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Editors Note

The Jaffna Science Association (JSA) has been functioning with the aim of disseminating scientific knowledge to the masses in the region. Since its foundation in 1991 by late Professor Alagiah Thurairajah, it has been carrying out various knowledge-sharing activities to inform the latest advancements in Science to the people in this region. Many of the activities carried out by the JSA are targeted at school students and university undergraduate students, and it encourages them to actively participate in many different knowledge-sharing activities such as essay competitions, oratorical competitions, quizzes and, science exhibition and display their talents. JSA also conducts popular lectures, journal clubs, seminars and workshops to different audience groups to well inform them with the latest technical advancements in Science.

The annual sessions of the JSA are conducted with the objective of disseminating latest scientific research results and advancements in science to the people in the region and to encourage young scientific researchers to actively participate in innovative research.

A specific topic, which addresses a most crucial issue to the region or to the people in the region, is selected as the theme of the year and more focused activities are carried out by the JSA to identify the causes of the issues and to propose appropriate scientific solutions to these issues. The Nineteenth Annual Sessions of the JSA are conducted under the guidance of the nineteenth executive committee of the JSA with the theme of "Climate Change".

Many of the research abstracts presented in this volume are focusing on this theme, even though some of them do not directly address these issues. Resource persons who have contributed to this volume are experts in their area of research and it is our hope that these articles would be beneficial to the society and the region.

Chief Editor,
Jaffna Science Association.
April 2012.

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April 2011 – March 2012

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A1.

Identification of Chaos in Bonhoeffer-Van Der Pol Oscillator

Muraleetharan, B. and Selvarajan, S.

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In the modern era, there has been great interest to study the chaotic behavior of the dynamical system. Particularly, several mathematical and computational studies have been carried out to investigate and control the chaos in dynamical system. Here, we study the chaotic behavior of Bonhoeffer – Van Der Pol (BVP) Oscillator that is modeled by the coupled differential equation of the form:

$$\left.\begin{aligned} \frac{dx}{dt} &= x - \frac{x^3}{3} - y + A_0 + A_1 \cos \omega t \\ \frac{dy}{dt} &= c(x + a - by) \end{aligned}\right\} \quad \text{(BVP)}$$

where: A_0 is DC-bias; $A_1 \cos \omega t$ is periodic membrane AC current; ω is the frequency; a, b and c are membrane radius, specific resistivity of the fluid and temperature factor respectively; t is time variable; x is electrical potential across the cell membrane; y is the recovery variable.

The objective of this study is to present, how the chaos could be identified in the BVP oscillator. We begin with, analysing the linear stability of this system of differential equations (BVP) by varying the values of parameters A_0 and A_1. Range based on A_0 and A_1, control value is introduced to avoid the noise appears in the BVP oscillator.

BVP as a dynamical system is known for exhibiting a rich variety of non-linear behaviors as different parameters are varied. In this study, mathematical and computational methods were employed to investigate the dynamical behavior of BVP as non-linear dynamical system. The system's response has been described by the numerical solutions and the phase portrait via the Poincare maps. Obtained numerical solutions and phase portrait were used to identify chaotic behavior in BVP oscillator. In this paper parameter ranges that correspond to the identified chaotic behaviors are reported.

Keywords: Chaos, Poincare maps, Eigen values.

A2.

A Study on Relationship Among the Identified Factors in Breast Cancer Patients

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Breast cancer is the commonest cancer among females. The more estrogen a woman is exposed to during her lifetime, the greater the risk for breast cancer occurrence. The main objective of this study was to investigate the relationship between age of patient and obesity, number of children, mother's age at first birth and menopausal age. Other objective was to find the best model to the cell frequency of the three-way contingency table. Samples were randomly chosen from the Cancer Unit, Teaching Hospital, Jaffna. The odds ratios and corresponding 95% confidence intervals were estimated to investigate the relationships and the best log-linear model was selected through forward selection method. Based on the results, it was concluded that the age of patient was not associated with the observed obesity. Overall linear trend for the association between obesity and age of patient was no longer found to be statistically significant. Further, it was found when the mother's menopausal age is 50 or above and who had first baby above 29 years of age, had significantly increased breast cancer risk when they had 2 or less than 2 children compared to having more than 2 children. Similar phenomenon was observed when ignoring the menopausal age. According to the log-linear models, there was no evidence that linear-by linear association between menopausal age and number of children; mother's age at first birth and number of children and menopausal age and mother's age at first birth exist. Finally it was selected menopausal age and the number of children are conditional independent, given mother's age at first birth as the best model.

Keywords: Odds Ratio, Confidence Interval, Log-linear Model, Likelihood Ratio Test.

A3.

Statistical Modeling for Distribution of Body Surface Area Among Cancer Patients

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[2]*Department of Mathematics and Statistics, University of Jaffna,*

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In several fields especially physiology and medicine, the body surface area (BSA)of a human body is measured or calculated for many various clinical purposes. The BSA calculation, which decides quantity of the drug, plays very important and massive role in successful chemotherapy programme. Several methods are being practiced for the estimation of the BSA. Sri Lankan oncologists use Dubois and Dubois (D & D) formula to estimate BSA in chemotherapy. D & D formula is BSA = $0.007184 \times \text{Weight}^{0.425} \times \text{Height}^{0.725}$. The body behavioral patterns and customs of the Sri Lankans and genetics of Sri Lankans are sharply different from those in the west and consequently body shape and body mass index changes dramatically. As the parameter values of the above formula were obtained using samples from western country, a reasonable doubt is that whether the estimated parameters could be used for Sri Lankan population? Thus re-estimation of parameters of the D & D and best fitting model for distribution of the BSA using Sri Lankan samples are our main objectives. We have collected sample of 51individuals (25 male and 26 female) from Teaching Hospital of Jaffna. Using the above sample we have re- estimated the parameters of D & D as BSA $(m^2) = 0.00900477 \times \text{Weight}^{0.362\ (Kg)} \times \text{Height}^{0.767(cm)}$.More over we proposed couple of Statistical models for the distribution of BSA among cancer patients. Among those models the best model for male is BSA = $0.982 + 0.0182 \times$ Weight and the best model for female, BSA = $1.13 + 0.0116 \times$ Weight where weight should be measured in kg. Calculated BSA using D & D formula is lower than the observed BSA, it may be agreed that the chemotherapy given to the patient will be less and consequently they may get early recurrence. The estimated points by our proposed models are better than D & D and they are very close to observed BSA. We hope that our formulae would be applied for Sri Lankan cancer patients.

Keywords: Linear Models, Parameter Estimation, Body Surface Area, Chemotherapy, Dubois and Dubois formula.

Identifying the Relationship in Student Performance Between Grade Five Scholarship and G.C.E (A/L) Examinations

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The grade five scholarship examination is a highly competitive Sri Lankan examination conducted by the Department of Examinations of the Ministry of Education. The success at the grade five scholarship is not the pole criterion to pay the way for better employment or higher studies opportunities. The General Certificate of Education Advanced level qualification obtained by school students in grade thirteen is mainly considered an important factor for university entrance or general career prospects. In this regard, the following correlation/ relationship studies have been undertaken and reported in this paper.

- Scholarship performance Vs G.C.E (A/L) performance
- Scholarship performance Vs General knowledge test held with G.C.E(A/L)

In addition to this a survey was conducted examining the factors influencing student performance in the G.C.E (A/L) examination. Investigations were conducted to aid statistical modeling of the relationship in student performance between the grade five scholarship and G.C.E(A/L) examination using the data collected from Schools, Technical College and University students by questionnaire. Based on the results obtained through categorical analysis, it is primarily identified that,

I. scholarship exam qualification do not have favor in the advanced level examination qualification.

II. for every twenty five marks increase in scholarship exam, the probability of getting university entrance is decreased on average by 0.06.

III. A/L General knowledge exam mark depends on grade five scholarship exam mark and the A/L stream: Science (Math/ Bio)/ Commerce/ Arts. For same scholarship mark, it is also observed that the general knowledge mark is seven higher for commerce students and thirteen higher for science students than arts students.

IV. students' interest and selection of subject for the A/L on their own interest (instead of external compulsion) are the important factors to attain good result in the Advance level Examination.

Keywords: Proportions, Relative Risk, Odds Ratio, Logistic Regression, Log-likelihood Ratio, Multiple Regression.

A5.

Schemes with Improving Convergence Rates for the two stage Gauss Method

Annanthakrishna, A., and Vigneswaran, R.
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Various iterative schemes have been proposed to solve the non-linear equations arising in the implementation of implicit Runge-Kutta methods. The rate of convergence of the more general iteration scheme is examined when applied to the scalar test differential equation $x' = qx$ and the convergence rate depends on the spectral radius of the iteration matrix. Two new schemes with improving rates of convergence are obtained for the two stage Gauss method by minimizing the maximum of a lower bound of spectral radius of the iteration matrix over regions of the complex z-plane, where $z = hq$ and h is the fixed step-size.

Keywords: Implementation, Implicit Runge-Kutta methods, Rate of convergence, Stiff systems.

A6.

Determination of haemolytic activity of Buthus doriae (Pocock, 1899) (Buthidae) and Palamnaeus wronghtoni (Pocock, 1899) (Scorpionidae) collected from Jaffna Peninsula

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Though scorpion sting is reported as one of the major public health problems in some other countries, it has been not reported as a major health issue in Sri Lanka. But during the recent past years it is becoming as one of the major public health problems in Jaffna Peninsula. Since 1998, several scorpion sting cases were reported in Jaffna teaching hospital with severe envenomation symptoms. Some of the above patients were died due to the failure of treatment especially the children in Vadamaradchi region.

Scorpion specimens for this study were collected from the Vadamaradchi area since September 2010. The suspected deadly scorpion species collected from the Vadamaradchi area was identified as *Buthus doriae* and the common harmless species was identified as *Palamnaeus wronghtoni* based on the keys available (The fauna of British India). Venom was freshly milked separately from the above two species by giving electric shock. Collected venom was stored at -20°C until further use. Three blood agar gel plates were prepared and four wells (4 mm diameter) were created in each plate by punching under sterile conditions. For each plate two of the above wells were treated with 10µl of venom of one scorpion species and the other two wells were treated with equal volume of (10µl) sterile saline water (0.1M) as a control to exclude the other factors causing haemolysis. Similar set up of experiment was applied with other scorpion's venom in order to compare the haemolysis effect. Plates were incubated at 37°C for overnight and the haemolytic activity was determined by measuring the haemolytic zones produced around each well. The whole set of experiment was repeated at least six times for both species and the results were statistically analyzed using paired t-test.

Results have shown that the venom of two studied scorpion species have the hemolytic potential under laboratory conditions. Among them the hemolytic activity of *B.doriae* (8.85±0.2193mm) was significantly higher ($P<0.05$, t-test) when compared with *P.wronghtoni* (6.03±0.8778mm).

Keywords: Palamnaeus wronghtoni , Buthus doriae Venom, Hemolytic activity, Scorpionism

A7.

Studies on Shark Diversity in Point Pedro Coastal Sea, Northern Part of Sri Lanka.

