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Editor's Note

The Jaffna Science Association (JSA) was established in 1991 with the objectives of promoting science, scientific research and advancement of science education & technology. To full fill this mission, JSA is convening annual sessions since its inception to enhance scientific research, dissemination and application of scientific findings.

The JSA has succeeded in convening the 17th Annual Sessions, held on 21, 22 & 23 April, 2010. In this session 38 research papers are presented of which two are from Pure Sciences (Section A), twenty five from Applied Sciences (Section B), eight from Medical Sciences (Section C) and three from Social Sciences (Section D). This book contains the abstracts of the research papers presented at the 17th Annual Sessions of the Jaffna Science Association.

All the abstracts compiled in this book have been reviewed by experts in the relevant fields and their views have been addressed. It is an honour to thank the reviewers for their valuable comments to keep the norm. The work and cooperation of the authors is commendable and I wish them success in their future endeavours and believe that they would continue their contributions to the region.

This volume will be helpful to students, researchers as well as general public and will immensely facilitate to attain the objectives of the JSA.

Dr. E. Y. A. Charles
Chief Editor

Department of Computer Science,
University of Jaffna

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Contents

Abstracts included in this volume which are accepted for presentation at the 17th annual sessions of JSA shall be considered as publications only if presented.

Under-Estimators and Optimality in Mathematical Programming

Selvarajan. S and Srisatkunarajah. S
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In this paper, we study the mathematical programming problem:

$$\text{(P)} \qquad \begin{aligned} &\textit{Minimize } f_0(x) \\ &\textit{subject to } x \in X_0,\ f_j(x) \le 0, \quad j = 1, 2, \ldots, m, \end{aligned}$$

where X_0 is an open subset of $\mathbf{R}^n$ and $f_j : X_0 \to \mathbf{R}$, $j = 0, 1, 2, \ldots, m$ are continuously differentiable functions and $D = \{ x \in X_0 \,/\, f_j(x) \le 0, \quad j = 1, 2, \ldots, m \}$, feasible set.

The objective of this study is to present, how the optimality properties of the under-estimator approximation problems (UP) (defined below) is related to the corresponding properties of the original problem (P).

We begin with under-estimator: The function $h : \mathbf{R}^n \to \mathbf{R}$ is an under-estimator of a function $f : \mathbf{R}^n \to \mathbf{R}$ at $\bar{x}$ over $C \subseteq \mathbf{R}^n$, if for each $x \in C$, $f(x) \ge h(x)$ and $f(\bar{x}) = h(\bar{x})$.

Let $\bar{x}$ be a feasible point of (P). Suppose that for each $j = 0, 1, \ldots, m$, f_j admits an under-estimator $g_j(\bar{x}, \cdot)$ at $\bar{x}$ over X_0 (we note that such under-estimator always exist as the function f_j is an under-estimator of itself). We now define the following approximation problem (UP) involving under-estimators of the objective function and the constraints of the original problem (P).

Under-estimator-approximation problem is defined by

$$\text{(UP)} \qquad \begin{aligned} &\textit{Minimize } g_0(\bar{x}, y) \\ &\textit{subject to } y \in X_0,\ g_j(\bar{x}, y) \le 0,\ j = 1, 2, \ldots, m. \end{aligned}$$

It is established that every KKT (Karush-Kuhn-Tucker) point of the original problem (P) is indeed a KKT point of the approximation problem. In fact this property of the approximation problem can well be utilized to establish KKT sufficiency results for different class of multi-extremal programming problems with several local solutions that are not global. A new KKT sufficiency result is furnished to illustrate this point.

Keywords: Global optimality, Under-estimators, KKT conditions.

Effect of Input Current on Single Neuron Dynamics

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Recently there has been great interest in simulating brain activities using neural network. In fact several experimental and computational studies have been carried out to simulate behavior of human brain using neural network. The objective of this paper is to simulate different type of brain functions via single compartment neuron model. We studied single compartment neuron model to mimic different dynamical behavior of the brain. Especially, we investigated the quantitative solutions of this neuron model by a small perturbation around its rest state (fixed point or equilibrium point). The perturbation is made by introducing an external input current which stand for background activity of the entire neural system. The effect of the external input current to neuron dynamics around its rest state is investigated and observed that the high value of input current makes high bursting activity in the neuron similar to the spontaneous bursting observed in some experiments on brain tissue. The behavior of the neuron was found to be very sensitive to the input current and the neuron membrane potential exhibit stable stationary states, limit cycles and bursting like trajectories similar to those were observed in some *in vitro* and *in vivo* experiments. The observed results on the effect of the input current on single neuron dynamics shows sensitive dynamics; exhibiting various type of trajectories. It is an important aspect that would generate interest among the scientists working on brain simulation.

