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Diversity and abundance of medium and large mammals of the Giritale nature reserve of North-Central province, Sri Lanka.

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Thirty medium and large mammal species are known to occur in the dry zone forests of Sri Lanka. However, there is a paucity of data related to species diversity and abundance of those species. This study was conducted in three habitat types namely forest, shrub-land and grassland in the Giritale Nature Reserve in North- central province of Sri Lanka. Study was conducted from June to December 2007. Many short line transects (total length 4km per habitat) were used for each habitat and marked using a GPS. Havahart live animal cage traps were used to capture the medium sized mammals each month. Direct and indirect observations were also conducted. Two hundred and forty five medium and large sized mammals belonging to seven orders, sixteen families and species were recorded at the three different habitat types by the direct census method. Rainfall data were obtained from the Meteorological Department. Three endemic species *Trachypithecus vetulus, Macaca sinica* and *Moschiola meminna* and five threatened species *Manis crassicaudata, Lutra lutra, Panthera pardus, Moschiola meminna* and *Trachypithecus vetulus* were recorded. *Bandicota indica* and *Herpestes brachyurus* were trapped. Forest had the highest Shannon diversity (H') index of 0.967 while Shrub-land had the lowest diversity index (0.458). Shannon diversity index was not significantly different in three habitats. Diversity index was not significant related with the rainfall. *Axis axis* was the most abundant and lowest abundant was *Bandicota indica*. Highest evenness value was recorded in grassland (0.967) and lowest (0.701) recorded in shrub-land. Giritale Nature Reserve consist 60% of mammal species, 60% of endemic species and 62.5% of near threaten species with regarding the total mammalian fauna present at each category in the country. Present study which is the first to reveal the species diversity and abundance of medium and large sized mammals inhabits at the Giritale Nature Reserve.

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275/D

Chemical composition of selected varieties of chicken sausages

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"Ready to eat meat products" are very much popular among the Sri Lankan population than they were a few decades ago. The meat products available do not carry any information of nutritive values on the label. The present study determines the chemical composition and iron content of selected chicken products available in the local market. Where possible the nutritive values were compared with standard values given by the Sri Lanka Standard Institution (SLS).

A market survey indicated chicken sausages to be most popular. The most popular brands of chicken sausages were then selected for this study. Samples for each brand were obtained from two batches. These were fried for 2 – 5 minutes using medium flame and used for analyses of moisture, ash, crude protein, digestible carbohydrate, fat, and iron content using standard methods (AOAC). Moisture, ash, crude protein, digestible carbohydrate, fat, and iron content of the three different brands ranged from 52.6 – 63.6 %, 0.10 – 0.17 %, 12.4 – 15.0 %, 2.7 – 4.8 %, 14.6 – 23.6 % and 1.1 – 2.2 mg/g respectively. In all three brands moisture and fat contents totaled to more than 75 % of the wet weight. Moisture and fat contents were significantly different among the three brands ($p < 0.05$). The sample which had the lowest fat content had the highest moisture content. Among the three brands one brand had significantly low protein amount ($p < 0.05$) in the samples from both batches. Ash content was significantly low ($p < 0.05$) in one sample and correspondingly the iron content was also significantly low in the same sample ($p < 0.05$) compared to the other two brands. The difference in proximate composition among the three brands may be due to different raw materials used in their product, age of the animal, type of feed they used and different body parts of the animal that were used in the product. There was no significant difference between the two batches of the sample ($p > 0.05$) except for protein in one brand. The fat content compared well with the data given by the Sri Lanka Standard Institution (SLS) and all the three samples had higher carbohydrate content (on dry basis) than the standard values given by the SLS.

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276/D

Rhizobiology of some selected crop wild relatives of *Vigna* in Sri Lanka

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In this study, four legume species collected from different locations in Sri Lanka were subjected for analysis of which hardly any information is available on their rhizobiology. They are *Vigna dalzelliana*, *Vigna trinervia*, *Vigna trilobata* and *Macroptelium* sp. The object of the study was, characterizing rhizobia, maintain a rhizobium collection, examination of infectivity & effectivity of the rhizobial isolates and development of effective inocula for crop varieties. During the work, isolation, purification, characterization and authentication of rhizobium isolates from the root nodules of host plants were done.

Characterization was performed using morphological characters such as colony characters, gram staining and spore staining, biochemical characters such as BRYMA test and checking for gas and acid production and infectivity and effectivity was checked using a reference plant, siratro (*Macroptelium artropurpureum*)

Rhizobium isolates could tentatively assign into 14 isolates according to the results of characterization. These include seven isolates from *V. dalzelliana*, one isolate from *V. trinervia*, two isolates from *V. trilobata* and four isolates from *Macroptelium* sp. All of them are gram negative non spore formers. Among them 11 isolates are fast growers and the other 3 are slow growers. All the slow growers are non gas producers where as all the fast growers except 2 are gas producers. Upon inoculation of isolates to siratro the VTL2 isolate showed highest infectivity and this could be used to inoculate crop species of *Vigna* with the aim of increasing the yield. Other isolates showed less or no infectivity.

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277/D

Preliminary investigation into antibacterial and antifungal activity of a species of *Trichoderma* isolated from Soil

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Fungal metabolites are important source of wide variety of drugs including the antibiotic penicillin and popular cholesterol lowering agent lovastatin.