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Sharks are one of the economically important commercial food fish in Sri Lanka. Sharks belong to a phylogenetic group named Selachii. There are no records on diversity of sharks in the coastal seawaters of Point Pedro Sea. The present study was carried out to identify all shark species and to provide a systematic list of shark, from January to September 2010, at Supparmadam and Katkovalam landing centers. Samples were collected from landing catches obtained by gill net (mesh size of 7'') and fishing lines. Five species of sharks representing 3 families were recorded. Of the identified families, Carcharhinidae is the dominant family representing 3 species such as C. macloti, Rhizoprionodon acutus, Prionace glauga followed by Squalidae with 1 species such as S. spallanzani and Hemiscylliidae including 1 species such as C. griseum. Out of the 6624 fish collected Carcharhinus macloti recorded highest percentage of occurrence and it was the only species observed in both landing centres during the period of investigation. The distinguishing morphological characters used for the above identification and the recorded occurrence of sharks in Point Pedro coastal sea landings are discussed in detail in the present paper.

Keywords: Species diversity, shark fish, systematic list, Point Pedro

A8.

Variation in the Fragment Length in the D3 Region of the 28SrDNA among the two Oriental Sandfly (Diptera: Psychodidae) genera *Phlebotomus* and *Sergentomyia*

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Sandflies are the vectors of Leishmaniasis, which is an emerging threat in Sri Lanka. The vector of the disease is yet to be confirmed from the country. The suspected vector is *Phlebotomus argentipes* sensulato, which is the vector for visceral leishmaniasis in South India. But recent reports suggested the involvement of a mixture of species in the disease transmission. The two major oriental sandfly genera are *Phlebotomus* and *Sergentomyia*. Distinguishing these genera based on the morphology is difficult as there is no definite character state found among them. In the current study, we have tried to differentiate both the genera using a simple PCR based method. The D3 region of the genomic 28SrDNA was amplified from three species from *Phlebotomus* (*Ph. (Euphlebotomus) argentipes* sensu stricto, *Ph. (Eup.)glaucus* and *Ph. (Eup.) annandalei*) and two species from *Sergentomyia* (*Se. (Sergentomyia) punjabiensis* and *Se.(Sergentomyia)* sp.). Variation in band size and position (*Sergentomyia* has a long fragment compared to that of the *Phlebotomus*)were observed in the 2% agarose gel electrophoresis. Further digestion of the PCR amplified product will be useful in screening large number of flies in a vector control programme.

Keywords: Sandfly, Sergentomyia, Phlebotomus, D3, band size

A9.

Validation of the PCR-RFLP assay using Hae III Restriction Enzyme to Distinguish Members of the Phlebotomus Argentipescomplex in Sri Lanka.

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Sandflies belong to the genus *Phlebotomus* are generally considered as vectors for leishmaniasis, a disease caused by *Leishmania* species. *Phlebotomus (Euphlebotomus) argentipes* Annandale and Brunette (Diptera: Psychodidae: Phlebotominae) is suspected as the potential vector for cutaneous leishmaniasis in Sri Lanka. *Ph. (Eup.) argentipes* sensu lato exists as a species complex. The taxonomy of the Argentipes complex was reassessed recently and reported to have three species viz. *Phlebotomus (Eup.) glaucus* Mitra and Roy, *Ph. (Eup.) argentipes* sensu stricto Annandale and Brunette sensu stricto and *Ph.(Eup.) annandalei* Sinton. A PCR-RFLP assay using Hae III restriction enzyme reported to be useful in recognizing Sri Lankan Ph argentipes s.l. populations from other species. An attempt was made to validate this assay to distinguish these three species. A portion of the 18S rDNA was amplified using reported primers adapting the previously reported DNA extraction method and PCR amplification conditions with slight modification. The amplified DNA was then subjected to HaeIII (Promega) digestion with manufacturer's buffer, bovine serum albumin and nuclease free water at 60-65° C for 2 hours. The digested products were then run in 1.5% agarose gel. The reported common pattern with two bands (one at 130 bp and the other at approximately 240bp) were produced for all three sibling species. Although the assay can still be used to separate *Ph argentipes* s.l. from other Phlebotomine species in Sri Lanka, the assay cannot be used to separate the members of the Argentipes Complex.

Keywords: PCR- RFLP, restriction digestion, HaeIII, Argentipes Complex, sibling species

A10.

Influence of Selected Chemical Constituents on the Lethal Effect of BACTIVEC® on Dengue Vector *Aedes aegypti*

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BACTIVEC® is a commercial larvicide containing toxin of *Bacillus thuringiensis* (*Bt*), soil dwelling bacterium, commonly used as a biological pesticide. This larvicide has been tested and sprayed for dengue vector control programmes. Spores and crystalline insecticidal proteins produced by *Bt* have been used to control insect pests since 1920. The objective of this study was to determine the influence of selected chemical constituents on the lethal effect of BACTIVEC® on dengue vector *Aedes aegypti*. *Ae. aegypti* 2nd instar larvae were reared in different concentrations of solutions containing PO_4^{3-} and NO_3^-. Three ppm was found to be the concentration of BACTIVEC® that caused 100% mortality among *Ae. aegypti* larvae in tap water. Experiments were carried out using different concentrations of PO_4^{3-} and NO_3^- with and without fixed concentration (3 ppm) of BACTIVEC®. 10 larvae (2nd instar) of *Ae.aegypti* were reared in 100 ml water in 150 ml capacity plastic cups. Solutions having concentrations ranging from 500 to 3000 ppm of PO_4^{3-}-P and 250 to 2500 ppm NO_3^--N were tested. Three replicates were run in parallel for every concentration of PO_4^{3-} and NO_3^-. Larval mortality was recorded after 24, 48 and 72 h. The results revealed that 3000 ppm PO_4^{3-}-P solution and 2500 ppm NO_3^--N solution were able to cause 100% mortality on *Ae. aegypti* larvae in the absence of BACTIVEC®. Two-way ANOVA was performed to determine the effect of NO_3^- and PO_4^{3-} on the lethality of BACTIVEC®. The results showed a significant effect by NO_3^- ($p= 0.03$) and insignificant effect by PO_4^{3-} ($p= 0.49$) on the lethality of BACTIVEC®. The present study demonstrates that quality of water might influence the larvicidal property of BACTIVEC® and this should be taken into consideration when this larvicide is sprayed in different water bodies to control dengue vector in Sri Lanka.

Keywords: Aedes aegypti, BACTIVEC®, dengue, larvicide, vector control

A11.

Some Bionomics of Members of the *Anopheles subpictus* Complex in Sri Lanka

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Anopheles subpictus sensu lato is a potential vector of malaria in Sri Lanka. This taxon exists as a species complex comprising four sibling species namely A-D showing different bio-ecological traits in the Indian subcontinent and a limited study revealed the presence of all four sibling species in the North-central province of the country. The present study investigated the prevalence and insecticide resistance status of the sibling species of the Subpictus Complex from four districts located in the dry zone of Sri Lanka. Adult mosquito samples were collected during July 2008 and June 2010 in different locations in the districts of Puttalam, Ampara, Batticaloa and Trincomalee. Different collection techniques such as cattle baited hut (CBHC), cattle baited net (CBNC), human landing catches (HLC), hand collection (HC), window trap(WT) and pyrathroid sprayed collection(PSC) were used. Isofemal progenies were obtained from collected blood fed *An. subpictus* females and their sibling species status was confirmed based on diagnostic number of egg ridges. Sibling species status of dead adult *An. subpictus* were identified based on reported diagnostic morphological characters. Insecticide susceptibility tests were carried out using the standard WHO protocol. Two to three day old adult mosquitoes of each sibling species were exposed to 5% malathion, 4% DDT, 0.05% deltamethrin, 0.05% λ-cyhalothrin. A total of 9834 (4071 from CBNC, 1957 from CBHC,71 from HLC, 656 from H C, 801 from W T and 2028 from PSC) adults were collected. All four sibling species were indentified in all four districts. Species C (63.7%) was predominant in inland areas followed by species B (20.8%), species D (15%) and species A (0.5%). Whereas species B (49%) was predominant in coastal areas and followed by species C (41%) and species D (10%). The sibling species of A were collected only in indoor and cattle baited hut collections. Species B, C and D of all four districts were highly resistant to DDT. Species C and D were highly resistant to malathion. However species B collected from all four districts were highly susceptible to malathion. All sibling species were highly susceptible to pyrethroids (deltamethrin and λ-cyhalothrin). The study demonstrates that the presence of all four sibling species is wide spread and they express differential feeding preference and susceptibility to insecticides that should be taken into consideration for using insecticides to control malaria vectors.

Keywords: Anopheles subpictus, sibling species, bionomics, insecticide resistance

A12.

Assessment of Bull Semen Quality during Storage Conditions at the AI Centre, Thirunelvely (Northern Province)

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Artificial insemination (AI) has been accepted as the primary breeding programme of cattle in Sri Lanka. According to Abeygunawardena *et al* (2001), the highest numbers of successful AIs were done in Central Province (CP) and the lowest were recorded in Eastern Province and Northern Province. The coverage in terms of the proportion of breedable cattle was highest in CP followed by Western Province (WP) where highest calving rate was recorded. So far there are no studies performed related to semen quality of bull, which belongs to AI centre at Thirunelvely. The semen of Jersey was collected by means of artificial vagina and stored at 4-8°C. General examination was evaluated on Chilled semen to assess volume, colour and pH. Microscopic examination was performed to assess the progressive individual motility, sperm morphology and sperm concentration under a light microscope. Fresh semen (0 h) to 72 h of stored semen were compared by progressive individual motility, sperm count and sperm velocity. Sperm count was evaluated by using hemocytometer (improved NEUBAUER). Viability was determined by using 1% eosin as only dead sperms uptake the stain and appeared as red in colour. Repeated measures analysis of variance (ANOVA) with Dunnett's post test was performed using prism 5.04 to compare the viability of semen from 0 h to 72 h during storage. Viability decreased significantly (ANOVA $P<0.05$) in a time dependent manner from 0 h to 72 h during storage and percentage of viable sperms and sperm velocity gradually decreased when compared to control 0 h (93.17± 1.322%, 23.33 ± 1.419μm/s), with 24 h (85.50 ± 0.8892 %, 13.33± 0.7698μm/s), 48 h (79.22± 0.7731, 1.778 ± 0.2383μm/s) and 72 h (69.17 ± 1.360 %, 0μm/s).The drastic decline in viability could be attributed to gradual depletion of nutrients, bacterial contamination and adverse effects of sodium ions. Our studies have shown that the sperm viability is more than 70 % for 0 h, 24 h and 48 h of stored semen. Therefore the reason for weakness of AI performance in NP could be the failure of wise use of estrus detection methods or else.

Keywords: Viability, bull semen, hemocytometer, sperm velocity, sperm count

A13.

Growth Pattern and Length-weight Relationship Parameters for *Scomberoides commersonianus* (Lacepede, 1801) (Family: Carangidae) from the Point Pedro Waters, Sri Lanka.

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The present investigation was carried out to understand the growth pattern and length-weight relationships of *Scomberoides commersonianus* (Lacepede, 1801)from the Point Pedro waters. The Talang queenfish, *Scomberoides commersonianus*is the largest of four species of "queenfish" found throughout the Indo-West Pacific ocean. Monthly random samples were collected from November 2010 to September 2011 from Point Pedro landing centre, Northern part of Sri Lanka. A total of 103 specimens ranging from 16.7 – 106 cm standard length and 92.62 – 13500 g body weight were examined. Covariance analysis for length weight relationships of male and female. *commersonianus* revealed that there was no significant variation between male and female fishes ($P>0.05$). The estimates of the regression parameters for male, female and pooled data of *S. commersonianus* obtained by regression analysis are $TW= 0.0370 * SL^{2.730}$ ($N = 58$, $r^2 = 0.964$), $TW = 0.040 * SL^{2.700}$ ($N = 45$, $r^2 = 0.981$) and $TW= 0.038 * SL^{2.717}$ ($N = 103$, $r^2 = 0.971$) respectively. The results of two-sample t-test show the regression exponent value (b) of 2.73, 2.70 and 2.717 was obtained for males, females and pooled respectively. The 'b' values were significantly different from 3 ($P<0.05$) indicating negative allometric growth in all instances. This preliminary information would be useful for fishery managers to convert length measurements in to total biomass in the field.