Key words: Neural network, brain simulation, single compartment neuron model.

Effect of selected soil borne Bacteria on the germination of some seeds of Fabaceae family

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This study was aimed to find out the effect of selected soil borne bacteria on the germination of Fabaceae plant seeds and to recommend the genus which could be used for plant growth promotion. Four different bacterial species such as *Bacillus licheniformis, Proteus vulgarisi, Pseudomonas aeruginosa* and *Staphylococcus aureus* were used. Bacterial inocula were prepared in saline water separately. Surface seeds of *Phaseolus aureus, Phaseolus mungo, Vigna sinensis, Vigna unguiculata, Phaseolus vulgaris*, White and green varieties of *Cicer aerietinum* were soaked in inocula for 10min seperately. At uniform intervals equal number of seeds were transferred into sterile Petri-dishes containing sterile moisten cotton wool. Plates were incubated (4 days) in light at room temperature (30°C) and the number of seeds germinated and lengths of germ tubes were measured. Controls were also maintained without the inoculation of bacteria. Data were analyzed statistically by significant "t" test ($p < 0.05$) with controls and found significant difference in the mean length of germ tubes of soaked seeds compared with control. Germination of White variety and Green variety of seeds *C.aerietinum* was promoted by *Bacillus licheniformis* and *Proteus vulgarisi* where as seeds of *Vigna unguiculata, Phaseolus vulgaris and Vigna sinensis* were promoted by *Proteus vulgarisi, Pseudomonas aeruginosa* and *Staphylococcus aureus* respectively. The degree of promotion varied among plant seeds and among the different bacterial species used. *Bacillus licheniformis* showed high promoting effect on both White and Green varieties of *C. aerietinum* than rest of the bacteria showed promoting effect on the respective seeds.

Key words: *Bacillus licheniformis, Proteus vulgarisi, Pseudomonas aeruginosa* and *Staphylococcus aureus.*

Study the effect of local Nitrogen sources on the development of bacterial culture

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Carbon and the nitrogen sources in the culture medium affect growth of microorganisms. The objective of this study is to determine the effect of locally available nitrogen sources on the growth of different bacteria species. The effects of four local nitrogen sources sesame, coconut, ground nut and soy meat seed cakes, on the growth of five different bacterial species were investigated *In vitro*. One loop of 24 hours old cultures of *Bacillus coagulans*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Klebsiella* sp and *Staphylococcus aureus* were used to prepare serial dilutions. Agar plates that contain nutrient supplement replaced with different seed cakes of $28gL^{-1}$ were inoculated with 0.1mL of 10^{-6} dilution of different bacterial species. Non-replaced nutrient supplement ($28gL^{-1}$) plates served as control. The plates were incubated at 37°C for 24-48h and bacteria colonies were counted. There were no significant differences ($p< 0.05$) observed among mean number of colonies of *Klebsiella* sp in plates containing sesame (82.2 ± 2.6), coconut (84.4 ± 6.9), ground nut (77 ± 1.6) and soy meat (82.8 ± 5.7) seed cakes when compared with the control (81.8 ± 8.3). The results indicated that sesame, coconut, ground nut and soy meat seed cakes could completely replace the nutrient agar for the growth of *Klebsiella* sp. Coconut seed cake inhibited the growth of *Pseudomonas aeruginosa*, *Escherichia coli*, *Staphylococcus aureus* and *Bacillus coagulans*. To grow *Bacillus coagulans*, *Escherichia coli*, *Pseudomonas aeruginosa* and *Staphylococcus aureus*, soy meat seed cake could function as supplementary medium instead of nutrient agar.

Key words: *Bacillus coagulans*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Klebsiella* sp. and *Staphylococcus aureus*.