Soil samples collected were cultured in yeast malt agar using standard procedures to isolate fungi which were later purified. To determine the bioactivity of these fungi, pure cultures were grown in the same medium in large scale. Extracts of cultures were made using methanol followed by separation with ethyl-acetate to obtain low molecular weight compounds. Crude ethyl-acetate extracts in methanol were used to determine antibacterial and antifungal activity against several bacteria spp, (*Bacillus* sp*, E. coli, Staphyloccocus* sp and *Klebsiella* sp.) and several yeast strains (*Saccharomyces* strains, and a *Shizosaccharomyces* strain) using Kirby-Bauer method. Each disc contained 500 µg of the crude extract. Discs containing Amoxicillin (25 µg), Polymyxine B (20 µg) and methanol separately were used as positive and negative controls respectively. All assays were done in duplicate and average diameters of clear zones were recorded. Out of the seventeen extracts tested, one showed antibacterial activity against *Bacillus* sp. Both sample and Amoxicillin gave 11 mm clear zone. Same extract showed antifungal activity against S*accharomyces* strain giving clear zones of 15 mm. The positive control, Polymyxine B gave only 12 mm clear zone. By studying colony characters, fungal morphology and asexual reproductive characters, the bioactive fungal culture was identified as a species of *Trichoderma*.

The above fungus was grown in different media to select the best medium for growth and to determine any change in bioactivity in different media. Potato dextrose broth (PDB) was found to be the best medium. To study changes in bioactivity and chemical diversity in the presence of the different metal ions, an experiment was also set up where fungus was grown in PDB medium containing different metal ions (Mg^{2+}, Cd^{2+}, Al^{3+}, Ni^{2+}, Fe^{2+}, Cr^{2+}, Ca^{2+}, Zn^{2+} and Co^{2+}) at concentration of 1 mg/100 mL. The ethyl acetate extracts of above cultures were tested for antibacterial activity using *Bacillus* sp.
The yield and antibacterial activity of the fungal extract had increased when the fungus was grown in the presence of Mg^{2+}, Cd^{2+}, Al^{3+} and Ni^{2+} while in the presence of Ca^{2+} and Zn^{2+} only the yield of extract increased.

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278/D

Moss (*Barbula* sp.) used as biomonitor of atmospheric heavy metal deposition: Estimation of uptake efficiencies

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Concentrations of Pb, Ni, Cu, Cr and Cd in two *Barbula* species in permeable bags (moss bag method) were compared with bulk deposition measurements of these elements at three monitoring stations; Dalugama, Biyagama and Sedawatte which can be identified as highly polluted areas in Sri Lanka. Amount of heavy metals in moss and bulk collector were determined by Atomic Absorption Spectrophotometry (AAS) during six months of period from October 2007 to March 2008.

Heavy metal concentrations measured in three monitoring stations during six months period is given in μg/g dry weight of moss sample. Concentration of heavy metals in bulk collector is expressed in μg/cm^2 area of the funnel. These elements showed generally significant correlations between moss and bulk deposition, and uptake efficiencies (E_x) relative to that of Pb were estimated using the formula $E_x(\%) = \frac{K_x}{K_{Pb}} \times 100$ where K_x is the slope of the regression line of element x, and K_{Pb} is the slope of the regression line of Pb in mosses vs atmospheric deposition. The uptake efficiency of heavy metals were also established for each site using another formula $E_x^s(\%) = \frac{C \times A}{D}$ where $E_x^s(\%)$ is the uptake efficiency of an element x at monitoring station s, C is the moss concentration, D is the bulk deposition and *A* is a "ratio constant" estimated for each monitoring station. The uptake efficiencies of heavy metals to be: Ni 50-65 %; Cu 55-70%; Cr 45-60 %; Cd 60-70% for *Barbula* sp.1 and Ni 65-70%; Cu 80-90 %; Cr 30-50%; Cd 45-60% for *Barbula* sp.2. Therefore Ni and Cu have higher uptake efficiency towards Barbula sp.2 whereas Cr and Cd have higher uptake efficiency towards Barbula sp.1.

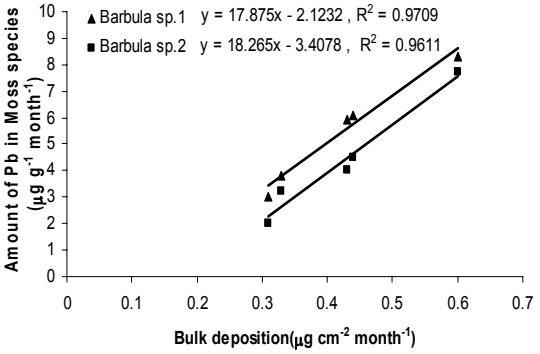

Figure 1

Plot of amount of Pb in two moss species against the bulk deposition

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279/D

Inhibitory effect of *Allium sativum* on pathogenic bacteria

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The goal of the present study was to authenticate the antibacterial activity of different solvent extracts of *Allium sativum* (garlic bulb) obtained by sequential hot extraction method using soxhlet apparatus. Garlic bulbs were dried in an oven at 40 ^{o}C and powdered. This powder was extracted using dichloromethane, ethyl acetate, ethanol, methanol and water. Solvent from each extracts was completely evaporated. Working stock was prepared in the mixture of acetone and DMSO. Antibacterial activity of these extracts was assessed by agar well diffusion method against *Staphylococcus aureus, Pseudomonas aeruginosa* and *Escherichia coli.* Nutrient agar plate containing $_{10}^{6}$ cells / ml of bacterium was prepared and allowed to set. The well of 8.0 mm of diameter was made on it and 50 mg / 100 µl of each extract was inoculated into the well. Streptomycin was used as standard and the solvent mixture of DMSO and acetone was used as control. The antibacterial activity was recorded by measuring the zone of inhibition after 24 hours of incubation at 37 ^{o}C. Each experiment was carried out in triplicates and the mean value was taken. The result demonstrated that all the test samples except water extract had the ability to inhibit all the test organisms at 50 mg / 100 µl concentration and the degree of zone of inhibition was in the range of 11.0 ± 0.26 mm to 22.0 ± 0.18 mm. *Pseudomonas aeruginosa* and *Staphylococcus aureus* were found to be highly sensitive to methanol and ethyl acetate extract respectively. Dichloromethane and ethanol extracts on *Pseudomonas aeruginosa* and *Staphylococcus aureus*, ethyl acetate extract on *Pseudomonas aeruginosa* and methanol extract on *Staphylococcus aureus* showed moderate inhibition. *E. coli* was found to be less sensitive to all the test samples except methanol extract which expressed moderate inhibition. The standard experiment demonstrated that the zone of inhibition produced on *Pseudomonas aeruginosa and Staphylococcus aureus* by streptomycin, methanol and ethyl acetate extracts was almost similar.