Keywords: Length-weight relationship, Scomberoides commersonianus, Regression analysis, Covariance analysis, Allometric growth

A14.

A Study on Spoilage of Commonly used Spices Garlic and Onion BY *Bacillus*sp

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*Bacillus*sp contamination has been studied in samples of garlic and onion, the spices which are used commonly in culinary practices. *Bacillus*sp has been found to be the most prevalent pathogenic bacteria in fruits, cereals and vegetables and spices. This bacterium has been found to be responsible for several food borne outbreaks in restaurants where fast foods are prepared very often. Therefore the objective is to study the spoilage of garlic and onion by *Bacillus*sp, which are used very often in cooking. Three samples each were taken from garlic and onion and used for this study. From the biochemical tests such as gram staining, spore staining, motility test, catalase test, growth of bacteria in nutrient broth with 7% NaCl, citrate test, Voges Proskauer test, starch hydrolysis, nitrate reduction, Indole test, casein hydrolysis, acid production from sugars the *Bacillus* was identified at species level. Confirmatory test mainly the beta haemolysis test was carried out to confirm the identified species. Standard keys designed by R.E.Buchanan and N.E.Gibbons (1975)(Bergey's manual) was used for the identification. The results showed the presence of *Bacilluscereus*, *Bacilluslicheniformis*, *Bacilluscirculans*, *Bacillus firmus*, *Bacillus polymyxa* in garlic and *Bacillus cereus* and *Bacillus sphaericus* in onion. As garlic and onion are frequently used spices in most of the cooking practices the contamination of *Bacillus*sp should be prevented by proper storage methods.

Keywords-Bacillus sp, garlic, onion, spices

A15.

Comparison of two Methods for Determining Lipid Content of *Scomberoides commersonianus* from the Jaffna Lagoon

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The present investigation was carried out to compare the extraction efficiency of Soxhlet and Bligh and Dyer methods while extracting the total lipid content from the *Scomberoides commersonianus* fish flesh. The total lipid content was evaluated in different size fish in order to understand the efficiency between the two methods. Regular field visits were made to the Kurunagr, Point pedro and Delft landing centers from November 2010 to July 2011. The total length of fishes was categorized in to 15 cm class intervals and twelve fish samples from each length class were collected and brought to the laboratory. A portion of muscle was subjected to total lipid analysis by two methods. Total lipid was extracted by soxhlet method using hexane and by bligh and dyer method using chloroform: methanol mixture (2:1 V/V). Percentage of total lipid in dry weight was computed for each sample. The results show that Soxhlet method gave lower lipid content than the other method. Among the eighty *S. commersonianus analyzed* mean total lipid content of flesh varied between 4.2 and 32.14% for 35.1 – 50 and 110.1 – 125 cm standard length class interval while extracting by Bligh and Dyer method. But total lipid content varied between 2.88 and 25.67% for 35.1 – 50 and 110.1 – 125 cm standard length class interval, while extracting by Soxhlet method. Estimated total lipid was higher for individuals within the standard length class interval 110.1 – 125 cm. It can be concluded that the Bligh and Dyer method is the suitable method for the quantification of exact total lipid content of marine samples.

Keywords: Total lipid, Scomberoides commersonianus, Soxhlet, Jaffna peninsula

A16.

Comparison of the Efficacy of Bioagents and Botanicals with Commercial Fungicides in the Management of *Alternaria* blight.

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Allium cepa L. [family Alliaceae] is an evergreen bulb growing to 0.6m. Flowers, leaves, root and seeds are edible parts of onion. Purple blotch (blight) is the severe disease on onion. It can reduce yield up to 20% or more. Objective of this study is to identify the pathogen and to find potential alternative control method to chemical control. The pathogen was identified as *Alternaria porri* and pathogenicity of fungus has been established by artificial inoculation. In the investigation, antagonistic effect of fungal Bioagents (*T. harzianum, T. viride)*, a bacterium (*Pseudomonas)*, botanical (*Lantana camera)* and fungicides (chlorothalonil, mancozeb) were assessed *in vitro* against the pathogen *A. porri* by poisoned food technique and in field condition.

In *in vitro* evaluation, average diameters of *A. porri* in different treatments and in field evaluation, percentage inhibition of disease over control was calculated. Each experiment was carried out in triplicate and the results were subjected to one-way ANOVA followed by Least Significant Difference test. Maximum inhibition in colony growth of *A. porri in vitro* was observed with mancozeb where no growth was observed (0.00±0.00) followed by fungal bioagents *T. viride*(1.12±0.03) and *T. harzianum* (1.12±0.08) which were on par with each other. Further chlorothalonil (1.58±0.08), *Pseudomonas* (2.29±0.01), *L. camera* (3.20±0.05) and control without any treatment (7.60±0.02) showed different diameters of mycelial growth on PDA.

All bioagents, botanical and fungicides showed inhibition on the growth of *A. porri* and their potential on the control of disease differed significantly ($p<0.05$). Complete inhibition obtained with mancozeb interms of percentage of disease inhibition (100±0.00) followed by T. *harzianum* (81.81±0.00) and *T. viride* (78.78±5.25). Although *Pseudomonas* (54.54±0.00) and *L. camera* (21.21±5.25) showed lesser inhibitory effect than chlorothalonil, however their effect on pathogen is significant ($p<0.05$).

This study suggests the potential use of fungal and bacterial antagonist and botanical in the control of blight pathogen in onion field. Further study is warranted to isolate, mass propagate and store these bioagents in order to use them in fields. Use of botanicals in the preparation of organic amendments is also suggested for the use in onion fields. This method of control reduces the environmental pollution and health hazard by chemical besides causing fewer disturbances to environment.

Keywords: Allium cepa L., T. harzianum, T.viride, Blight, Inhibitory effect.

A17.

Studies on the Population Dynamics of *Anopheles* Mosquitoes in Suthumalai and Uduvil Localities in Jaffna District

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Anopheles culicifacies is the major vector of malaria in Sri Lanka. The other species reported to be transmitting malaria are *An. subpictus, An. annularis, An. tessellatus* and *An. vagus.* Although reported malaria cases in Jaffna have been very low in the recent past, Jaffna district experienced high malaria incidences in the 1990s. Anopheline mosquitoes consist of a large number of species each of which differs from another in prevalence, resting and feeding behavior. Therefore it is crucial to establish the bionomics of potential vectors to facilitate designing appropriate vector control measures. *Anopheles* larvae were collected from Chinnakulam a freshwater body in Uduvil locality from January 2011 to August 2011. Survey was performed using dippers of 350 ml capacity, three times per month during the study period. Blood fed *Anopheles* were collected from Suthumalai locality from November 2010 to June 2011 using cattle-baited net collection technique. Collections were done in between 05.00 -06.30 h, three times per month. A total of 3675 larvae were collected during the study period. *An annularis s.l.* was the predominant species (47.08%) followed by *An. culicifacies s.l.* (37.31%)and *An. pallidus* (15.60%). A total of 667 adults were collected. *Anopheles subpictus s.l.* was the predominant species (60.11%) followed by *An. pallidus* (27.58%), *An. pediteraniatus* (10.19%), *An. varuna*(2.09%). Based on egg morphology all collected *Anopheles subpictus* were identified as species B. The present study reveals that even though the malaria situation is under control in the region the presence of potential vectors highlights for a continuous vector survey since any imported case of malaria can result in local transmission.

Keywords: Mosquito, Anopheles, malaria, population dynamics, vectors

A18.

Reducing Hygroscopic Nature of Gymnemic acid by Esterification

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The hygroscopic nature of a compound depends on its ability to take up moisture readily from the surrounding air or other moist materials. The hygroscopicity of gymnemic acid, isolated from *Gymnema sylvestre*, significantly reduces its shelf life as well as sales. The objective of this study is to esterify the glucuronic acid moiety of gymnemic acid and compare the hygroscopicity of gymnemic acid and its ester. The handpicked dry leaf powder (25 g) of *Gymnema sylvestre* was treated with 75 V/V % ethanol at 60 °C to yield *Gymnema* leaf extract of 8.72 g (35 W/W %) with dirty greenish brown colour.Then, the above crude *Gymnema* leaf extract was esterified with acidified methanol at pH 3.0 and the product, methyl gymnemate, was precipitated at pH 2.0 as a brown coloured solid, 2.68 g (11 W/W %). Complete conversion of gymnemic acid to its ester was confirmed by IR spectroscopy. A study on the ability of gymnemic acid and methyl gymnmate to absorb moisture in the atmosphere over a period of time revealed a significant reduction in the hygroscopic nature of methyl gymnemate compared with gymnemic acid and the weight of methyl gymnemate remained almost invariable after the initial trivial weight gain. Hence, it could be concluded that gymnemic acid is hygroscopic probably due to the presence of $-CO_2H$ group in its glucuronic acid moiety and conversion of $-CO_2H$ group into $-CO_2Me$ group, by methylation, would have increased the hydrophobic character and reduced the hygroscopic nature of methyl gymnemate.

Keywords: Hygroscopic, esterification, gymnemic acid, methyl gymnemate

A19.

Glucose-6-Phosphate Dehydrogenase (G6PD) activity among people living in malaria endemic areas in northern Sri Lanka

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Glucose-6-Phosphate Dehydrogenase (G6PD) is an X- linked cytoplasmic enzyme, that catalyses the first reaction in the pentose phosphate pathway of aerobic cells. G6PD deficiency is the most common enzyme disorder, strongly associated with malaria endemicity.

Sixty one (32 male and 29 female) selected people who are living in malaria endemic areas were screened both qualitatively and quantitatively for G6PD activity using commercially available G6PD assay kit. A questionnaire was administered to know their past illness of malaria. Seventy five percent of male and fifty nine percent of female showed moderate enzyme (G6PD activity falls between 10-60%) activity and the rest normal activity. Of the selected 61 subjects 14 (8 male and 6 female) of them had malaria. Fifty seven percent of people affected with malaria had moderate G6PD activity.

The questionnaire-based study revealed that there was no association between moderate deficiency or normal activity of G6PD and malaria. Through the present study no association could be established between G6PD deficiency and malaria infection. However further molecular analysis is in progress to further confirm this for Sri Lankan populations.

Keywords: Glucose-6-Phpsphate Dehydrogenase, malaria endemicity, G6PD assay

A20.

Phytochemical Screening and Antifungal Activity of some Medicinal Plants of Family Lamiaceae

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Many members of the Lamiaceae family are used in traditional and folk medicine and also used as culinary and ornamental plants. Leaves are the most used plants parts of this family. Ethanolic extract of the leaves, stem, seeds of *Leucas zeylanica*, *Ocimum canum*, *Ocimum sanctum* and leaves of *Mentha arvensis*, *Ocimum basilicum* were subjected to qualitative phytochemical analysis foralkaloids, saponins, terpenoids, steroids, flavonoids, tannins, phlobatannins, and cardiac glycosides by using standard procedures. "In Vitro" antifungal activity was determined by agar streaking assay method against *Aspergillus* sp, *Penicillium* sp, *Trichoderma* sp, *Mucor* sp and *Rhizopus* sp. after 48 and 72 hours of inhibition with control.