Susceptibility of Tomato Cultivars to Root-Knot Nematode *Meloidogyne Incognita* (Kofoid and White) in Jaffna District

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Root-knot nematodes infect a wide range of vegetables particularly tomato and cause losses up to 80% in heavily infested fields. The control of plant parasitic nematodes is difficult task, has mainly depended on chemical nematicides for decades and remarkable reduction of nematode population has been achieved. Soil nematicides are effective and fast-acting, but detrimental to the environment and human health. Present investigation was with the aimed to screen the commonly grown cultivars in Jaffna against root-knot nematode (*Meloidogyne incognita*). Experiments were conducted in ten liter pots each containing six Kg of autoclaved soil mixed with basal fertilizers at the recommended dosage. Three weeks old tomato seedlings of commonly (locally) grown cultivars such as Palaly local, Roma, Shang thung, KC1, Urumpirai cultivar and T-246 were planted in to each of the pots. Single root-knot nematode female with eggs (Cyst) was used as inoculums for each pot and was inoculated a day after transplanting. Complete randomized design was used for this experiment containing six treatments with four replicates. At the time of 50% of flowering, galls in each root clump were counted. Results showed that significant (∞=0.05) and lowest (41.5) number of galls was found in Urumpirai cultivar than others (Figure 2). Results showed that presence of root galls along with *Meloidogyne incognita* female on six varieties of tomato indicates that none of the six varieties were resistant to *Meloidogyne incognita*. However, significance differences among varieties in the presence of galls indicate different levels of susceptibility. As such urumpirai cultivar is the best among the tomatocultivars to cultivate in nematode infested fields. But field trails are being conducted to confirm the results.

Key words: Gall, *Meloidogyne*, tomato, Urumpirai cultivar.

Insecticidal properties of *Gymnema sylvestre* R.Br against Rice weevil, *Sitophilus oryzae*

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Considerable efforts have been focused nowadays on plant derived materials, potentially useful as commercial insecticides. In this regard, botanicals extracted from the medicinal herb, *Gymnema sylvestre* (Family: Asclapiadaceae) were studied for their insecticidal activities against stored product insect pest, *Sitophilus oryzae.* Seven different formulations i.e. leaf extract, leaf powder, leaf powder extract, leaf powder paste, gymnemic acid powder, gymnemic acid paste, gymnemagenin extract of *G. sylvestre* leaves were evaluated. Adults of *S. oryzae* were exposed to the treated rice and the mortality was assessed after 24h, 72h, 7day, 14day and 21 day of exposure at room temperature and RH. Then all adults were removed and the treated substrate remained at the same conditions for an additional 30 days, after this interval the commodity was checked for progeny production. To assess the effects of different extracts on mortality and progeny production 20 rice weevils were introduced in the rearing chamber and were kept undisturbed until counting. Treatments were replicated three times. Mortality data was analyzed using SAS. Exposed *S. oryzae* showed mortality in all formulations and the average mortality percentages indicated that the extracts caused significant mortality on the target insect. The percentage of reduction in progeny production of rice weevil on rice treated with different *G. sylvestre* leaf extracts was determined by the formula used by Khoshnoud (2008) and were in descending order as leaf extract (60.9%), leaf powder extract (58.9%), Gymnemagenin extract (54.3%), Leaf powder paste (48.6%), Gymnemic acid paste (29.3), Gymnemic acid powder (13.6%) and leaf powder (20.6%). Observed mortality percentage was increased with increase in time intervals after application but the extract concentrations had no significant effect. Cumulative mortality (71.1%) and progeny suppression (60.9%) were at the highest level in leaf extract. Therefore, these results indicate that *G. sylvestre* can be used for the protection of stored grain from infestations of *S. oryzae.*

Key words: *Gymnema sylvestre*, progeny production, mortality, *Sitophilus oryzae,* extracts.