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280/D

Preliminary study on antibacterial activity of extracts of *Eucalyptus melliodora*

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The objective of the study was to demonstrate the antibacterial effect of ethanol, methanol and aqueous extracts of leaves of *Eucalyptus melliodora* on five pathogenic bacteria by *in vitro* bioassay. Dried leaves powder was soaked with ethanol for 72 hours and filtered with No.1 whatman filter paper. This procedure was repeated for three times and all the extracts were pooled together. The resultant residue was dried and similar extraction was done with methanol and sterile water. The solvent from each extracts was removed and antibacterial activity was tested against *Pseudomonas aeruginosa, Klebsiella* sp*, Escherichia coli, Staphylococcus aureus and Bacillus* sp by agar well diffusion method. 15 ml of autoclaved and cooled nutrient agar was incorporated with 1 ml of bacterial inoculum (10^6cells / ml). It was poured into sterile petri-dish and allowed to set. The well of 8.0 mm of diameter was made on it and 100 µl (50 mg/100 µl) of each extract was inoculated into the well. 100 µl (50 µg/ 100 µl) of streptomycin was used as standard and the mixture of DMSO and acetone was used as solvent control. Plates were incubated at suitable temperature (37^oC) for 24 hours and the diameter of zone of inhibition was measured. The results were expressed as mean value of triplicate experiments. The results revealed that the growth of all the test pathogens were suppressed by all the test samples with the zone of inhibition ranging from 12.0 mm to 29.0 mm. Ethanol, methanol and aqueous extracts showed the highest activity on *Klebsiella* sp*, Bacillus* sp and *Staphylococcus aureus* respectively and the zone of inhibition was fallen in the range of 24.0 mm to 29.0 mm. The effect of ethanol extract on *Pseudomonas aeruginosa* and *Escherichia coli* was found to be less compared to the rest of the data and the zone of inhibition was 13.0 mm and 12.0 mm, respectively. The standard experiment demonstrated that among the test bacteria *Bacillus* sp was more sensitive to streptomycin and *Escherichia coli* was less sensitive to streptomycin. In order to make clear comparison of the crude extracts with standard further bioassay should be done with the equal concentration of both. Mixture of DMSO and acetone did not affect the growth of all test bacteria.

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281/D

Soil and groundwater salinity variation in Matara district coastal belt- Sri Lanka

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The present research study identifies changes in salinity of soil and groundwater in tsunami affected and unaffected areas in Matara district. Within study area a total of 21 auger holes were drilled representing both tsunami affected and non-affected areas. The auger holes were distributed within approx 0.5 to 0.7 km distance from the coastline. Auger holes are selected to maintain perpendicular transacts to the coastal line. From each auger point, soil samples were taken from the surface layer and followed by each 50 cm depth until groundwater table is reached. Groundwater samples were also taken from auger holes and from dug wells near to auger holes. Soil physical parameters such as specific gravity, soil moisture, were determined. Soil chemical parameters such as pH, electrical conductivity (EC), total dissolved solids (TDS) and salinity were measured using pH and EC meters. The electrical conductivity (EC) of the soil in the tsunami affected area varied from 100 µS /cm to 422 µS/cm and groundwater salinity changed in between 400 to 2000 µS /cm. A direct relationship between EC and soil depth was detected. The prepared maps confirm that soil salinity, pH and EC variations were directly related with groundwater salinity. Additional salinity levels are related with morphological factors and soil physical parameters.

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282/D

A Preliminary study of the water intake pattern in rats

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The objective of this preliminary study was to evaluate the water intake pattern in rats. The experiment was carried with Charles foster strain healthy albino rats in both sexes bred and kept in the animal house attached to the Pharmacology laboratory of the Institute of Post Graduate Teaching and Research in Ayurveda, Gujarat Ayurvedic University, India. They were maintained on Navchakan Oil Mill's "Amrut" brand rat pellet feed and exposed to natural day and night cycles. The trial was performed in three replicates, each containing six rats. Simple random sampling method was applied. Rats weighing between 178 – 226 g were used. The method described by Dixit. U. D., Ravishankar. B. and Dwivedi. R.B. was adopted. (Dixit et al., 1995) Duration of the experiment was eight days. Rats were placed in separate metallic cages. Each day, 100 ml of tap water and 50 g of food were supplied to each rat in the morning at 9.00 a.m. Water was given to the animals by glass bottles attached to the cages. Water remaining in each bottle was recorded each day. Body weight was recorded before and after the experiment.

No significant difference in water intake could be observed in group 2 and 3 in comparison to group 1 rats. The mean water intake of rats in the term of the absolute value of group 1 was 43.43 ± 1.95 ml, group 2 was recorded as 45.15 ± 2.25 ml and group 3 has shown 43.06 ± 3.84 ml intake. Differences obtained in between the groups were statistically insignificant.