Flavonoids and alkaloids were present in almost all parts of plants tested, except alkaloids was only absent in seeds of *L. zeylanica* and stem of *O. sanctum.* Saponins and phlobatannins were only observed in *O. basilicum* and *L. zeylanica* leaves respectively. *O.canum* and *O.sanctum* contained terpenoids in all their parts where as cardiac glycosides were only observed in all parts of *O.sanctum.* Leaves of *L. zeylanica, O.canum, O. sanctum* and *O.basilicum* had 87%, 65%, 65% and 75% of phytochemical compounds tested.

Leaf and seed extracts of *O. sanctum* and *M. arvensis* leaf extract exhibited strong positive antifungal activity against *Aspergillus* sp. Mucor sp was strongly inhibited by *O.canum, O.basilicum* and *M. arvensis* leaf extracts. *Penicillium* sp was strongly inhibited by *O.sanctum, O.basilicum* and *M. arvensis* leaf extracts. All the tested plant parts had less effect on *Trichoderma* sp and *Rhizopus* sp. Degree of antifungal activity of leaf extracts of plants was higher than the other plant parts against tested fungi. Further purification and characterization of the bioactive components may provide better understanding of bioactivity.

Keywords: Phytochemical compounds, antifungal activity, Lamiaceae

B1.

Impact of Charred Firewood on Soil Properties of Regosols in Jaffna Peninsula

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Charred Firewood (CF) could be used to enhance agricultural productivity by improving soil quality. A laboratory incubation study was conducted for 12 weeks to find out the effect of application of CF alone and in combination with inorganic fertilizers on selected properties of Regosols of Jaffna peninsula. Treatments were T_0 (control), T_1 (CF), T_2 (NPK fertilizer), and T_3 (½CF + ½ NPK fertilizer). Complete randomized design was used with three replicates. Results of incubation experiment indicated that pH of soil significantly increased in T_1 (CF) and decreased in T_2 (NPK fertilizer). Available N was significantly higher in T_3 (½ CF + ½ NPK fertilizer) and T_2 (NPK fertilizers) compared T_1 and T_0. Available P was significantly increased in T_2 (NPK fertilizer) followed by T_1 (CF) and T_3 (½ CF + ½ NPK fertilizer) compared to T_0. Available K was significantly increased in T_1 (CF), T_3 (½ CF + ½ NPK fertilizer) and T_2 (NPK fertilizer) compared to control. EC was significantly increased in NPK fertilizer followed by T_3 (½ CF + ½ NPK fertilizer) and T_1 (CF) compared to control. Cation exchange capacity and microbial biomass carbon were significantly increased with T_1 (CF) compared to other treatments. Results indicate that though CF alone has a negative effect on soil pH during initial stage CF has potential to enhance the soil fertility parameters such as nutrient availability, cation exchange capacity and microbial biomass in Regosols of Jaffna Peninsula.

Key words: Regosols, CF, Soil nutrients, Soil properties.

B2.

Selection of Starch Hydrolysing Enzymes by the Fungal Strains Isolated From Contaminated Raw and Dried Palmyrah Tubers (*Odiyal*)

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The fungi isolated from '*odiyal*' were analysed for the production of amylolytic enzymes with potential activities, and the kinetic properties of the selected enzymes were estimated. '*Odiyal*' is a product of raw dried palmyrah (*Borrasus flabellifer*) tuber. *Aspergillus* sp.,*Rhizopus* sp., *Mucor* sp. and *Fusarium* sp. were the four fungi isolated from contaminated '*odiyal*'. The *Aspergillus* sp.and *Rhizopus* sp. were selected as good α-amylase producers, and the *Rhizopus* sp. and *Mucor* sp. as good glucoamylase producers. Highest α-amylase activities obtained from *Aspergillus* sp. and *Rhizopus* sp. were 4284 and 3762 $\mu gmL^{-1}min^{-1}$ respectively on the 7th day. Highest glucoamylase activity obtained from *Rhizopus* sp. and *Mucor* sp. were 1854 and 1800 $\mu gmL^{-1}min^{-1}$ respectively on the 6th day. The α-amylases from *Aspergillus* sp.and *Rhizopus* sp showed zero order kinetics for 6 and 8 min. respectively. The glucoamylases from *Rhizopus* sp. and *Mucor* sp. showed zero order kinetics for 14 and 10 min. respectively, and the reaction time was fixed as 5 min. The optimum pH for the activity of α-amylase from both *Aspergillus* sp. and *Rhizopus* sp.was 6.5. The optimum pH for the activities of glucoamylases from both *Rhizopus* sp. and *Mucor* sp. was 3.5. The optimum temperatures for the activity of α-amylase from *Aspergillus* sp. and *Rhizopus* sp. were 55 and 65^{0}C respectively at pH 6.5. The optimum temperatures for the activities of glucoamylase from *Rhizopus* sp. and *Mucor* sp. were 55 and 70^{0}C respectively at pH 3.5. According to the findings, pH 6.5 and 55°C were optimum for the activity of α-amylase from *Aspergillus* sp.; pH 6.5 and 65°C were optimum for the activity of α-amylase from *Rhizopus* sp.; pH 3.5 and 55°C were optimum for the activity of glucamylase from *Rhizopus* sp.; pH 3.5 and 70°C were optimum for the activity of glucamylase from *Mucor* sp.

Keywords: amylolytic activity, α-amylase, enzyme activity, fungal strain, glucoamylase

B3.

The Development of a Palmyrah (*Borassus Flabelifer*) Fruit Pulp Flavoured Pasteurized Milk Toned With Soy (*Glycine Max*) Milk

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Flavoured milks with natural horticultural additives are highly preferred and health professionals strongly support their intake among other beverages. A study was conducted to develop a palmyrah fruit pulp (PFP) (*Borassus flabelifer*) flavoured pasteurized milk toned with soy milk (*Glycine max*) using different percentages of PFP and soy milk sweetened with 7.5% (w/v) sugar based on the recommendations of Sri Lanka Standard Institute. In the preliminary trial, flavoured milks were prepared by adding 2, 4, 6, 8, and 10% of PFP (v/v) to cow milk. In the second trial, PFP added flavoured milks were prepared using fresh PFP, vanilla, and chocolate flavours. According to the results of first two trials, third trial was conducted with 10, 20, 30, and 40% of soy milk. Most preferred product from third trial was compared in a fourth trial with vanilla flavoured milk as a control along with pasteurized chocolate flavoured milk commercially manufactured in Jaffna District. Finally, the most preferred product, and control were subjected to proximate analysis, *coliform* screening and shelf life determination. Product with 6% of PFP and 10% of soy milk was preferred than the pasteurized flavoured milk commercially manufactured in Jaffna District. Formulated product was rich in protein (3.50±0.09%) and lower in fat (3.00±0.10%), and the fibre content (0.23±0.01%) was a big plus, than control. *Coliform* group bacteria were absence in the product. This product could be stored at 4±1°C with 12 days shelf life. Cost of production of 180 ml bottled product was Rs.13.61. This formulated product can be manufactured under a sustainable market due to the consumer preference with high quality nutrition, appreciable shelf life and an affordable price.

Keywords: nutrition, palmyrah fruit pulp, pasteurized flavoured milk, soymilk

B4.

Design Fabrication and Testing of Lime Size Grader

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The lime size grader is a useful device in the market to fix reasonable price based on the size. Farmers earn income from their products based on size grading is an indispensable and vital activity. Intensive size grading manually requires more time and of result to severe managerial failure. To apply the concept a multi size grader was designed. It can be mechanically operated with the help of an electric motor. With locally available materials, a size grader having container perforated sieve for linear reciprocal mechanism and also crank component for rotating mechanism. The machine was fabricated, tested and then evaluated. The electric motor of 0.25 hp and 120 rpm was used to supply power through chain power transmission alignment to the pre-wheel which mounted on crank shaft. One-side mounted pre-wheel was used to increase the speed of rotating mechanism. Materials used for fabrication of machine had no structural weakness or mechanical failure during operation. Here the upper container sieve has 42 mm in diameter holes, which are equal in diameters and also the lower container sieve has 38 mm in diameter holes. These flat plastic (PVC) perforated sieves were suitable to separate the limes from ungraded limes stock. These PVC sieve can prevent the rust, avoid bruise effect and reduce frictional damage to the fruit skin. Among the several angles tested, angle 0° gave better performance in grading efficiency and also suitable speed of 90 rpm showed the best grading. The lime size grader is a user friendly low cost machine for lime grading. The capacity of the lime size grader was found to be as high as 120 Kg/hr. Furthermore; the overall grading efficiency was 91 % at the optimum operating conditions. From the results it was concluded that suitable lime size grader can be recommended for farmers. By changing the sieves and their holes sizes, the machine could be utilized for other fruit crop grading.

Keywords: Grader, perforated sieve, reciprocal mechanism, rotating mechanism, lime

B5.

Design of an Efficient, Low Cost Filter using Locally Available Materials for the use of Organic Extract in Drip Irrigation

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Adaptation of efficient irrigation method like drip irrigation is important especially for Jaffna peninsula because there are neither any perennial rivers nor non-perennial rivers and tanks to supply water. A limited amount of groundwater is the only source accessible for all purposes such as drinking, industrial, public utility and irrigation. At present, cultivation technology is motivating towards organic farming. Therefore keeping a drip system with free from debris of organic fertilizers is critical because most clogs will irreparably disable a system. Hence an experiment was carried out with the objective of design, fabrication and evaluation of primary filter, secondary filter and sand filter with locally available cheap materials. The design filters were fabricated to filter the organic extract fertilizers of five leaves solution, gliricidia solution, and cow dung solution. The system performances were evaluated with uniformity co-efficient of emitters. The effect of pressure head loss due to fixing of sand filter was justified before and after fixing of filter in drip irrigation by uniformity co-efficient. Filter efficiencies were calculated in wet weight basis by weight losses of organic extract after each filtration through both filters. Flow rate of the fertilizer tank and drip system was measured to estimate the dilution factor and to control the flow rate. The "U" shaped sand filter was chosen to increase the efficiency of the filtering, because the solids passing through the upward movement in the out let arm was negligible due to the gravity force of the particles. Also this shape facilitated the back flushing to accomplish cleaning. The top edge of the media contained pea gravel, which filtered the macro physical clogging agents and prevented forming of inert material layer just above the sand media. A series of wire-mesh were placed in the out let path of the filter to arrest the sand particles passing through the liquid fertilizer. All the measured values of the efficiency were less than the recommended value and conclusion was made that there was no system performance in the field lay out according to the recommendation. There was no significant variation in the uniformity before and after installation of sand filter into the system. the calculated emission uniformity were 60.05% for water, 56.43% for five leaves solution, 53.02% for gliricidia, 53.87% for cow dung solution. The dilution factor was 8.38. It is possible to control the fertilizer dilution by fixing of gate value between fertilizer tank to supply line. Finally the conclusion was made that there was no any significant changes in the uniformity due to the installation of sand filters and applying the organic fertilizer solution. Also it indicates that there was no any clogging in the field due to application of organic fertilizer solution.

Keywords: Drip irrigation, Organic fertilizer, sand filter

B6.

