caused for increasing the persistence of life insurance policy, based on one of the well-known insurance company in Matara. In this study, the life insurance policies which were opened during the period of 1st of January 2010 and 31st of December 2011 are considered. The data set is formed of a sample of 570 life insurance policies. Gender of the policy holder (male and female), type of policy (with 14 categories) and mode of payment (single, monthly, quarterly, half yearly, and annually) are considered as affecting factors. The method of analysis is based on statistical approach, survival analysis. Kaplan-Meier Estimator and Life Table Analysis are used as survival techniques. According to the present study, persistence of life insurance of females is likely to be higher than males. The policies those have higher survival time have the less of surviving probability and hence they have higher risk of lapsation. Some policies are identified as they have higher persistence. Single mode of payment has the constant surviving rate and policies paid half yearly, have the lowest survival rate while those paid annually have the highest survival rate. The survival model provides much more information to the management of the insurance company than what the regression model can offer.

***Keywords*:** Survival Data, Censor Variable, Kaplan- Meier Estimator, Life Table Analysis

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Design and construction of an Anemometer with a Wind Vane

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An Anemometer is a device for measuring wind speed and is a common instrument used at weather stations. Weather stations such as Meteorology department need to measure both wind speed and the wind direction for making weather forecast. Anemometer with a wind vane has been designed and constructed. A digital compass and a picket fence are used to measure wind directions and wind speeds respectively. Arduino board is used to calculate the wind direction and wind speed. The readings are displayed on an LCD screen and stored screen and stored in a SD-card. This is a user friendly instrument could be manufactured at a low cost.

*Keywords***:** Wind, Speed, Direction, Anemometer, Wind-vane

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Abstracts

of

poster presentations

Effect of fertilizer on agronomic characters and yield in forty traditional rice cultivars in Sri Lanka

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Traditional rice gene pool in Sri Lanka consists of various biotic and abiotic stress tolerant cultivars. Some of the traditional rice cultivars have been studied in systematic way to understand their ability to withstand drought, salinity and submergence stresses at different growth stages. The selected rice cultivars can be directly introduced in to farmer field or can be utilized as initial breeding materials for the production of rice cultivars with such tolerances. This needs prior understanding on their agronomy, phenotype and their potential yield in farmer field. The yield potential and fertilizer responsiveness of traditional rice cultivars are known to be less than those of modern rice cultivars. With the objectives of understanding agronomic characters, yield potential and fertilizer responsiveness of the traditional rice cultivars, a field experiment was carried out in 2011 Yala season at Faculty of Agriculture, University of Ruhuna. A standard fertilizer recommendation (recommended dose) has been introduced by Department of Agriculture in Sri Lanka for modern rice cultivars. In this study three fertilizer levels; ½ of the recommended dose, recommended dose, two folds of the recommended dose and no fertilizer application was studied at the field condition for forty traditional rice cultivars. Rice cultivars were transplanted according to completely randomized block design with four replicates. Each replicate consisted of three rows of rice plants and data were collected from 20 plants of the middle row. Agronomic characters such as plant height (cm), number of tillers/plant, number of leaves/tiller and yield/plant were evaluated during the study period and bio mass indices were calculated at the end of the experiment. According to statistical analysis there were significant effects of fertilizer on plant height, tiller number and on number of leaves/tiller. According to correlation analysis none of these agronomic characters correlated with yield/plant since these varieties belonged to different age groups. The best fertilizer level for the highest yield must be recommended for individual cultivar. Furthermore, bio mass index of each rice cultivar at different fertilizer level is also a factor to be considered.

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Superheated steam blasting for cleaning and sterilization of clay pots used for curd packaging