Impact of Trade Policy Change on Sri Lankan Apparel Exports

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Prominent growth in the apparel sector led to the profound transformation of the Sri Lankan economy. Sri Lanka exports around sixty percent of its apparel products to US and its apparel export to US contributes a fairly sizable portion of Sri Lanka's foreign exchange earning. The termination of MFA quota by the end of year 2004 offers a wide range of openings and simultaneously increased the competition among countries. Primary aim of this research is to quantify the impact of the elimination of MFA quota on Sri Lankan apparel export category HS 6104. More over it has taken effort to estimate the import demand elasticities of HS 6104 in the US import market. The secondary data were collected from the US department of statistics and the analyses were carried out within the framework of the Linearized Almost Ideal Demand System. The results suggested that the phase out of MFA quota provided an opportunity to Sri Lankan apparel exports to US. The negative sign of the own price coefficient stands as an evidence of consistency with the demand theory. The estimated uncompensated own price elasticity of -1.142 suggested that the revenue of Sri Lankan apparel sector can be increased by reducing the unit price of the export clothing. The resulted expenditure elasticity of 1.6264 suggested that the American consumers have a higher expenditure preference to the Sri Lankan clothing than Chinese, Indian and Bangladesh clothing.

Key words: Sri Lanka, apparel industry, Quota, Linearized AIDS model, MFA.

A Performance Comparison of Mobility Models for Mobile Ad-hoc Networks

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Mobile Ad-hoc Networks (MANETs) is a kind of wireless Network. MANETs consist of a collection of mobile wireless nodes, with limited communication range, communicating directly with each other without infrastructure support. In the research of MANET, simulation tools play an important role. Network simulation is a technique where a program models the behaviour of a network either by calculating the interaction between the different network entities (hosts/routers, data links, packets, etc) using mathematical formulas, or actually capturing and playing back observations from a production network. Due to the technical and economical difficulties in conducting field experiments with mobile wireless devices, researchers often depend on simulation based studies to carry out performance evaluation of newly developed applications and protocols. Mobility models are often used in these simulations based experimental studies to describe and model the movement of mobile nodes, since in a mobile Ad-hoc network it is very common that nodes move around in the area considered. Mobility patterns may play a significant role in determining the protocol performance; it is desirable for mobility model to emulate the movement pattern of targeted real life application in a reasonable way. Our aim in this project is to implement mobility models in the Jist/SWANS simulator and compare performance of mobility models in the area considered. We have implemented Gauss-Markov, and Random Direction mobility models for the mobile ad-hoc networks in Jist/SWANS Simulator. In order to validate the implementation of mobility models, we used Ad-hoc On-demand Distance Vector routing protocol (AODV) and measured its performance metrics in the considered simulation environment. In our experiments we have varied the experimental parameters uniformly and all other simulation parameters remain the same between experiments. Our comparative results for different mobility models are discussed on a variety of simulation settings and parameters. The message activity, average messages sent and received per node, number of messages delivered, memory used and elapsed time are measured for the routing protocol and also for the varying number of node densities. We found that RREQ messages in AODV protocols make up the majority of the messages passed throughout the network. Furthermore, the proportion of RREQ messages also increases as the number of nodes increases. There are proportionally more RREQ messages because they are flooded through the network upon each route request. It is obvious to see that RREQ messages make up most of the traffic. One suggestion to improve the overall performance would be to reduce the number of RREQ messages sent. The message activity increased sharply with increasing number of node density and also increased average message sent and received by nodes. It was observed that AODV performance decreases due to increasing message activity caused by increasing number of nodes or density. When we increased the number of nodes then number of massages delivered also increases. This is because when the number of nodes increases, more and more nodes can stay closer to each other and more and more messages get delivered. It was also observed that the average packets received per node during the simulations with varying number of nodes. As the packets received increases, nodes start to serve the requests of other network nodes more and consume more energy, and hence create more overhead. Since most of the packets sent in AODV routing protocol are broadcast packets, the number of packets received per node is high. The request packets are sent to the selected backbone nodes. When the node density was increased the number of data items that a node can save in its memory increased. So the memory used for protocol is also increased. Our future work includes validating the performance of many other recently developed protocols in the presence of the implemented mobility models. Also there are new mobility models proposed by researchers and which can be added to the simulator and their performance can be analyzed as well.

The Use of Colour Sift In Road Sign Recognition

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The Colour SIFT can be used to extract local invariant features from a colour image. It is an extended version of SIFT (Scale Invariant Feature Transform) method. The SIFT descriptor basically characterizes the local edge distribution (intensity distribution) around key points in the image but the Colour SIFT considered colour gradients, rather than intensity gradients, and put this into the Gaussian derivative frame work of the SIFT method. Colour SIFT based descriptor outperform the traditional intensity based SIFT, due to its significant increase in discriminative power.