Intake water per unit of body weight per day was calculated by the rule of three to find the relative values. When the relative values were calculated, the mean water intake of rats in the group 1 was 20.62 ± 1.03 ml where the group 2 was 20.93 ± 1.48 ml and group 3 was 19.62 ± 2.09 ml respectively. The result was not statistically significant in unpaired 't' test.

Variations gained in both the absolute values and the relative values in this preliminary study were not statistically significant. The result obtained from this study has ensured the homogenous water intake pattern of the albino rats and the suitability of using animal models for the experimental studies.

283/D

Effect of water quality on shrimp larval catch in seagrass ecosystem of the Negambo lagoon

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Negombo Lagoon is one of the most productive shallow brackish water estuaries in Sri Lanka. Sea grass beds cover 22% of the lagoon area and are highly productive, providing habitats and nursery grounds for a variety of brackish water organisms including many economically and ecologically important species. However, the lagoon environment is under threat due to increased human activities and the discharge of wastes into the lagoon.

The shrimp population depends on the environmental parameters (both physical and chemical) of the sea grass ecosystem. This study therefore mainly intends to build the relationship between the water quality parameters (physical, chemical) and the larval catch within the sea grass beds. The seagrass beds located in the Negombo lagoon namely, Kadolkele on the northern side Aluthkuruwa, Thalahena and Sethapaduwa on the western shore and Liyanagemulla Katunayake and Kurana on the eastern shore were selected for the study.

Water samples were collected twice a week for a period of one year. Environmental parameters such as temperature, salinity, pH, turbidity, dissolved oxygen Ammonical–Nitrogen, Nitrate–N, Nirtite-N and Phosphate –P were measured. Production function for the sea grass habitats (relationship between the larval catch and other chemical and physical parameters) indicate that salinity, ammonical nitrogen, nitrate, and phosphate contribute positively to the larval catch while nitrite and phosphate contribute negatively for the larval catch. The usefulness of this model in predicting productivity of the lagoon is also discussed.

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SECTION E1

284/E1

Development of a database for invasive alien plants of Sri Lanka

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Plants that spread in natural or semi natural habitats producing significant changes in terms of community composition and ecosystem processes are categorized as invasive plants. Majority of plant invaders are aliens that have been introduced from one country to another. Thus, Invasive Alien Plants (IAP) can be found in all countries of the world. Biodiversity of Sri Lanka has also been threatened by IAP. At present information on these plants can be found in literature and other storage devices which are scattered in different institutions through out the country.

With the advancement of global information technology and fast information retrieval systems, advance computer technologies are increasingly applied to handle biological, ecological and environmental information. Today, many countries maintain their own information management systems as a part of their strategies in biodiversity conservation.The present study aims to fulfill the urgent need of an easily accessible integrated computerized information retrieval system for Invasive Plants of Sri Lanka in order to strengthen our National Action Plan on IAP Management. The objectives were to make the system available as an automated checklist of IAP and geo-referenced inventory or tracking tool to identify their distribution.

The methodology included designing of the software according to the identified requirements, coding and testing. The software design was based on the client server / two-tier architecture using SQL 2000 and Interfaces were designed using Microsoft Visual Basic.NET 2005. Coding of the software program was done using Visual Baic.NET programming language and SQL query language in order to integrate information and make the system functional. Testing was conducted to certify the proper functionality of the system. Finally, information on IAP was fed to the system. This information management system on IAP allows access for data entry and search facilities depending on the user's requirements. It also allows the administrator and registered user to update information in order to assist monitoring and successful management of IAP of Sri Lanka.

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285/E1

A study of natural radioactivity levels in beach sand collected from Uswatakeiyawa to Chilaw

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High radiation background levels have been reported in certain areas in Sri Lanka. Pulmudei in the East Coast, Beruwala in the South West Coast and Uswatakeiyawa in the West Coast are some examples. The measured background radiation levels in these areas are high due to the presence of thorium rich monazite in the beach sand. However a systematic study to measure the activity levels in beach sand in these areas has still not been carried out. Such a study is important with respect to estimating the radiation exposure to the public and also in locating previously unidentified mineral sand deposits.

The activity concentrations of ^{238}U, ^{232}Th and ^{40}K in 49 sand samples collected from a 72 km coastal stretch from Uswatakeiyawa to Chilaw have been determined using gamma ray spectrometry. The measured activity concentration of ^{238}U, ^{232}Th and ^{40}K range from 05 to 1207, 04 to 5997 and 38 to 2048 Bq kg^{-1} respectively. The detection limits for the activity concentrations of ^{238}U, ^{232}Th and ^{40}K for the geometry used were 1.70, 2.37 and 10.41 Bq. kg^{-1} respectively. A good correlation between the measured activity concentration of ^{238}U and ^{232}Th could also be seen.

The highest activity level of both ^{238}U and ^{232}Th was found in a sand sample collected from a location in Kapumgoda which is situated about 16 km north of Uswatakeiyawa. The radiation level measured at Kapumgoda was 3.2 μ Sv h^{-1} which is more than 10 times the normal background.

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286/E1

Dynamic light scattering: Instrumentation and data processing

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Dynamic Light Scattering (DLS) also known as Photon Correlation Spectroscopy is one of the most popular methods used to determine the size of small particles. The advantage of using dynamic light scattering is the possibility to analyze samples containing broad distributions of species of widely differing molecular masses (e.g. a native protein and various sizes of aggregates). With this technique it is also possible to obtain absolute measurements of several parameters of interest like molecular weight, radius of gyration, translational diffusion constant and so on. The aim of this work was to develop an experimental set up for Dynamic Light Scattering, to develop a method for data processing and to check the reliability of the developed experimental set up and data processing method.