Preparation of Rice - Wheat Composite Bread Using Premix

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The aim of this study was to find out the feasibility of preparing rice bread using premix (rice flour, wheat flour, yeast and bread improver) stored for 3, 4, 6 and 8 weeks. Wheat bread, rice– wheat bread and premix breads were compared for their characters. The basic formula of all types of breads contained flour (1kg), yeast (7g), sugar (20g), salt (15g), margarine (40g), bread improver (2g) and water (600g). Based on the determination of gluten percentage of different combinations of rice-wheat flour mixes, flour mix with 20% rice and 80% wheat was selected to prepare premix breads and rice-wheat bread while wheat bread was prepared using 100% wheat flour. The qualities of rice-wheat bread and different premix breads did not differ ($p>0-05$) among them. Moisture content of wheat bread was significantly lower ($p<0.05$) than that of rice - wheat bread and premix breads. The total sugar and total protein content of rice-wheat bread and premix breads did not differ significantly ($p>0.05$) but total sugar contents of rice-wheat bread and premix breads were significantly higher ($p<0.05$) than that of wheat bread while total protein content of rice-wheat bread and premix breads was significantly lower ($p<0.05$) than that of wheat bread. Fat content of wheat bread was significantly lower than that of wheat – rice bread and premix breads. There were no significant differences ($p>0.05$) in ash and crude fibre content among all types of breads. There were no significant differences in specific gravity and the sensory qualities among rice-wheat bread and premix breads, but specific gravity of wheat bread was higher than that of rice-wheat bread and premix breads and there were no significant differences in the sensory qualities except crumb colour and crust colour.

Even though rice-wheat bread and premix breads differed in some qualities with wheat bread, they did not differ in qualities among them. Therefore from this study it can be concluded that rice breads can be prepared using premixes stored for two months with the qualities consistent with that of bread prepared using fresh rice-wheat flour mix.

Keywords: premix, wheat bread, rice-wheat bread, premix bread

B7.

Development of A Soy (*Glycine Max*) Milk Toned Set Yoghurt

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In this study, an attempt was made to develop set yoghurt with the acceptable combination of milk and soy milk (*Glycine max*). Incorporation of suitable percentage of soymilk was determined by organoleptic evaluation. Various levels of soymilk viz. 5,10,15,20 and 25 percent were used for the preparation of yoghurt. The yoghurt without addition of soymilk was used as control. Selected yoghurt sample (10% soy milk incorporated yoghurt) and control were analysed for chemical parameters, microbiological test and sensory parameters. The means for total solids, fat, protein and fibre for the control samples were 19.73±0.12, 4.00±0.06, 3.30±0.02, 0.00±0.00 respectively whereas for the soy yoghurt samples the means were 19.26 ± 0.81, 3.84 ± 0.08, 3.34 ± 0.01, 0.14 ± 0.01 respectively. Results obtained showed that, considering non-fat solids contents and absence of *coliforms*, all the samples were in line with the Sri Lankan Standards. The products were packed in cartons and stored under refrigerated conditions at 4±1^{0}C for a period of three weeks whereas pH, titratable acidity and syneresis were measured once in three days, during 3 weeks. The means of syneresis and pH increased whereas titratable acidity decreased throughout the storage period. Based on the results of above parameters and visual observation products were acceptable for a period of fifteen days under refrigerated conditions. Yoghurt sample prepared with incorporation of 10 % soymilk resulted in superior organoleptic as well as chemical characteristics compared to normal yoghurt. It could be manufactured for a sustainable market with a low cost of production (Rs.14.14/cup).

Keywords: Microbiological, Milk, Physico-chemical, Soymilk, Soy yoghurt, Yoghurt.

B8.

Efficacy of Trenbolone Acetate over Methyl Testosterone in Ultrasound Mediated Androgen Immersion Protocol for Masculinising Nile Tilapia (*Oreochromis niloticus*).

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The objective of this study was to evaluate the comparative efficacy of two commercially available synthetic androgens viz currently used Methyl Testosterone (MT) with environmentally safe Trenbolone Acetate (TBA) to masculinise the undifferentiated tilapia fry into unisex fry. An experiment was set up with one hundred fries density of four groups of hormone immersion cum ultrasound application, hormone immersion without ultrasound application, without hormone ultrasound application and a control group of neither hormone immersion nor ultrasound application in two different treatment durations. Complete sacrificial of treated fish at the age of 60 days crop after stocking for evaluating the sex reversal rate and ultimate survival rate. In both treatment duration all the treatment groups produced significantly higher ($p<0.005$) percentage of males than the control group, which did not receive either hormone immersion or ultrasound application. Although both androgen immersions regardless the treatment duration, ultrasound application and ultrasound alone treatments produced significantly higher ($p<0.05$) percentage of males the control group which did not receive any hormone immersion or ultrasound vibration, TBA immersion cum ultrasound treated group in two hours treatment duration produced significantly highest mean male percentage of 89.60 ±0.99 SD with mean survival rate of89.67±4.04 SD where as 100µg/L MT with 2.0 hours produced mean male percentage of 85.42± 1.58 SD with mean survival rate of91.67±2.52 SD. Hence the present study revealed that the TBA is more effective than MT in ultrasound vibrations to produce highest percentage of all male Tilapia fries as an alternative eco-friendly method for nursery phase of dietary oral administration MT treated fishmeal.

Keywords: Androgens, Immersion, Unisex, Masculinisation, Ultrasound, Tilapia

B9.

Physico-Chemical Analysis of Bottled Drinking Water Available in Jaffna Peninsula

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More than thousands of bottled drinking water is sold in Jaffna peninsula (19L, 5L, 1.5L, 1L & 0.5L). People rely on its quality of the bottled drinking water. In this study attempts were made to evaluate the quality of sold bottled drinking water by physical (Total Dissolved Solid, Electrical conductivity and pH) and chemical (Nitrate and Calcium) analysis. Bottled drinking water of 22 brands was selected which include one brand produced in Jaffna and others are brought from out of Jaffna. The quality of bottled drinking water sold in Sri Lanka is regulated by SLS that the recommended and Electrical conductivity, Total Dissolved Solid and pH range of bottled water should be 750 µS/cm, 1000mg/L and 6.5 to 8.5 respectively. Minerals found in bottled water recommended by Sri Lankan Standard (SLS) such as Nitrate and Calcium contents are 50 and 100mg/L respectively. The entire bottled drinking water brands, which are sold in Jaffna, has very low electrical conductivity compared with SLS (750 µS/cm) and varied from 19 to 253 µS/cm with the mean of 80.53 (±60.92) µS/cm. The pH values of the bottled drinking water brands varied from 4.11 to 7.58. Only 9.09% of the bottled drinking water brands contained the pH value above the minimum permitted level (6.5) by Sri Lankan Standard. The Total Dissolved Solid content of the bottled drinking water brands was very low and varied from 9 to 123.67 mg/L with the mean of 39.5 (±30.23) mg/L. The calcium content of the bottled drinking water brands was low and varied from 6.48 to 83.77 mg/L with the mean of 49.9 (±25.09) mg/L. The nitrate content of the bottled drinking water brands was low and varied from 0.21 to 4.19 mg/L with the mean of 1.26 (±1.08) mg/L. Therefore all the drinking water brands supplied in Jaffna peninsula having different amount of physical properties and chemical contents that is low and high amount which are not satisfy Sri Lankan Standard. So, RDHS (Regional Director of Health Service) should consider the specific amount of physical properties and chemical contents in bottled drinking water supplied in Jaffna peninsula.

Keywords: Calcium, Electrical conductivity, Nitrate, pH, Total Dissolved Solid

B10.

Potential of Water Hyacinth (*eichhornia crassipes* (mart.) Solms) to Remove Nutrient Loads in Water and as a Source of Nutrients

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Water hyacinth (*Eichhornia crassipes*) a common weed in fresh water bodies was tested for its potential to remove N and P from treated water. The ground water used in the experiments had a pH of 6.8, nitrate N of 8.5mg/l and available phosphorus 0.4mg/l. Open plastic buckets of 20 liters capacity were used to grow the plants. A total of twelve treatment combinations including four levels of nitrate N (0, 20, 40 and 60mg/l) and three levels of P (0, 20 and 40mg/l) were treated. The design used was a Complete Randomized Design of two-factor factorial with three replicates. Water was analyzed at weekly interval for nitrate N and P. At the end of the experiment nutrient analysis of plants was carried out. At the end of third week, the percentage nitrate N and P removal by *E.crassipes* was varied in the range 40-63.5% and 75-97.2% respectively. While the total N and total P content of *E.crassipes* varied between 1.3-1.7% and 0.84-2.05% respectively. These plants have a comparable amount of nitrogen and phosphorus with locally available green manures and organic manures. Therefore *Eichhornia crassipes* could be used to treat water polluted by nitrate and phosphorus and the treated plants could be used as source of nutrients for crops or animals.

Keywords: phytoremediation, Nitrate - N, Eichhornia crassipes, Phosphorus, water

B11.

Efficient *In-Vitro* Plant Regeneration in *Solanum Fiebrigii* Using Thidiazuron

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Efficient *in-vitro* shoot regeneration system that is an important tool for modern plant improvement programs was developed for *Solanum fiebrigii*, which is an ornamental plant with beautiful flowers that belongs to *Solanaceae*, mainly found in Northwest of Argentina. Leaf explants of *S. fiebrigii* were cultivated on half or full strength Murashige and Skoog (MS) medium with different concentrations (0.5, 1, 2, 3, 4, 5 mg/l) of Thidiazuron (TDZ) without auxin. Explants were placed with the adaxial side upward with 9 explants per plate, 50 explants for each replication, and this was replicated 3 times per treatment. The experiments were designed and set up in a completely randomized design. Almost all the leaf explants formed green callus within two weeks in all media tested. The highest (97.1%) and the lowest (46.0%) frequency of shoot regeneration was observed on medium containing half strength MS with 2 mg/l TDZ and on medium containing full strength MS with 5 mg/l TDZ respectively. Shoot regeneration frequency was varied on media containing full and half strength MS with 0.5, 1, 2 and 3 mg/l TDZ, but was not significantly different among the concentrations. Comparatively, frequency of shoot regeneration was poor on medium containing 5 mg/l TDZ and was significantly differed from other tested TDZ concentration. Shoot regeneration frequency did not differ significantly between half and full strength MS at any TDZ concentrations. The number of shoots per explants was also varied among the media tested. The highest number of shoots (20.9) and the lowest number of shoots (3.8) were obtained on medium containing full strength MS with 2 mg/l TDZ and that containing half strength MS with 5 mg/l TDZ, respectively. This study clearly suggests that efficient *in-vitro* plant regeneration of *S. fiebrigii*, is possible on medium containing only thidiazuron as a plant growth regulator.

Keywords: in-vitro, Solanum fiebrigii, thidiazuron

B12.

Characterization of Soil Series under Calcic Red Yellow Latosols in Jaffna Peninsula.

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This study was carried out to characterize the major physical and chemical properties of the agriculturally important soil series namely Inuvil, Palali, Chankanai, Chankanai rocky phase and Vaddukoddai belongs to Calcic Red-yellow Latosols of Sri Lanka. The random soil sample collections were carried. The number of samples from each soil series varied from 3 – 12 depending on the extent of each series. Chankanai rocky phase series had the highest mean value of the bulk density (1.72±0.11) and the lowest bulk density (1.49±0.08) was in the Palali series. The highest particle density (2.72±0.28) was observed in Inuvil series and the lowest particle density (2.45±0.03) was in Chankanai rocky phase series. The sandy loam texture was commonly observed in the soil series. The colour of the soil was ranged from light olive brown to dark red. The Chankanai rocky phase series had the highest value of pH (8.24±0.16), electrical conductivity (85.37±23.45 µS/cm) cation exchange capacity (9.16±4.9 cmol/kg) organic matter (1.93±1.05%), total nitrogen (523.97%), available sulfur (247.35 kg/ha), available phosphorus (676.25±179.13 kg/ha) and available potassium (156.34 kg/ha). Inuvil series had the lowest values for pH (6.96 ± 0.47), available phosphorus (124.73±57.62 kg/ha) available potassium (89.35±26.41) and available sulfur (126.08±58.13 kg/ha). Palai series had the highest available phosphorus (1079.26±130.35 kg/ha) and lowest values for electrical conductivity (42.04±28.94 µS/cm) and cation exchange capacity (6.06±3.67 $cmol_+/kg$).