In this paper, we propose a real time method to detect road signs in an image and recognize them using Colour SIFT to observe the performance of Colour SIFT in road sign recognition. The three colour (red, blue and yellow) road signs are detected and categorized by Bayes classifier. At the end of the detection, the road sign labels were extracted from the image. In the recognition phase, Colour SIFT is used to extract the local invariant features of the image labels and recognition is done by matching the extracted features with the stored features of the standard road signs in the database. A nearest neighbour indexing method is used to compute the matches. Then the match scores are used to decide whether the standard road sign with the highest match score is the correct one or the detected image label does not belong to any of the standard road signs in the database. This system has been tested using 71 Sri Lankan road signs. 54 of them were recognized correctly. Colour SIFT performs a 76% of correct recognition to this problem.

Key words: Road Sign Recognition, SIFT, Color SIFT, Bayes Classifier.

An Automated System for Inventory Management in University

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The current inventory management system in the institution like University of Jaffna is manual. As we know, every branch maintains its records results much of the data being duplicated. This leads need of considerable amount of human resources, unsuccessful searching of existing records and inconsistency. To overcome or to eliminate the difficulties is to make inventory system management automated. Thus has not developed yet here.

This system maintains inventory for different purposes and is an on line multi-user system. It is structured by ER- diagram (User information, Item details, Department information, Supplier details, and so on) and assigns each entity with their relationship and attributes according to them the database is created in normalized form. Hence the system contains thirteen numbers of tables. And importantly; it has centralized database. It will provide an efficient database management and generate variety of reports that are needed to various levels of Administration.

The automated system also provides validating checks as to make sure the correct information is stored at any time, to implement this, it prompts with appropriate message. This software includes user identification this will be an authentication of user such as passwords (Encryption), account type, Main interface with all faculties and centers, Database backup facilities and recovery. The software was designed using object oriented programming methodology and implemented.

Through this system, approximately 90% of duplication has been removed. The user can save lots of time and can find data with less human efforts. So, it was embedded with graphical user interface to provide ease of use to the client. Which gives easy way to insert, update and delete. The proposed system can be used in any institutions like University to handle completion of inventory records easily; And Centralized database can be extended to distributed database in future, if necessary.

Key words: Inventory management, database.

A Database Management System for Public Information of Point-Pedro Divisional Secretariat

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The Divisional Secretariat, Point-Pedro follows manual processing for keeping details of public. Every section maintains its own files leading much of the data being stored multiple times. This leaded into inconsistency, delay and unnecessary work load. Hence it was realized that a computer aided system is essential to overcome the difficulties in the manual system.

Activities of various sections of the Divisional Secretariat are studied and the details needed to develop a computer system are identified. The details considered fall into the following categories: families, family members, farmers, fishermen, disabled persons, dropout students, vehicles and live stocks. Further birth, marriage and death details are also considered which are much complex to handle. Database is created by drawing detailed Entity-Relationship diagrams and then by normalizing.

Suitable integrity constraints are used to avoid unformatted data and to avoid unnecessary null values. Backup and recovery subsystem is included to deal with problems that occur on system failures in the middle of any actions. The software is written in Java with suitable user interfaces. Several features are included to make the system easy to use as well as secure. For example a family is assigned a unique identification number which is passed to the following interfaces automatically and it cannot be modified in those interfaces. Data can be viewed by entering family number or part of it in main interface or by entering some other details in the advance search interface.

Approximately 80% of redundancy has been removed by this system comparing to the manual system, by using a single database for multiple sections where earlier each section maintained their files separately. System can speed up the completion of tasks approximately by 80% in particularly when the task involves searching for information. A task can be performed within few seconds using this system while the manual one needs several minutes and labor. This system removes redundancy, speeds up searching information and reduces average time taken to complete a task.

Key words: Public information management, Database management system.

Visualization of Brain MRI Images and Abnormal Region Identification

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Visualization of human brain from a volume of datasets obtained from MRI Scanner is essential for medical analysis. MRI (Magnetic Resonance Imaging) is a powerful medical imaging technique used primarily in medical settings to produce images of the inside parts of the human body. Any analysis for human brain needs minute details of its structure because of its highly complex nervous system. A system has been developed to enhance and visualize MRI images and segment the abnormal region.