The experimental set up is illustrated above. It consists of He-Ne laser with wavelength λ=632.5nm, a Photomultiplier tube (PMT), Fiber optics probes, a high voltage supply, cell (sample holder) and personal computer with vernier labpro software. Scattered light is collected at PMT and amplified before sending to the computer. Since we have only numerical data set to be dealt, using an appropriate software intensity auto correlation coefficient is calculated. The intensity correlation of the scattered beam is fitted to the autocorrelation function $g_2(q,\tau) = 1 + \exp(-2Dq^2\tau)$. Here, D is the diffusion coefficient, q is the scattering vector, and is the lag time. q is calculated using $q=4\pi n\sin(\theta/2)/\lambda$. Knowing D, the particle size is calculated using the Stokes–Einstein equation $D=K_BT/6\pi\eta a$. Ferric Hydroxide colloid was used to measure the accuracy of this method. 750ml of boiling distilled water was poured into 12ml of a 32% Ferric Chloride solution. The hydrolysis of Ferric Chloride occurred instantly and a sol of Ferric Hydroxide was formed. The colloid was quite stable and the particles size usually lies in the range 0.1μm to 1 μm.The results of the particle size analysis of Ferric Hydroxide colloid using the method described above agree well with the particle size given in literature for the same system.

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287/E1

Radiation effect on Poly (Ethylene Oxide) complexed with Copper Thiocyanate

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Effect of radiation on polymer materials is an area of rapidly increasing interest. Some high technology industries require polymers that exhibit a specific response upon exposure to high energy radiation.

AC impedance measurements, DC polarization test, Differential Scanning Calorimetry and Mechanical testing were performed on irradiated and unirradiated systems of $(PEO)_9CuCNS$ in order to study the effects of radiation on the polymer electrolyte. The conductivity variation of $(PEO)_9CuCNS$ polymer electrolyte has been studied over a temperature range of 25 – 100 °C and it follows the VTF (Vogel-Tamman-Filcher) type behavior. At 25 °C the conductivity of the unirradiated system is about 10^{-9} S cm^{-1} and it increases as temperature increases. However, the conductivity of irradiated systems decreases as temperature increases.

Mechanical testing of the above system revealed that the strain energy release rate G_{1c}, which is a measure of fracture toughness of the material, was increased from 3 to 81 kJ m^{-2} as the sample is irradiated over time duration of 0 to 1 month. The DSC results show an increase of glass transition temperature by ~2 °C after irradiating the polymer sample. DC polarization test revealed that the ionic transference number of irradiated polymer decreases by 3.5% while electronic transference number increases by 21%. This is attributed to the crosslinking effect and formation of free radical under irradiation. Therefore, it can be concluded that the absorption of high energy radiation by the polymer electrolyte lead to produce more crosslinking than chain damage.

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SECTION E2

288/E2

Studies on the carotenoids and the *in-vitro* bioaccessibility of β-carotene of jakfruit (*Artocarpus heterophyllus*) kernel from the major cultivations of Sri Lanka

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Ripe jakfruit (*Sinhala: waraka*) is widely available in Sri Lanka. In present study the specimens (n=6) collected from the major cultivations in the Kurunegala and Matale districts, the major jakfruit producing districts in Sri Lanka showed a marked variations from specimen to specimen not only in total carotenoid content but also in components. Carotenoids were extracted with acetone and separation was done by open column chromatography (OCC). Identification was carried out by position/order of elution in OCC, uv/visible spectrophotometry, thin layer chromatography (TLC), chemical tests; HCl vapour test, epoxide-furanoid rearrangement test, iodine catalyzed *cis-trans* isomerisation test and peak enrichment in reverse phase high performance liquid chromatography (RP-HPLC). Quantification was done by HPLC. The following carotenoids were detected from ripe jakfruit; β-carotene (traces to 50), α-carotene (traces to 20.5), lutein (2.7 to 221.5), unidentified I (traces to 33.7), unidentified II - *trans* isomer (8.3 to 45.5), unidentified II - *cis* isomer (11.1 to 59.9), unidentified III (non-detectable amount to 32.2) and unidentified IV (traces to 32.8), all in units of µg/100g of dry weight (DW). The major carotenoids common to all specimens were lutein and unidentified II. Theoretically calculated retinol equivalent (RE) and retinol activity equivalent (RAE) varied from traces to 10 and 5/100g DW, respectively. This made prediction of percentage contribution from this fruit to the recommended daily allowance (RDA) of pro-vitamin A per portion impossible. *In-vitro* bioaccessibility was performed by simulating the gut physiology. Results showed a low bioaccessible β-carotene (~ 8%) probably due to the nature of the rubbery texture of the kernel. *In-vivo* mastication and re-gurgitation prior to *in-vitro* digestion showed a higher accessibility (12-18%) of β-carotene. Crocetin; a carboxylic acid carotenoid was extracted into the methanolic KOH water extract after saponification and it was tentatively identified by its chemical characteristics and spectrum. The kernel subjected to autoclaving (121 °C). This resulted in a new carotenoid released into the water layer with marked changes in carotenoid profile. In addition, there was isomerisation in the case of β-carotene with the reduction in total carotenoid concentration indicating that canned products will be even less significant contributor to the recommended daily allowance (RDA) of vitamin A.