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Use of hygienic packaging materials is very important to avoid microbial contaminations that lead to poor shelf life of curd. Microbial and dust contaminations in clay pots are found to be a major problems in using them for curd packaging and therefore proper cleaning and sterilization of clay pots is essential. The present method of washing, potassium sobate treatment and re-firing is not satisfactory due to poor shelf life of curd and high cost of production. Therefore, the main objective of this experiment was to evaluate the effectiveness of steam injection for cleaning dust and sterilization at once of the clay pots used for curd packaging. Five treatments; steaming inside, steaming both sides, steaming and 1% potassium sobate application inside, steaming and potassium sobate application on both sides and control with four replicates were used for the experiment. A simple corn type steam injection nozzle was directly connected to a high pressure steam hose. Pots were treated according to the treatments and total colony counts were determined in pots using Ringer solution and cotton swabs for rubbing the surface and milk agar as the culture media. In addition, the Coliform test was also conducted. Mould growth on the packed curd was observed visually and pH of curd was also measured during storage. The cost analysis was also done to evaluate the feasibility of the new technique and compare with the present method. According to the results, steam blast sterilization significantly reduced ($P>0.05$) the microbial counts compared to the current method. Further, the combination of steam blasting and application of 1% potassium sobate on the inner surface was found to be the best treatment. The shelf life of curd could be extended by four days up to 11 days while reducing the cost to a half.

Keywords: Clay pots, Coliform test, Curd, Shelf life, Steam blasting

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Growth performance of *Wedelia trilobata* in Matara District and its competition and allelopathic effect on *Axonopus compressus*

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Invasive alien plants have caused extensive economic and ecological damages throughout the world. Many coconut cultivated lands which dominated with grasses in Southern Sri Lanka have been invaded by recently introduced ornamental ground cover plant, *Wedelia trilobata*, and now it has become a big problem for the cattle feeding. Enough attention has not been focused yet to understand its vigorous growth and competition and hence the relevant information is not available in existing literature. A study on this weed is therefore very much important. No seed germination of *W. trilobata* was observed under laboratory conditions and therefore the rapid invasiveness was investigated throughout the vegetative propagation. Competitive ability of *W. trilobata* with the grass A*xonopus compressus* was studied under the green house conditions keeping the total plant density constant while changing the densities of the two components. Covering effect and allelopathic effect of *W. trilobata* on the grass and growth rate of each species was also studied. Fresh weight, dry weight, length of the stem and root, root/shoot ratio were taken as the measurements. With the increase of *W. trilobata* density, shoot length and root length of *A. compressus* were gradually decreased. Covering rate of *W. trilobata* varies in different locations. It spreads 62.86cm2 month⁻/m2 in Deniyaya area compared to 51.71cm^2 month⁻/ m2 in Devinuwara. Considering alleolapathic effect, 50gL⁻ of *W. trilobata* leaf extraction significantly affected the growth of *A. compressus*. These physiological parameters are advantageous to implement successful and efficient management programs for *Wedelia trilobata*.

Keywords: allelopathic effect, *Axonopus compressus, Wedelia trilobata,* competition

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Gill and Liver histological alterations in juvenile *Oreochromis niloticus* exposed to contaminated sediment from a fisheries harbour

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Histo-pathological biomarkers are widely used to elucidate potential toxicological impact of contaminated sediments on organisms, including fish. A controlled laboratory experiment of sediment toxicity was carried out to qualitatively examine gill and liver histological alterations in juvenile *Oreochromis niloticus* exposed to contaminated sediment from a fisheries harbour. Four groups in duplicate, namely negative control (no sediment), reference group (pristine sediment), and two exposure groups with single (T1) and triple (T2) levels of HC-contaminated sediment from a fishery harbour were used. The study aimed at reporting the gill and liver histology in randomly selected fish (n=6 per group in duplicate) from the four experimental groups at the end of 16-week period. Gill histology was found to be altered in all the examined fish in T1 and T2 groups when compared to the gill histology found in the negative control and the reference groups. Pathological alterations of the gills include epithelial hyperplasia and hypertrophy, dilation of marginal canals, and hyperplasia in the inter-lamellar space, and lamellar fusion apparently blocking the water flow between lamellae. Major liver histo-pathological indications were observed in all examined fish in T1 and T2 groups, including vacuolization of liver cells and focal necrosis. The results reveal that long term exposure to persistently contaminated sediment causes histological alterations in gill and liver of fish, and highlight the bioavailability of sediment-associated pollutants to the fish.