One MRI dataset contains thousands of 2D MRI slices. The system which was developed in matlab reads each and every slice and displays the axial, sagittal, and coronal view of the brain. Also every slice can be enhanced by filtering, histogram equalization, edge detection, and thresholding techniques to have a more quality image.

The more the quality the more useful they are for distinguishing abnormal regions. The watershed algorithm is one of the major segmentation method based on the topology of the image. This method can be used to isolate the image portions which have different intensities. The system uses this technique to segment abnormal regions of brain from the MRI images so the users can easily analyze the abnormal portions and identify its proper pattern.

In most of the hospitals in SriLanka, including the Teaching Hospital in Jaffna, brain abnormalities are segmented from MRI images by marking the abnormal regions slice-by-slice manually. The task of manually segmenting brain abnormalities is generally time-consuming and difficult. Comparing with this method, our system provides a speedier and efficient way for the segmentation of brain abnormalities.

Key word: MRI Image visualization, brain abnormal region identification, image segmentation.

Preliminary Studies to Increase the Ethanol Content in Wine from Grapes Available in Jaffna Peninsula

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This study was aimed to increase the ethanol production from grape must (juice) with *Saccharomyces cerevisiae*. The formulated Yeast extract, Peptone and Sugar (YPS) medium contained yeast extract, 2.5gL^{-1}; bacteriological peptone, 1.15 gL^{-1}; $(NH_4)_2HPO_4$, 0.25 gL^{-1}; $MgSO_4.7H_2O$, 0.025 gL^{-1} and Glucose, 10 gL^{-1} at pH 5.0. When the YPS medium was inoculated with *S. cerevisiae,* 3.75(±0.025) gL^{-1} ethanol was produced at 30°C and pH 5.0. When glucose was replaced with the same amount of sucrose (Table sugar), ethanol production increased to 4.25(±0.15) gL^{-1}. When sucrose concentration in the YPS medium was changed from 50, 80 and 100gL^{-1} respectively, 26.45(±0.5) gL^{-1}, 45.4 (±0.25) gL^{-1} and 43.7 (±0.25) gL^{-1} ethanol were obtained at 22h. To find the effect of mixing on ethanol production, the experiment was preceded with media consisting of different concentrations of sucrose (50, 80 and 100gL^{-1}) and the fermentation was carried out under stationary condition as the control. The highest ethanol production [47.15(±0.25) gL^{-1}] was obtained in the medium with 80 gL^{-1} sucrose under stationary condition. The non peeled grapes and peeled grapes were homogenized and the extracts were prepared. The composition of Non Peeled Grapes Extract (NPGE) and Peeled Grapes Extract (PGE) were analyzed. NPGE contained higher content of total sugar, protein, acid as Tartaric acid and ash [86(±0.1) gL^{-1}, 6.587(±0.2) gL^{-1}, 11.7(±0.2) gL^{-1} and 0.65(±0.23) gL^{-1} respectively] than PGE [80(±0.14) gL^{-1}, 5.687(±0.2) gL^{-1}, 11.25(±0.2) gL^{-1} and 0.51(±0.21) gL^{-1} respectively]. The NPGE and PGE were supplemented with the nutrients of YPS medium except sucrose. Ethanol production from NPGE and PGE was compared with 80gL^{-1} sucrose with YPS medium. The highest ethanol [51.075 (±0.2) gL^{-1}] was produced in NPGE medium than that in PGE medium (41.8(±0.25) gL^{-1}) and 80 gL^{-1} sucrose medium (47.75(±0.2) gL^{-1}). Hence NPGE was selected as the carbon source for further study.

Key words: Grapes Extract, Yeast extract Peptone Sugar (YPS) medium, *Saccharomyces cerevisiae,* Wine, Sucrose.