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A predictive model for determination of the iodine value of coconut oil by GLC analysis of the component fatty acids

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Iodine value (IV) is one of the most important and frequently used quality control parameters of coconut oil. A study was conducted to develop a predictive model for determination of iodine value (IV) of coconut oil using gas liquid chromatographic (GLC) analysis of the component fatty acids (FA). Altogether twenty-six samples were selected to represent three sub-categories of coconut oil, namely ordinary coconut oil, virgin coconut oil, and coconut paring oil. Out of the twenty-six, fifteen samples were used as a calibration set while the remaining eleven samples were kept for validation purpose. Samples were analyzed for iodine value using the AOCS method Cd Id–92 and for FA composition using GLC detection of fatty acid methyl esters (FAME). Pearson correlation analysis between IV and individual FA indicated that lauric ($C_{12:0}$), myristic ($C_{14:0}$), palmitic ($C_{16:0}$), oleic ($C_{18:1}$) and linoleic ($C_{18:2}$) were the five parameters having strong correlation with the iodine values. When these five parameters were used as independent variables in a stepwise regression procedure, a predictive model for iodine value was obtained with $C_{16:0}$ and $C_{18:1}$ as independent variables (coefficient of determination, R^2 = 0.9611 and standard error, SE=0.93). When the model was validated with an independent set of eleven samples, the coefficient of determination was 0.946 with an overall SE of 0.95. The study concludes that the iodine value measured by the GLC method was comparable to that obtained by AOCS method Cd Id– 92.

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Feldspar-fluoride interactions: Examination of interfacial processes by potentiometry

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Fluoride is an essential constituent for the production and maintenance of healthy teeth and bones. However, high levels of fluoride are found to cause health hazards in many respects, requiring effective means of fluoride removal from water. Defluoridation of fluoride-rich water by naturally occurring minerals and porous materials has been addressed for many decades. Nevertheless, microscopic picture of fluoride-substrate interactions yet needs further clarification. This research is on mechanistic investigation of feldspar - fluoride surface interaction under experimental conditions that are important from the environmental view point.

Analysis of methylene blue adsorption data indicate that the specific surface area of the feldspar used for this investigation (31.2% Al, 11.6% K and 57.2% Si) is 9.79 m^2 g^{-1}. Further, variation of surface charge density, as determined through surface titrations of an aqueous feldspar suspension in two different ionic strengths, results in the point of zero charge of feldspar between pH = 3.5 and pH = 4.0.

Fluoride adsorption changes both surface and bulk properties of feldspar. The structure of crystalline feldspar was gradually changed into amorphous phase upon reaction with fluoride according to X-ray diffraction measurements. This is a rapid process reaching an apparent plateau within a 20 min stirring time and a 2.0 h equilibration time for a 10 % (w/v) fluoride/feldspar suspension. More importantly, aluminium is found to leach out during fluoride –feldspar interaction at low pH values suggesting enhanced dissolution of feldspar, although this effect is not significant at high pH values.

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Comparison of antioxidant activity of seeds of *Dolichos biflorus* with some edible seeds

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Plant seeds play a major role in human diet all over the world. Considerable scientific evidence suggests that whole grains, as commonly consumed by humans reduce risk for chronic diseases including cancer and heart disease. Recently we commenced a chemical investigation on the seeds of *Dolichos biflorus* L. (Sinhala. Kollu). *D. biflorus* is widely used in traditional systems of medicine for rheumatism, liver diseases etc. As a part of this study we compared the antioxidant activity of the seed extracts of *D. biflorus* with some popular edible seeds: *Cicer arietinum* L.(kadala), *Lathyrus aphaca* L.(yellow pea), *Pisum sativum* L.(green pea), *Vigna unguiculata* L.(red cowpea), *Lens culinaris* L. (mysore lentil), *Zea mays* L. (badairingu), *Vigna cylindrica* L. (wanduru mae), *Phaseolus mungo* L. (undu) and *Phaseolus aureus* Roxb. (green gram) against 2,2'-diphenyl-1-picrylhydrazyl (DPPH) radical by spectrophotometric method.

Each variety of seed (25g) was extracted with methanol using sonicator at room temperature (30min. x 3). Each extract was evaporated to dryness and subjected to testing for antioxidant activity. The antioxidant activity of *D. biflorus* was observed as IC_{50}= 330 µg/ml. The highest antioxidant activity was observed for the methanol extract of seeds of *V. cylindrica* (IC_{50} = 23 µg/ml). The antioxidant activity of methanol extract of *P. mungo* (IC_{50} = 218 µg/ml) is higher than that of *D. biflorus*. Further the seed extracts of *L. aphaca* (IC_{50}= 940 µg/ml), *P. aureus* (IC_{50}= 340 µg/ml), *V. unguiculata* (IC_{50}= 475µg/ml), *Z. mays* (IC_{50}=510 µg/ml) showed lower antioxidant activities than that of *D. biflorus*. The IC_{50} of *C. arietinum* (IC_{50}>1000 µg/ml), *P. sativum*(IC_{50}> 1000 µg/ml) and *L. culinaris*(IC_{50}>1000 µg/ml) showed lowest antioxidant activity out of the tested seed extracts.

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Fluoride removal studies of water using natural materials found in Sri Lanka

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Fluoride is considered as a double edged weapon as in correct dosage it strengthens the enamel to prevent dental caries and in excess causes ugly brown stains of the teeth called dental fluorosis. High fluoride levels in the ground water are a major problem that leads to diseases related to high fluoride intake amongst people. This problem now has risen to endemic levels in Sri Lanka, especially in the North Central Province and some other dry zone areas.