Keywords: Agriculturally important soil series, Physical and chemical properties, Calcic red-yellow latosol

C1.

Optimization of Culture Conditions to Yield High Alkaline Protease Titre

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The work was aimed at optimizing the culture conditions to produce high titre of alkaline protease production by *Paenibacillusdendritiformis*. Single colony of the strain was cultivated in nutrient-agar medium containing (gL^{-1}) nutrient broth, 10.0; peptone, 10.0; sodium chloride, 5.0; and bacteriological agar, 17.5 at pH 7.0 at 37°C for 24h. The cells activated for 18h at 40°C and 120 rpm were inoculated to the fermentation medium and incubated at 40°C and 120 rpm. The activation and fermentation media were same and contained (gL^{-1}) glucose, 10.0; peptone, 6.0; yeast extract, 2.0; KH_2PO_4, 10.0; $MgSO_4.7H_2O$, 0.2; and Na_2CO_3, 10.0; at pH 9.5. Highest alkaline protease activity [91.2(±1.7) UmL^{-1}] was obtained at 120h and 37°C. The agitation speed of 200rpm was most suitable and the highest protease production [112(±1.4) UmL^{-1}] was obtained at 96h and 37°C. The 36 hours old slant culture was suitable to inoculate the fermentation medium for high titre of alkaline protease production [122.9 (±1.3) UmL^{-1}] at 96h. Highest alkaline protease activity [138(±2.8) UmL^{-1}] was obtained at 96h, when the age of inoculum was 18 hours. When the medium to shake flask volume ratio was 1:20, highest alkaline protease activity [141.2(±3.3) UmL^{-1}] was obtained at 96h d. To obtain highest alkaline protease activity [151.8(±4.3) UmL^{-1}] at 96h, the inoculum size of 16.67(v/v) was chosen. Before optimizing the culture conditions, protease activity produced at 120h was 91.2 (±1.7) UmL^{-1} but after optimization the highest activity produced at 92h was 162(±1.4) UmL^{-1}. Therefore 1.8fold increase in protease activity was achieved after optimizing the process parameters with a reduction in production time from 120 to 92h.

Keywords: Protease, inoculums, strain, optimum,medium,Paenibacillusdendritiformis

C2.

Characterization of a Thermostable Alkaline Protease Producing Bacterial Strain

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The objective of this study was to characterize one of the selected bacterial strains, among the five locally isolated alkaline protease producers (strains DS_1, DS_2, DS_3, DS_4 and DS_5) from dog decaying soil. These five strains produced the alkaline proteases, which were active at pH 9.5 and 70°C. The properties of the enzyme produced by the strain DS_4 indicated its potential use in industrial applications and considered for identification. Strain DS_4 is non-branching, gram-positive, sporulating, motile, facultative aerobic, catalase positive, β-hemolytic, oxidase positive long rods. Hence it belongs to Genus *Bacillus*. Ellipsoidal shaped subterminal to central endospores were observed in 24h old cultures. It has the ability to produce acid from glucose, while does not produce acid from xylose and mannose. It grew at 50°C. It was able to hydrolyze starch and tyrosine, but did not produce urease and indole. It reduced nitrate. It has the ability to grow in 70gL^{-1} NaCl.Based on these biochemical tests the strain DS_4 was expected to be *Bacilluscereus.* By the 16S rDNA sequencing, the strain DS_4 was confirmed to be belonging to the Kingdom: Procaryotae; Division: Bacteria; Order: Bacillales; Family: Bacillaceae; Genus: *Bacillus*; Species: *cereus.*

Key words: Protease, biochemical tests, gene sequence, morphology, strain, genus.

C3.

Nutritional Status of Vegetarian Adolescents Aged 16-19 Years from National and Provincial Schools in Jaffna Zonal Division of Education

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The objective of this study was to assess the nutritional status of G.C.E (A/L) vegetarian adolescents from Jaffna zonal schools. A cross sectional sampling was used to identify a sample that represents the students aged 16 to 19 years. A total of 410 students (193 males and 217 females) were included in this study from 20 schools (4 national and 16 provincial schools). Among the students, 35 students were selected for this study. Anthropometric measurements of weight and height were measured in all the students. Blood was collected for biochemical analysis (total protein, albumin and haemoglobin). In this study, prevalence of stunting among vegetarians was 5.7%, whereas prevalence of stunting and severe stunting in non-vegetarians was 9.1 and 0.8% respectively. Prevalence of severe thinness was 5.7 and 3.2% in vegetarians and non-vegetarians respectively. Prevalence of obesity (1.3%) and severe obesity (0.3%) were found only among non-vegetarians. Prevalence of anaemia was 30.3 and 32.8% in vegetarians and non-vegetarians respectively. The anaemia was low in vegetarian females (28.6%) than in non-vegetarian females (45.7%). Prevalence of protein deficiency among non-vegetarians and vegetarians were 0.8% and 3.0% respectively. Thus, the prevalence of stunting, anemia and obesity were higher among non-vegetarians than vegetarians while prevalence of severe thinness and protein deficiency were higher among vegetarians. Revisiting the dietary pattern of the students is recommended to further understand the above conditions in non-vegetarian students.

Keywords: Adolescents, Vegetarians, Anemia, Thinness, Stunting, and obesity.

C4.

Nutritional status of children aged 1-5 years in Chavakachcheri Medical Officer of Health (MOH) Area

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Nutrition intervention is a sensitive indicator and important throughout life, the ante-natal and early childhood phases are more important. The objective of this study is to determine the prevalence of malnutrition and to investigate the associated factors for malnutrition among the children aged 1 to 5 years in Chavakachcheri MOH area of Jaffna district. Multistage cluster sampling was used to identify a sample that represents the children aged 1 to 5 years. Children (n=73) were recruited in this study between March to September 2010 from one primary sampling unit of Chavakachcheri. To assess the nutritional status anthropometrically, height, weight, Head Circumference (HC) and Mid Upper Arm Circumference (MUAC) were measured. Information regarding households including socio-economic status and breast-feeding patterns were recorded by using pre and post corded questionnaires. General examination of the children was carried out to detect anemia, pallor and Goiter. Concentration of haemoglobin (Hb), serum albumin and serum ferritin were analysed to detect the iron deficiency anaemia (IDA) and protein deficiency. Urinary iodine concentration was measured to detect the iodine deficiency status (IDS). Weight, height, HC, MUAC and age were used to calculate weight-for-age Z score (WAZ), height-for-age Z score (HAZ), weight-for-height Z score (WHZ), HC-for-age Z score (HCAZ), MUAC-for-age Z score (MUACAZ) by using WHO Anthro v.3.0.1 software. Associated factors for malnutrition were derived by using SPSS version 16 software. Of the total of 73 children, forty three (59%) were males. Of these children, 31.5% were underweighted, 21.9% were wasted, 20.5% were stunted and 1.4 % were overweighed. Among the children, 20.0% had less HC-for-age, and 47.9% had less MUAC-for-age. Among the 73 children, 15.0% were affected by both wasting and underweight whereas, 1.4% was affected by wasting and stunting, 6.8% was affected by underweight and stunting and 2.7% was affected by wasting, underweight and stunting. Micronutrient malnutrition, namely IDA (27.8%) and IDS (21.9%), were highly prevalent. Protein deficiency was observed in 47.9% of children and mean serum albumin concentration was 3.6 mg/dL (±0.7). Of these children 31.9% of children were affected with anemia, 27.8% of children were affected with IDA and 21.9% of children were affected with Urinary iodine deficiency. No case of goiter was detected. Of these children, 68.5 % of children fed with Exclusive Breast Feeding, while 2.7% of mothers did not feed the babies with beast milk and 28.8 % of mothers did not exclusively breast feed their babies. Based on our findings, under nutrition, protein deficiency and micronutrient deficiencies are prominent among the children living in Chavakachcheri MOH area.

Key words: Malnutrition, Underweight, Wasting, Stunting, anaemia, Anthropometry

C5.

Trends in Intake of Fruits and Vegetables by G.C.E (A/L) Students in JAFFNA Zonal Schools

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The aim of the study was to assess the intake of fruits and vegetables by the students and to compile the trends of intake. Twenty schools were selected randomly from a list of all twenty-seven schools in Jaffna zone. Four hundred and thirty students were selected from the schools proportionately. Questionnaire was used to assess the intake of food for a week prior to research. Two tablespoons are considered to be equivalent of one serving of vegetables. The data obtained is analyzed and mean value for each category of fruits and vegetables are calculated. Overall average consumption of vegetables in servings (one serving is equivalent to two table spoons) per day was decreasing in the order of potato (1.19), drumstick (0.58), carrot (0.61), brinjal (0.36) ladies finger (0.18), beetroot (0.17) and pumpkin (0.16) and the leafy vegetable intake was in decreasing order from spinach (*Amaranthusgangeticus*) (0.56), murukkamilai (leaves of *Moringaoleifera*) (0.17) vallarai (*Centellaasiatica*) (0.25), ponnankani (*Alternantherasessilis*) (0.12), agathi (*Sesbaniagrandiflora*) (0.08). The average consumption scores for fruits indicate that banana consumption was highest and the order was bananas (0.95), mangoes (0.15), and 0.13 pieces of papaw, 0.1 oranges, and 0.14 apples. According to the results obtained the adolescent intake of fruits and vegetables are grossly inadequate because the ministry of health recommends 2 to 3 servings of fruits and 3 to 4 servings of vegetables per day. Also it is notable that potato and banana intake were high which are rich in carbohydrates. Intake of green leafy vegetables is also very low.

Keywords: Fruit, vegetables, green leafy vegetables, servings

C6.

Alteration of Selected Biochemical Parameters in thin Adolescents in G.C.E (A/L) Students of National and Provincial Schools in Jaffna Educational Zone

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The objective of the study was to determine the prevalence of thinness in G.C.E (A/L) students and alteration of selected biochemical parameters in thin adolescents. The study area was Jaffna zonal division of Education. This was a cross sectional study and 410 students were selected from 20 schools. Of this total, 61 (14.9%) students were thin adolescents. Anthropometric measurements were obtained and recorded to derive the BMI, weight-for-age, height-for-age Z scores. Blood samples were collected for the estimation of haemoglobin, total protein and albumin concentrations. The prevalence of thinness was calculated from anthroplus version 3.2.2.0 software. Among the thin adolescents (n=61), males were 62.3% (n=38). Of these thin adolescents, 68.9% were from Provincial school whereas 31.1% were from National schools. Prevalence of anemia in thin adolescents and non-thinadolescents were 38.3% and 31.5% respectively. Anaemia in national school students were 6.6% and 31.7% in Provincial school students. The prevalence of protein deficiency was significantly high in thin adolescents (45.7%) than in non-thin adolescents (28.5%) ($P<0.05$). The mean value of albumin in the thin adolescents and non-thin adolescent were 3.44 ($\pm$0.31) and 4.68 ($\pm$0.42) g/dL and it was significant ($P<0.05$). This result revealed that, the prevalence of thinness was significantly high in males than in females ($P<0.05$). Anemia was low in thin adolescents than in non-thin adolescent. Students from provincial schools were highly affected by anaemia and protein deficiency than national schools. It was concluded that, thin adolescents are more susceptible to the alteration of biochemical parameters.