Supplementation of Nitrogen Sources to Grapes Extract to Improve Ethanol Production

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Grapes produced in Jaffna could be used for wine production since there are no facilities available to preserve them. Mainly Istralian blue variety is produced in Jaffna and it contained (gL^{-1}) 86 (±0.1) total sugar, 6.587 (±0.2) protein, 11.7 (±0.2) acid as Tartaric acid and 0.65 (±0.23) ash. This study was aimed to increase the ethanol production by optimizing the nitrogen sources. *Saccharomyces cerevisiae* was grown, in a medium containing, Non Peeled Grapes Extract (NPGE) with (gL^{-1}) the total sugar of 86, yeast extract, 2.5; bacteriological peptone, 1.15; $(NH_4)_2HPO_4$, 0.25 and $MgSO_4.7H_2O$, 0.025 at 30°C and pH 5.0 under stationary condition. Increase in the concentration of $(NH_4)_2HPO_4$ from 0.25 to 1.0 gL^{-1} increased the ethanol production from 40.8 to 49.9 gL^{-1}. To the above medium 1.0 gL^{-1} of $(NH_4)_2HPO_4$ was added and supplemented with sucrose to bring the total sugar concentration to 80, 120, 160, 200 and 240 gL^{-1}, highest ethanol production [82.8 (±0.125) gL^{-1}] was obtained with the total sugar concentration of 240 gL^{-1}. NPGE supplemented with sucrose (total sugar 240 gL^{-1}), yeast extract (2.5 gL^{-1}), bacteriological peptone (1.15gL^{-1}) and $MgSO_4.7H_2O$ (0.025gL^{-1}), various concentrations of $(NH_4)_2HPO_4$ (1.0 to 2.0 gL^{-1}) was added and the ethanol production was increased from 82.8 to 86.3gL^{-1}. Addition of yeast extract (1.25 to 10 gL^{-1}) and bacteriological peptone (0.575 to 2.30 gL^{-1}) did not improve the ethanol production. This study showed that ethanol production could be improved from 40.8 to 86.3 gL^{-1} by supplementing (gL^{-1}) 154 sucrose, 2.0 $(NH_4)_2HPO_4$, 2.5 yeast extract, 1.15 bacteriological peptone and 0.025 $MgSO_4.7H_2O$ to NPGE.

Key words: Grapes Extract, Yeast extract Peptone (YP) medium, *Saccharomyces cerevisiae,* Wine, Sucrose.

Increasing the Ethanol Content of Wine by Fed – Batch Process

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The aim of this project is to increase the ethanol production by Fed-batch process. The main grapes variety produced in Jaffna peninsula is Istralian blue and contained (gL^{-1}) 86(±0.1) total sugar, 6.587(±0.2) protein, 11.7(±0.2) acid and 0.65(±0.23) ash. *Saccharomyces cerevisiae* was grown, in NPGE medium containing (gL^{-1}), Non Peeled Grapes Extract (NPGE) (with the total sugar of 86 gL^{-1} by supplementing with sucrose 154 gL^{-1}); yeast extract, 2.5; bacteriological peptone, 1.15; $(NH_4)_2HPO_4$, 2.0 and $MgSO_4.7H_2O$, 0.025 at 30°C and pH 5.0 under stationary condition and the ethanol production at 22h was 86.3 gL^{-1}. When 100mL of NPGE medium (total sugar 240 gL^{-1}) was inoculated at 30°C with *S. cerevisiae,* incubated for 22h and 100 mL of NPGE medium with either 480 or 240 or 120 gL^{-1} total sugar were supplemented, the ethanol produced at 44h was 72.5 (±0.2), 84.0 (±0.21) and 78.2 (±0.28) gL^{-1} respectively. Another three sets of experiments were performed by withdrawing 50 mL of spent medium at 22h from 100mL NPGE medium (in the total sugar concentration 240 gL^{-1}) and adding either 50mL of NPGE medium (480 gL^{-1} total sugar) or 25 mL of NPGE medium (480 gL^{-1} total sugar) & 25 mL of distilled water or 12.5 mL of NPGE medium (480 gL^{-1} total sugar) & 37.5 mL of distilled water and the ethanol produced at 44h was 71.9(±0.2), 81.7(±0.3) and 77.3(±0.5) gL^{-1} respectively. Since the ethanol production was not improved, another set of experiments were carried out by taking NPGE medium with 240 gL^{-1} total sugar was fermented to 22h, NPGE medium with 5mL of the spent medium was withdrawn and supplemented with (5mL) either 240 or 120 or 60 gL^{-1} total sugar and the ethanol production was 76.5(±0.3), 88.0(±0.25) and 83.4(±0.18) gL^{-1} respectively at 44h. This study was able to improve the ethanol production from 86.3 to 88.0 when the spent medium (950 mL) was supplemented with reduced volume (50 mL) of fresh NPGE medium. In these studies alcohol content of wine was not improved.