In this research removal of fluoride from water was attempted using natural materials such as red soil, brick, mica, serpentine and charcoal. Initially the defluoridation capacities of these materials were analyzed by setting up a vertical column (height 55 cm, diameter 3.5 cm) of each material and then by passing a known volume of 10 mg dm^{-3} fluoride standard solutions within predetermined time intervals. By this analysis brick, red soil and mica were identified as the best fluoride removal materials. Then ground water collected from Eppawala and Polpithigama areas were analyzed using the three materials after the defluoridation process. First, each sample of natural water was passed through individual columns packed with each material. This study reveals that red soil and brick have the best fluoride removal capacity, followed by mica, serpentine and charcoal. The same procedure was repeated for another separate set of water samples, but using mixed beds packed proportionately according to the defluoridation capacities of materials. In each experiment the effluent of the ground water was analyzed for fluoride as well as nitrite, nitrate, iron and hardness (non fluoride parameters).However, no significance difference was observed for non fluoride parameters.

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Developing a simple method for identification of plastics

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Today the plastic is a hugely consumed ready-made product. The amount of consumption of plastic product reaches thousands of tons of kilograms per year. Therefore, huge amounts of solid plastic waste are observed in Sri Lanka and it has been a great environmental problem for all the living beings. In all recycling factories sorting is done by laborers manually with their experience and ability. But there are some cases where they fail to determine the plastic despite their experience. In this case they have to abandon these plastics without recycling. So the aim of this study is to develop a simple method for sorting of plastic. In this research plastics are classified using their densities and the properties of flame for different plastics were also studied.

In order to measure the densities, samples of PP, LDPE, HDPE, PVC, PC, PS, ABS and PET were dipped in the water. Samples of PP, LDPE and HDPE floated on water. Therefore they were dipped in 20 cm of isopropanol. The density of isopropanol was changed by adding water. Required water volumes for each sample were 15 cm 25 cm
40 cm respectively. The samples PVC, PC, PS, ABS and PET sank in water. Therefore they were dipped in a saturated sugar solution. Only ABS and PS were seen floating in the sugar solution. PS can be identified from ABS by using Petrol. Only PS formed a sticky gum with petrol.

In the flame test, both LDPE and HDPE gave a yellow I white flame without smoke; PP gave yellow I white flame with slight smoke; ABS gave a yellow I white flame with a heavy smoke; PVC gave yellow I white flame inside the burner, but no flame without burner only a slight smoke; PET gave yellow I white red flame and black smoke with and without the burner; PC gave neither a flame nor smoke with or without burner. Only black color pieces were observed.

The results and the observations clearly show that simple density based method and a flame based method can be used, in combination, to identify different kinds of plastics.

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Seasonal effects on cooking and eating quality traits of some improved Sri Lankan rice varieties

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The current trend in rice breeding research is directed towards improving the rice varieties with consumer acceptable grain quality traits as it reaches a wider population. Cooking and eating qualities of rice are one of the major components of rice grain quality, in many rice production areas of the world. Amylose content (AC), gelatinization temperature (GT) and gel consistency (GC) are considered to be the most important traits closely related to the cooking and eating qualities of different rice. Therefore understanding the relationship between these parameters and variation due to different environmental conditions are necessary for rice breeding programme in developing rice varieties with consumer acceptable grain quality traits.

Twelve improved Sri Lankan rice varieties [Bg, Bw and At and Basmathi 370, (introduced variety)], cultivated in *Yala* (2006) and *Maha* (2006-2007) seasons at the Regional Rice Research and Development Center (RRRDC), Bombuwala were analyzed for AC, GT and GC, for possible variation due to seasonal difference in these parameters and for correlation of GT and GC to AC.

AC of selected improved Sri Lankan rice varieties varied from 23-30 %. Statistically significant differences were observed in AC between rice varieties ($P<0.05$). However, variation in AC due to seasonal difference was insignificant ($P>0.05$). Selected Bg, Bw and At varieties had high AC (25-30 %) and Basmathi 370 had intermediate AC both in *Yala* (23.34 ± 0.26) and *Maha* (23.44 ± 0.21) seasons. GT of the selected rice varieties varied from high, high - intermediate and low and GC either hard, medium or soft. Little variation of GC was observed between the two seasons. No variation of GT was evident due to the seasonal difference. There was no correlation between AC and GT ($r = 0.21$), AC and GC ($r = 0.12$) and GT and GC ($r = -0.16$) of rice varieties tested in this study.

These findings will be useful in rice breeding when choosing selective germplasms for development of new rice varieties with different functional values including cooking and eating characteristics.

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Problems faced by G.C.E (A/L) students in chemical calculations

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Chemical calculations are used to enhance the students' ability of applying chemical concepts along with the mathematical concepts to solve numerical problems and thereby improve the students' thinking ability and logical intelligence. Chemical calculations are frequently used in assessing the students' achievement in the learning process.

However, it has been found that the performance of students in chemical calculations at G.C.E. (A/L) examination is generally poor. This study was, thus, designed to investigate the problems faced by the students in chemical calculations. In this study two purpose designed instruments each on chemical calculations and mathematical calculations were constructed and validated. These instruments were administered to a sample of 140 Grade 13 students selected from two provinces. The sample was limited by the availability of the students at the time of the study and selected to minimize confounding factors. Only 120 of these students (48% physical science and 52% biological science) who completed all instruments were selected for the data analysis. National schools from two provinces were selected due to their readily accessibility and the willingness of school authorities to allow the students participate in this study. Students, school teachers and national evaluators of G.C.E. (A/L) Examination were also interviewed to get their opinion on chemical calculations.