Keywords: Thinness, Anaemia, Haemoglobin, Adolescents, Anthropometry, Albumin

C7.

Impact of Socio-Economic and Socio-Demographic Factors on Nutritional Status among G.C.E.(A/L) Students in Jaffna Zonal Schools

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High rate of poverty and low socio-economic levels prevail in most developing countries, taking their toll on diet and nutritional status. This study assessed the nutritional status and the impact of socio-economic and socio-demographic factors of G.C.E (A/L) adolescent students in Jaffna zonal schools. A cross sectional study was used and 193 male (47.1%) and 217 female (52.9%) students aged from 15 to 19 years from twenty schools (four National schools) out of twenty seven schools in Jaffna educational zone were interviewed and examined. Anthropometric measurements such as weight and height were measured and blood was obtained for biochemical analysis of serum total protein, serum albumin and hemoglobin. The prevalence of thinness and overweight were 14.9% (3.4% students were severely thinned) and 8.3% (1.2% students were obese and 0.2% were severely obese) respectively. Thinness was more in males than in females (19.7% in males and 10.6% in females, $p < 0.05$). The prevalence of stunting was 8.8% (8.8% in males and 7.4% in females); out of which 0.7% (1.6% in males and 0% in females) was severely stunted. The prevalence of anemia was 32.6% and anemia was more pronounced in female students than in males (20.4% in males and 43.9% in females, $p < 0.001$). The prevalence of protein deficiency was 1%. Household size, Type of school (National and other), urban and rural sector, Father's Job category and Mother's educational were significantly associated with height for age z-score ($p < 0.05$).Household size, Gender, Distance from the school, Father's Job category, Mother's Job category, Mother's educational level, Father's educational level, income class and wealth index were significantly associated with BMI for age z-score ($p < 0.05$).Household size and Gender were significantly associated with Hemoglobin level ($p < 0.05$). Comparatively male students were more malnourished than female students in Jaffna zone.

Keywords: Nutritional Status, Thinness, Stunting, Adolescent, Malnutrition, Anemia

C8.

Prevalence of Aneamia Among the G.C.E. (A/L) Students of National and Provincial Schools in Jaffna Educational Zone

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This study was done to find out the prevalence of anemia and associated factors among G.C.E Advanced Level students in Jaffna Zonal schools and to provide current prevalence rates of anemia among the students of National schools and Provincial schools in Jaffna zonal schools based on haemoglobin levels. The study included a population of 433 students of G.C.E Advanced Level aged 17 to 18 years. Haemoglobin levels were measured and hypothetically tested. The prevalence of anemia among National and Provincial school students are 30.3% and 34.4% respectively. Over all anemia prevalence is 32.8 percent. There are no severe anemic (<7g dL^{-1} hemoglobin) students in this population. It was observed that anemia affects the overall nutritional status of adolescence. Prevalence of anemia among National school boys and girls were 15.4 and 46% respectively, where as those in Provincial school is 24.8 percent for boys and 42.2 percent in girls. 35% of anemia prevalence was found in the students who are from urban area, whereas 30.5% of prevalence of anemia found in students who come from rural area.

Keywords: Anemia, adolescent, nutritional status

C9.

Ultrastructural Changes in Intestinal Microvasculature of Infant Rats After Infection with Rotavirus

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Rotavirus infection is the most common enteric diseases resulting in diarrhea. Changes in the microcirculation of intestines contribute to the pathophysiology of diarrheal diseases. The aim of this study was to find the morphological changes in the endothelial cells of intestinal microvasculature in infant rats developing diarrhea in response to Rhesus Rotavirus (RRV). Twenty-six, five-day-old Wistar rats were used. Eighteen rats each were inoculated orogastrically with 1 ml of RRV concentrate; and 8 rats were given equal volume of sterile saline as control. Animals were observed for diarrhea 2 hourly for the first 12 hours and daily for 6 days. Two to four rats were sacrificed at various time points of post infection. Tissue samples were taken from proximal and distal small intestine, caecum and colon and processed for electron microscopy. Blood vessels in the mucosa and sub-mucosa were studied. Seventy one percent of rats had diarrhea at 120 hours post infection. Ruffling of the luminal membrane of endothelial cell, vacuolation of cytoplasm, swelling of endothelial cell, swelling of organelles, rarefaction and disruption of cytoplasm were noted. Capillaries of rats infected with rotavirus were severely damaged and changes were more prominent in the colon. Significant damage was seen in the arterioles of the distal small intestines. Damage to venules was more in the caecum and colon. The endothelial damage began at 12 hours and continued till 144 hours post infection. The microvascular changes in our study would be useful in the mechanisms and prevention methods in rotavirus infection.

Keywords: electron microscopy, rotavirus, endothelium, microvasculature, intestine

C10.

Proximate Composition of Nutrients in Dishes Commonly Served by the Canteen at Faculty of Medicine University of Jaffna

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The main purpose of this study was to analyze the nutritional values of main meals, breakfast, lunch, and dinner served at Medical Faculty canteen. Under this research specifically carbohydrate, protein, fat, crude fiber, iron, calcium and ash contents were analyzed. The nutritional values were compared with actual recommended daily nutritional requirements of adolescent male and female separately and also focused on whether the foods have provided recommended percentage of energy from carbohydrate, protein and fat. Proximate analysis indicated that range of protein content was 0.372-7.175g/100g wet weight, while fat content was below 5g/100g in all the foods (0.12-3.63 g/100g wet weight), carbohydrates ranged between 14.71 and 32.48g/100g and fiber was high in food with red rice (1.16g/100g wet weight). The menu with egg and vegetables had good amount of iron (0.6 mg/100gwet weight). Thosai was a good source of calcium (21.8 mg/100gwet weight).On average the main meals provided a total of 1962.34 and 1294.72 kcal energy to male and female students respectively per day, which were 82 and 76% of the daily energy requirements respectively. The amount of calorie from the foods was insufficient due to low level of fat content. Foods were over loaded with carbohydrate (88 %) due to high flour or rice content in dishes. More than 95 % of food combinations have met the protein requirement for both male and female students. Only 11 % of food combinations had satisfactory level of fat to males and 9.5 % to females. Only 25.5% of food combinations were satisfactory to male students in iron content. All food combinations had low level of iron content than recommended daily amount to female students. None of the food combinations had the daily requirement of calcium and fiber to both male and female students. Menu analysis showed improvement in the menu is required to achieve meal compositions, which can meet the requirement of a balanced diet which can provide recommended daily nutrient allowances.

Keywords: Recommended daily nutritional requirements, carbohydrate, protein, fat, crude fiber

C11.

Evaluation of the Nutritional Status of Female Students aged 16 – 19 years in the Jaffna Zonal Schools

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The objective of the research was to evaluate the nutritional status of G.C.E (A/L) female students aged 16- 19 years in the Jaffna zonal schools. A cross sectional sampling was used to identify a sample that represents the female students aged 16 to 19 years. Female students (n=214) aged 16–19 years were selected from 20 schools in the Jaffna zone randomly between June to November, 2011. Nutritional status was evaluated using anthropometric indices [Body Mass Index (BMI) and Waist/Hip ratio (WHR)] and biochemical parameters (serum total protein level, serum albumin level and haemoglobin level). In this study, 92 (42.9%) were female from urban sector. Anthropometric result showed that, 43.48% and 39.34% of females were under weight from urban and rural sector respectively whereas, 9.78% of females from urban and 6.74% of female from rural were overweigh with 2.2% of urban female students were affected by obese. Of these students, 9.8 and 10.8% of females were affected by thinness from urban and rural sector respectively among 1.1 and 1.7% of females were affected by severe thinness from urban and rural sector respectively. Of the total females, 28.26% of urban female students and 15.57% rural female students were in moderate risk for WHR. Anaemia was significantly high in urban females (48.31%) than rural females (40.71%) ($P < 0.05$). In the females from urban, mean value of total protein, albumin and haemoglobin levels were 6.94 (±0.68), 4.75 (±0.31) and 12.07 (±1.38) g/dL respectively, whereas in females from the rural, the total protein, albumin and haemoglobin levels were 7.08 (±0.76), 4.85 (±0.37) and 12.44 (±1.26) g/dL respectively. The study result revealed that, females from urban sector was affected by over nutrition and females from rural sector were affected by under nutrition. But prevalence of anemia was higher in the females students from urban sector than those from rural sector ($P > 0.05$). The mean values of biochemical parameters were high in rural area.

Keywords: Haemoglobin, Thinness, Anaemia, undernutrition, Albumin, obesity

C12.

Morphological Variations of the Papillary Muscles of Mitral Valve in Normal Human Hearts

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Rapid advancement of mitral reconstructive surgery and the recent progress in homograft replacement of the diseased valves requires the detailed morphology of the normal mitral valves and papillary muscles. The morphology of papillary muscles were studied in 320fresh autopsied normal hearts. Number of muscle bellies, geometric arrangement of muscle bellies, relationship between muscle bellies and chordal distribution were investigated.

Anterolateral and posteromedial group of papillary muscles were found with varying number of muscle bellies. Single belly was the commonest form in the anterolateral group (73%) and two bellies were the commonest form in the posteromedial group (40%). According to the relationship between papillary muscle- chordate- leaflet unit, four groups were categorized. Group 1 includes the single belly papillary muscles and any shape. In group 2 the muscle belly is cleaved either insagital or coronal plane into two and if in a sagittal plane, a single belly always supports the posterior leaflet and if in coronal plane, the head lying posteriorly supports the commissural region and the other leaflets. In group 3, having three muscle bellies, one supported the commissural region, second the anterior leaflet and third the posterior leaflet. Group 4, where there were more than three muscle bellies was the complex.

The documented classical view of two papillary muscles should be adapted with four types of variations in morphology with increasing complexity. Thus the wide variations in mitral papillary muscles need consideration in mitral valve replacement and homograft implantation.

Keywords: Heart, Mitral valve, Papillary muscle, morphology

C13.

Influence of Smoking and Alcoholism on Predictors of Metabolic Syndrome

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A study on influence of smoking and alcoholism on predictors of metabolic syndrome in a study population of 101 subjects (age 30 to 50 years) were carried out. In the selected population 28 subjects were with the habits of both smoking (≥ 3 cigarettes per day) and alcohol consumption (≥ 300ml, approx 32% v/v ethanol per day) and 23 were smokers without alcohol consumption and 50 controls (non smoking, non alcoholic). The subjects were generally sedentary workers. An interviewer-administered questionnaire was used for data collection. Self reported data about smoking and alcohol consumption and other relevant information were obtained. Analysis of individual risk factors of metabolic syndrome was carried out based on International Diabetic Federation (IDF) cutoff values for defining metabolic syndrome. The prevalence of BMI above 24kg/m^2 was more in smoking alcoholics (32%) and smokers (26%) than in control (16%) subjects. Similar observations were found with the central obesity (>90cm, 32, 26 and 2%) blood pressure (>140/85, 42, 34 and 16%) and triacylglycerol (>150mg dl^{-1}, 35, 26 and 6%) in smoking alcoholics, smokers and controls respectively. The fasting blood sugar, higher than 115mg dl^{-1} was found in 25, 26 and 10% of the smoking alcoholics, smokers and normal subjects respectively. When the fasting blood glucose is considered almost equal prevalence of elevated levels (>115gdl^{-1}) was observed in smoking alcoholics (25%) and smokers (26%) and 10% of the control subjects had elevated levels. The results reveal that out of 6 parameters considered as the predictors of metabolic syndrome, the smoking alcoholics and smokers showed elevated values in blood pressure, body mass index (BMI), central obesity, triacylglycerol and fasting blood glucose. However when the total cholesterol/HDL ratio was considered the prevalence of elevated (>5) levels were observed in 25, 21 and 10% of the smoking alcoholics, smokers and control subjects respectively.Surprisinglythe results show less correlation between total cholesterol/HDL ratio and smoking and alcoholism. The limitation in this study was that non-smoking alcoholics were not studied. Thus a clear study is needed to correlate smoking and alcoholism with total cholesterol and HDL cholesterol levels and to arrive at a conclusion on the influence of smoking and alcoholism in the predictors of metabolic syndrome.