Keywords: biomarker responses, harbour sediment, histopathology, toxicity assays

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Checklist of Siganids from the Jaffna lagoon, Sri Lanka

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Jaffna lagoon in Northern Province of Sri Lanka is an important fishing area which also harbours high marine biodiversity. Members of the family Siganidae are commercially and economically important species among mangroves and estuaries and shallow lagoons in Sri Lanka. They belong to order Perciformes, sub order Siganoidei. Most of the members are excellent for mariculture due to their herbivorous food habits, rapid growth and economic value. The present study is an aim to document the species diversity of siganids inhabiting the Jaffna lagoon. The present investigation was carried out from June 2011 to June 2012 in order to update the checklist of the species of the family siganidae. Samples were collected from Kurunagar, Paasaiyoor, Navanthurai and Kakaitheevu landing centres. Specimens were collected by Sirahu valai, traps baited with aquatic plants, bottom gill nets and cast nets which are used in commercial fishing around the Jaffna lagoon. All siganids were brought to the laboratory and identified up to species level using their morphological characters. Their photographs were also taken. Based on the present study, seven species of siganids were recorded, including *Siganus canaliculatus, S. javus, S. lineatus, S. stellatus, S. virgatus*, *S. vermiculatus* and *S. spinus*. The distinguishing morphological characters used for the identification are discussed and the key to identify siganids was constructed.

Keywords: *Siganus*, estuary, checklist, biodiversity

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Morphological variation in some populations of *Systomus sarana* in Sri Lanka and a comparative analysis with *Systomus sarana* from Kerala-India

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The freshwater cyprinid fish that has long been identified as *Systomus sarana* (*Puntius sarana*) is a widespread species in Sri Lanka. Taxonomic complexity of this species has been indicated by previous literature, but no scientifically confirmed information is available on phenotypic variation of the species, and whether the Sri Lankan species is in fact similar or different from Indian *S. sarana* (s.l.). The present study aimed to describe the morphometric and meristic characters of *S. sarana* (s.l.) in Sri Lanka, and to carry out a comparative analysis with *S. sarana* from Kerala. High degree of variation in morphology was evident among some of the studied populations (Menik River-M, Kirindi Oya-KO, Nilwala River-N, Kelani River-K, Walawe River-WP, Malwathu Oya-MO, Gin River-G and Kerala/India-IK). Univariate ANOVA showed that, except Pre Doral Length, Post Dorsal Length, Caudal Peduncle Depth and Maximum Body Depth, all the other characters were significantly different (P<0.05) among studied populations. Discriminant function analysis identified post orbital length as having the greatest power to discriminate the populations. Significant separation of two groups of populations was possible by canonical analysis, where CV1 and CV2 explained 69.7% of the total variation in data. In cluster analysis, MO, K and IK populations create a separate clade which probably shows a lineage splitting from the other clade (M, KO, N, WP, and G) by having a linkage distance of ~85%. Results from meristic counts were also in agreement to this separation where number of scale rows above lateral line was different between the two clades (4 ½ vs. 5 ½). The results conclude that at least two clearly differentiable groups of this fish are present in Sri Lanka, and one of which (MO and K) shares the characters of Indian *S. sarana* more closely than the other group (M, KO, N, WP, and G).

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Consumption of Cow Milk and Goat Milk: A study among 1AB School A/L Students in Jaffna Municipal Council Area

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This paper presents the investigation on availability, consumption pattern, and factors affecting the consumption of cow milk and goat milk among A/L students of 1AB schools in Jaffna Municipal Area. From each school more than 10% of the students were selected randomly and questionnaires were given. Data was analyzed using SAS. Proc frequency was used to analyze the data. The data set analyzed contained 134 and 197 questionnaires for males and females, respectively. This included 192 students from urban areas and 139 students from rural areas. Out of 331 students, 67.67% of students consumed cow milk while only 10.87% of students consumed goat milk. Higher percentage of rural area students consumed cow milk and goat milk compared to urban area students. Consumption of both cow and goat milk by male students was higher than female students. About 80.95% of students from urban area obtained cow milk from milk centres, while 62.66% of rural area students obtained cow milk from their own cows. Among goat milk consumers, about 97.22% of students obtained goat milk from their own goats. About 91.96% of students consumed less than 200 ml of milk per day while all of the goat milk consumers consumed less than 150 ml of milk per day. Students who obtained cow milk from their own cows consumed more milk than others. However, some factors such as the living area, gender, availability, price, health reasons related to throat phlegm and milk allergy, flavour of milk, and usage of spray dried milk powder had an effect on milk consumption.