Descriptive statistics, Spearman rank correlation and two sample t-test (confidence interval 95%) have been used to analyse the student performance. Students' average mark for mathematics paper was 55.26% where as the average mark for the chemical calculation paper was 42.5%. Many students had made mistakes in addition (43.3%), subtraction (27.5%), multiplication (70.8%), division (83.3%), indices (47.5%), and logarithms (56.7%). Students have also made mistakes relating to the chemical concepts and principles such as atoms (35.7%), molecules (21.4%), molecular formula (17.9%), moles (8.9%), concentration (35.7%), molality (60.7%), mole-fraction (7.1%), stoichiometry (42.9%), Hess's law (32.1%), Born-Haber cycle (22.6%), gas laws (57.1%), Raoult's law (10.7%), pH, K_a, K_b, K_{sp} (75.0%), electrode equilibrium (25.0%), inorganic reactions (51.2%) and chemical kinetics (14.3%). More than 20% of students didn't complete calculations. The Spearman rank correlation coefficient of 0.524 showed that a positive correlation exists between the mathematical achievement and the chemical calculations achievement of the students. Students (25%) have expressed that applying chemical concepts along with mathematics is the major problem in doing chemical calculations. Teachers as well as national evaluators expressed the opinion that students made frequent mistakes in simplifying sums and linking the knowledge of chemistry with appropriate mathematical concepts.

The findings of this study suggest that existing chemistry classroom practices need to be re-evaluated with a view to using more appropriate teaching/learning methodologies and strategies to improve students' logical intelligence.

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Study of interactions of a novel class of vesicular monoamine transporter inhibitors with bacterial cells to investigate the uptake mechanism

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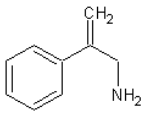
It has been shown that many illicit drugs as well as some antidepressants and psychiatric drugs are good substrates for nerve cell monoamine transporter proteins in brain.

Recent studies show that 3-amino-2-phenylpropene (APP) (Fig.1(a)) and its derivatives are potent inhibitors for bovine vesicular monoamine transporter(s) and cytotoxic towards the SH-SY5Y nerve cells *in vitro*.

(a) (b)



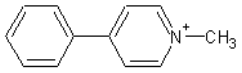


Fig 1: (a) 3-Amino-2-phenylpropene (APP) (b)1-Methyl-4-phenylpyridinium ion (MPP^+)

Recent experiments demonstrate that combination of APP with MPP^+ (Fig.1(b)) would produce inhibitors such as 4-phenyl-1-(2-phenyl-allyl)pyridinium bromide (APP-MPP^+, conjugated compound) (Fig. 2), which act as a potent inhibitor for bovine chromaffin granule vesicular monoamine transporter. It is believed that these compounds interact with transporter protein and change its conformation which allows compounds to interact with it. The mode of interaction and the mechanism of binding of these compounds to monoamine transporters are still not well understood. In this work *Escherichia coli, Bacillus, Staphylococcus aureus, Klebsiella* bacterial cells have been used as models to study interactions of APP-MPP^+ conjugate compounds with cells and to determine their cytotoxic effect. This investigation is focused on studying the interactions of APP-MPP^+ with microorganisms and their uptake mechanism.

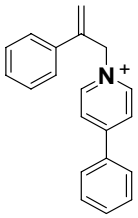


Fig 2: APP–MPP^+ Conjugated inhibitor, 4-phenyl-1-(2-phenyl-allyl)pyridinium bromide (APP-MPP^+)

These studies further indicate that this novel compound significantly inhibits the growth of *Escherichia coli* and it has minor effects on other bacterial cells too.

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Quality of water consumed by chronic kidney patients in North Central province of Sri Lanka

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The population of the North Central Province (NCP) is about 1.2 million and geographically it is the largest province in the country. Majority of rural population living in the area are farmers and they largely depend on the ground and surface water sources for their day to day life. At present, over 5,000 patients in NCP are on treatment for Chronic Kidney Diseases (CKD) and the etiology for this disease still remains a mystery.

'Heavy metals' are chemical elements with a specific gravity that is at least 5 times the specific gravity of water. Living organisms require trace amounts of some essential metals but excessive levels can be detrimental to the organisms. Toxic metals have no known vital or beneficial effect on organisms, and their accumulation over a period of time in human bodies can cause serious illnesses like CKD. In addition, some potential triggering factors for CKD are PO_4^{3-}, SO_4^{2-}, F^- and Mg.

According to the surveys done in Anuradhapura and Madawachchiya renal clinics, two affected areas Wewalkatiya and Nikiniyawa villages in Anuradhapura district and a reference village, Kohalwila, where no CKD patients were found were selected for water quality testing. The water distribution reservoir in Kekirawa affected area, Malawa tank, was selected as the surface water source. Sampling was done from ground water wells in patient houses, Malawa tank and reference village in dry and wet seasons by collecting 3 samples at a point totally 20 points from a site. The concentrations of Fe, Al, Zn, Cu, Cd, Cr, Ca, Mg, Ni, Mn and Pb were determined by Atomic Absorption Spectrophotometry (AAS). The concentrations of total phosphorous, available phosphate, available sulphate and fluoride were determined by standard methods, pH was measured and total soluble ions were determined by conductivity measurements.

The mean concentration of the analyzed metals in water samples from Anuradhapura district show very higher values than the reference site. Dissolved metal concentrations in analyzed water samples in affected areas do not exceed the Maximum Contaminated Levels set by the WHO for drinking water except for Al, Mn and Ni. The triggering factors of CKD, Mg, P, SO_4^{2-}, PO_4^{3-} and F^- accumulated in water in the affected area are very high compared to the reference site. Although these concentrations reduce in wet season, these values are always higher than the values obtained for the reference site.

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