Keywords: Metabolic syndrome, blood pressure, body mass index, central obesity, triacylglycerol

C14.

A Comparison of the Prevalence of the Metabolic Syndrome Using Three Proposed Definitions

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Various definitions of metabolic syndrome have been proposed by several organizations. The aim of this study was to analyze the variations in the prevalence of metabolic syndrome in Kopay divisional secretariat division using three proposed definitions and to compare the degree to which participants were being similarly or differently classified by the three definitions. The prevalence of metabolic syndrome was studied in 395 subjects. Definitions proposed by the International Diabetic Federation (IDF), National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) and a "unified definition" were used for analysis. The agreement and disparity in the diagnosis of the metabolic syndrome between these definitions were analyzed. According to definitions of IDF, ATPIII and the unified definition, total prevalence of metabolic syndrome was 27.6%, 18.0%, and 32.2%, respectively. The prevalence of metabolic syndrome differs based on the definitions used, 14.9% (IDF), 11.94% (ATPIII) and 23.13% (Unified definition) of the male participants and 34.10% (IDF), 21.07% (ATPIII) and 36.78% (Unified definition) of female participants. The prevalence of metabolic syndrome was high in the female regardless of criteria used ($p<0.05$ in all). Among the people who have metabolic syndrome, 51% in female, 29% in male were classified into metabolic syndrome under all three definitions. Among the participants who were classified as metabolic syndrome subjects using any of the three criteria, 99.0% of male, and 87.1% of female met at least two of the three definitions. The recently introduced unified definition covers all subjectswho were classified as having metabolic syndrome by other two definitions. Prevalence was elevated on applying the unified definition by4.6% (Vs. IDF) and 14.2% (Vs. ATPIII). Increased prevalence of metabolic syndrome reported by unified criteria compared to the IDF criteria was due to the fact that waist circumference was not considered as anessentialindicator in unified criteria. The prevalence was lowered in ATPIII criteria due to its higher cutoff levels for fasting blood sugar and waist circumference.

Keywords: Metabolic syndrome, IDF, ATPIII, Unified definition

C15.

Prevalence of Metabolic Syndrome among Adults aged 20 to 69 Years in Kopay Divisional Secretariat Division

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The aim of this study was to estimate the prevalence of metabolic syndrome among adults aged 20-69 years in Kopay DS division of Jaffna district and to identify the individual risk factors of metabolic syndrome. A total of 395 subjects aged 20-69 years were included in this study from 14 GS divisions of Kopay DS division. Anthropometric and blood pressure measurements and overnight fasting blood samples were obtained from all subjects. Clinical data, details about lifestyle, socio demographic and socio economic factors were obtained using an interviewer administered questionnaire. International Diabetic Federation (IDF) guidelines were used to identify metabolic syndrome. Prevalence of metabolic syndrome and individual risk factors were analyzed by sex and age group. The gender distribution of samples was 33.9% males and 66.1% females, with a mean age in males of 53.34 years (SD=12.39) and in females of 50.10 years (SD = 12.31). Metabolic syndrome was present in 109 (27.59%) subjects and the prevalence in males and females were14.93% and 34.10%, respectively and the difference was significant ($p<0.05$). The prevalence of metabolic syndrome in females was more than double when compared with males. Among the subjects studied those in the age group of 50-59 and 60-69 showed high prevalence of 35.45% and 30.17% respectively. Distribution of prevalence of metabolic syndrome for age showed linear increase up to 59 years ($p<0.05$). Prevalence of central obesity was 43.04% in general population and was higher in females (54.41%) than in males (20.9%). High blood pressure was found in 24.81% and showed a linear increase with age. Hypertriglyceridemia was observed in 26.32% of the subjects and 33.58% of the males and 22.60% of the females showed the elevated levels of triglycerides. Hypertriglyceridemia was significantly increased in the people of more than 40 years of age. Females showed higher prevalence of low HDL levels. Decreased HDL level was observed in all age group. (80.75% of total prevalence, 66.41% in males, 88.12% in females). Prevalence of impaired fasting blood sugar (FBS) was observed among 24.81% of the total population, and it was 28.35% among males and 22.98% among females. Subjects in the age group range of 60-69 showed significantly high levels of impaired glucose levels.

Keywords: IDF criteria, metabolic syndrome, Central obesity, Hypertriglyceridemia, HDL, Fasting blood sugar

D1.

The Effectiveness of Employing CALL (Computer Assisted Language Learning) in Teaching English as a Second Language to the Students of the University of Jaffna - A Case Study.

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The purpose of the study was to highlight the use of computer technology in teaching English language to the students of the University of Jaffna. The present day students of the University of Jaffna find the traditional methods of teaching English boring. So they lack basic language skills, in particular, vocabulary, spoken skills and usage of grammar. As a result, they are unable to excel in their academic activities and to satisfy the interviewers in job interviews. So, there is a need to develop their language through the most scientific methods of teaching especially through the newly advanced methods of using the multimedia and the Web.

The English teachers face different and difficult problems either academically or non-academically. Each class has a variety of levels of English proficiency, a variety of interests and a variety of paces of studying. So, it is impossible to lead the students through varied levels of learning, which make the students passive. For these reasons, we need to individualize the study of English in order to get more effective results.

The study involved qualitative methods of data collection which involved a questionnaire and interview with the language teachers and students of Arts of faculty in the University. The data collected from the subjects' responses were analyzed and the findings were derived. The findings will be beneficial for material development and ESL teaching and learning process in future. A better understanding of the students' difficulties of students in learning ESL and the problems faced by the language teachers would help to incorporate new strategies and latest technology in language teaching called as CALL.

Keywords: - scientific methods, visual – aids, English proficiency, individual differences, Computer Assisted Language Learning, language skills.

D2.

The Impact of Indirect Corrective Feedback on Undergraduates` Writing

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This study presents the findings of a small-scale classroom research carried out to investigate the effect of written Indirect Corrective Feedback on undergraduate writing. Indirect Corrective Feedback in this study refers to the feedback given by the teacher on student`s writing using a code to indicate the type of error. Although effective writing skills are significant to the success of university-level students, second language (L2) writers in the research context(The University of Jaffna) face challenges in developing writing skills. The ability to produce linguistically accurate writing needs to be developed among these undergraduates. However, due to their grammatical inaccuracies, many of the writings are difficult to understand. Thus this study was designed to investigate a suitable feedback technique to improve these students`L2 writing. There has been a longstanding controversy in the L2 literature regarding the effectiveness of error correction and feedback. Hence this study attempted to find out the effect Indirect Corrective Feedback had on students' writing. Twenty four third year undergraduates in the Faculty of Arts, University of Jaffna who were specializing in social sciences were randomly selected among a total population of ninety seven students. The group was treated with indirect error correction feedback in ` three day sequences' of composition writing, comparison of original texts with feedback and revision. The results revealed that the feedback type had a positive impact on students` writings. Irrespective of gender, both male and female students were able to correct their grammatical inaccuracies. The study has important implications for ESL teachers who teach writing at the University of Jaffna in particular and at other universities across the island.

Keywords: Second Language writing, accurate writing, feedback, Indirect corrective feedback, grammatical inaccuracies.

D3.

An Empirical Analysis of Dynamic Behavior of the Sri Lankan Exchange Rates Against five Main Trading Partners' Currencies.

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This study identifies the underlying patterns and investigates the dynamic behavior of Sri Lankan exchange rate changes against five major currencies, namely Euro, (LKR/EURO), U.S. Dollar (LKR/USD), the British pound (LKR/GBP), Indian rupee (LKR/ INR), and the Japanese yen(LKR/JPY). The data used in this study are weekly frequency and collected from Central Bank, Sri Lanka. The study period covers a time period from May, 2006 to April, 2011.Numerical descriptive statistics and graphical displays-: Line graphs, Histograms, and correlograms, kernel density estimate, Confidence Ellipse, - are used to explore the dynamic behavior and underlying pattern of the exchange rates. Autoregressive model and generalized autoregressive conditional heteroscedasticity model are used to study the types of dynamic behavior of the exchange rates. The augmented Dickey- Fuller and the Phillips- Perron tests were implemented to investigate the random walk nature of the series. GARCH (1, 1) model is used to capture ARCH and GARCH effect in the exchange rate returns series. Johansen multivariate co-integration method is employed to analyse the dynamic linkages among these exchange rates,

The empirical results show that Sri Lankan exchange rates against the main five currencies are non-stationary with stochastic trend, I(1). The means and variances of these distributions appear to change over time. They have fatter tails, LKR/USD, LKR/INR, and LKR/EURO has very high kurtosis, asymmetric shape, serial dependence-positively auto-correlated. The distribution of these exchange rates (except LKR/GBP) has positive skewness. GARCH effects are statistically significant for all series. GARCH variance distributions are skewed to the right, and leptokurtic for all 5 cases. GARCH variance series are highly auto correlated, Auto correlation function, (acf) decay slowly. The trace test of co-integration analysis indicates that there is no co-integration relationship among Sri Lankan exchange rate values against main partner's currencies. The statistical results of this study have important implications for balance of payments, mean-variance portfolio selection, option pricing models, exchange rate determination, risk modeling and financial risk management, forecasting, market efficiency.

Key words: Nonlinear, non-normality, cointegration, GARCH, fatter tails, volatility, nonstationary.

D4.

The Dynamic Linkages between Economic growth and Exports in Sri Lanka Evidence from Co-integration and Granger Causality Tests

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Export sector of a country has a vital role in the economic growth of a country. Empirical evidence on export growth nexus economic growth has been mixed and inconclusive. This study is examining the validity of the three hypotheses for testing the Export-Led growth paradigm for Sri Lanka, (i) whether GDP growth and export growth are co-integrated, (ii) whether export growth Granger cause GDP growth,(iii) Whether GDP growth granger cause export growth. This study tests the hypothesis by analyzing the case of Sri Lanka using annual time series data for the period from the year 1960 to 2010.The study employs a variety of analytical tools consisting unit root tests, co-integration analysis, with Error correction model (ECM) analyses and Granger causality tests. The empirical results show that bi-direction long run causality exists between real export growth and real GDP growth, and supports the existence of a "stable" long-run equilibrium relationship between real export growth and real GDP growth. The study fails to reject the all three hypothesis during the study period. The findings provide empirical support for the Export -Led growth paradigm in Sri Lanka and existence of the long run relationship. The paper suggests policy prescription that the government of Sri Lanka should put emphasis on promoting growth and development of export industries by ensuring increased productivity in such sector to achieve high rate of economic growth .

Keywords: Export led growth hypothesis (ELGH) Granger causality, Co integration, Error correction model, Unit Root tests,