Keywords: Cow milk, Goat milk, Milk consumption, Jaffna

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An automated, low cost device for feeding grains into a grinding mill

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A simple automated device has been constructed to feed grains into a regular manually fed grinding mill. It is capable of feeding grains with desirable constant rates according to the size and type of grains as well as in accordance with the efficiency of the mill. The mechanism and efficiency of the device could be improved further. The device can be easily manufactured locally at low cost and thus has a wider applicability in small scale industry. At present, the device can be used for feeding dry or wet rice, *kurakkan*, corn seeds, etc. The device can be modified further as an automated system with couple of sensors to use for multiple industrial applications and one such application under development is a device to measure weights of various powder products and seeds before packaging.

Keywords: automated device, feeding grains, sensors

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A case study of frictional damping of a physical pendulum

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The harmonic motion is a prominent motion in nature. Pendulums are made for demonstrating harmonic oscillations and they are applied in various physical systems. Damping of a pendulum with time is due to frictional forces in nature. A case study was carried out to study of frictional damping of a physical pendulum. A mathematical model was developed. This paper describes the mathematical model, data taking methodology, and data analyzing in details. The results are in good agreement with the real data.

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Exploring geographic and age variation in cancer incidence in Sri Lanka

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Cancer is worldwide recognized as an uncontrollable, incurable and fatal disease, caused by the spread of abnormal cells. The main objective of this study which has been conducted as a collaborative research with National Cancer Control Program (NCCP) is to analyze the characteristics of the age variation and regional patterns of cancer incidences in Sri Lanka. Information on newly diagnosed cancer patients was obtained from the National Cancer Registry (NCR) maintained by National Cancer Control Program (NCCP), Sri Lanka for the years 2005 and 2006. Age Standardized Rates (ASR) of incidence and Estimated Annual Percentage Change (EAPC) were calculated for the period 2005 - 2006. An overall increase in incidence rate was observed from the analysis. The highest annual rate of cancer incidence was observed for males and females of the age group 65 - 69. Further, the number of incidences peaked for the range 50 - 59 for both genders. Moreover, geographic variation in age-adjusted incident rates among males and females were observed using SatScan datamining tool. It is identified that among 25 districts, Breast and Cervical Cancer are the mostly distributed cancer types among females while Bronchus Cancer and Lung Cancer are mostly distributed among males. Monitoring the trends and regional variations of cancer incidence supports the implementation and evaluation of regional education interventions which could increase the awareness of cancer symptoms.

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Classification of Candida Cells with Morphological Identification

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Candida causes fungal infections in human and animals. Since a large number of Candida cells can be found in one sample, manual quantification and classification has become a tedious task for technicians. Moreover, it is used to identify fungal infections and for treatments. Therefore classification and morphological identification of these organisms is an essential feature in the diagnostic process. Live Candida cells appear in purple color and dead cells appear in pink. Since Candida cells appear as overlapped cells, it is really important to separate each touching cells and count them as individuals. Color segmentation can be used to classify live and dead cells. It is achieved by analyzing the red component grayscale image. The well famous watershed method has been used for the segmentation of touching Candida cells. The Distance Transform is used to apply watershed method as it enables any types of intensity images. Introducing a semi-automated system avoids the uncertainties where the user can remove the artifacts from the final result of the system. Also seeded region growing algorithms can be used for further segmentation if the user can select seed points manually.

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Hybrid modifications of Bacterial Foraging Optimization: A Survey

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Other than using traditional methods, Meta-heuristics are very popular in solving complex and intricate problems. Among the meta-heuristics, Bacterial Foraging Optimization is a newly introduced nature inspired algorithm which has been successfully used in solving complex problems since its inception in 2002 by Kevin M. Passino. BFO algorithm is successfully applied in the fields of Computer Science, Engineering, Medical science, and Mathematics. Original optimization heuristics have problems in accuracy, optimum solutions in large scale problems, delay in convergence and premature convergence. Several hybridizations of BFO and Particle Swarm Optimization have been applied in different engineering problems. It has been successfully coupled with meta-heuristics such as Tabu Search, Differential Evolution and Genetic Algorithm as well. This study is based on the improvements of BFO in hybrid modifications and the applications compared with other optimization algorithms. The study shows that the hybrid modifications converging faster and solve the problem of premature convergence in the original BFO.

Keywords: Bacterial Foraging Optimization, hybrid modifications, meta-heuristics

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