Key words: Grapes Extract, *Saccharomyces cerevisiae,* Wine, Sucrose.

Nutrient contents of Palmyrah root tuber preparations from Different areas of Jaffna peninsula

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Palmyrah is a traditional plant grown in Jaffna peninsula and its products mainly the palmyrah fruit pulp, unboiled & dried (*'odiyal'*) and boiled & dried palmyrah root tubers (*'pulukkodiyal'*) have important role in the traditional foods of the population living in this area. In Jaffna peninsula calcic red yellow latasolic soil is found in most of the areas while in some areas the soil contains high amount of ferrous oxide. Thus it is important to analyze the nutritional composition of unboiled & dried and boiled & dried palmyrah root tubers obtained from different areas of Jaffna peninsula such as Delft, Kayts, Punnalaikadduvan, Arali and Kudathanai. The mean moisture, ash, starch, fat, fibre and protein contents of unboiled & dried root tubers from different areas were 15.54(±0.56), 1.46(±0.3), 74(±1.22), 1.6(±0.3), 2.1(±0.55) & 4.35(±0.66) % respectively and that of boiled & dried palmyrah root tubers were 16.15(±0.9), 1.3(±0.26), 73.9(±1.9), 1.4(±0.1), 1.31(±0.57) & 4.8(±0.53) % respectively. Unboiled & dried palmyrah root tubers from Delft and boiled & dried root tubers from Arali showed the lowest and highest contents of moisture respectively. The highest content of protein 5.42(±0.06) % was found in boiled & dried palmyrah root tubers from Kayts. Protein contents of unboiled & dried root tubers from Kudathanai (3.41(±0.01) %) and Punnalaikadduvan (4.4(±0.02) %) showed positive correlation with their soil nitrogen contents (31.6 & 40 µg nitrate-nitrogen per g of soil respectively). Unboiled & dried palmyrah root tubers from red soil (Punnalaikadduvan) and boiled & dried root tubers from sandy soil (Delft) consisted the highest and the lowest contents of fibre respectively. Both ash & fat contents contributed a small proportion in the nutritional contents of unboiled & dried and boiled & dried palmyrah root tubers. There were no obvious differences found in the starch contents of both the flour preparations from different areas. Based on the reference values of the mineral content of the soil and the nutrient content of samples studied there were no correlation obtained. Thus the variation is mainly based on the genetic make up of the plant which needs to be studied.

Key words: Nutrient, Palmyrah root tuber, Protein, Soil property.

Antimicrobial Effect of Palmyrah Root Tuber from Different Areas of Jaffna Peninsula

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The objective of this study is to determine the antimicrobial effects of palmyrah root tuber on the growth of bacteria that cause gastro intestinal tract disorders in humans. A preliminary study was carried out to determine the effects of aqueous and ether extracts (1g/10mL) (40, 60, 120 & 180 µL) of boiled & dried and unboiled & dried palmyrah root tuber flour from different areas of Jaffna on the growth of *Pseudomonas* spp., *Klebsiella* spp., *Proteus* spp. & *Escherichia coli.* The areas selected were Delft, Kayts, Kudathanai, Punnalaikadduvan and Arali. Ether extracts of boiled and unboiled dried palmyrah root tuber flour from different areas showed no inhibitory zones and similar observation was obtained for aqueous extracts of boiled & dried root tuber flour. Aqueous extracts of unboiled & dried palmyrah root tuber flour (180 µL) from different areas produced zones of inhibition at 4h of incubation and disappeared at 24h. Aqueous extracts from Delft - unboiled & dried root tuber flour (180 µL) produced the highest inhibitory zones against *Pseudomonas* spp. (0.7 cm), *Klebsiella* spp. (0.6 cm), *Proteus* spp. (0.7 cm) & *Escherichia coli* (0.65 cm). Zones of inhibition produced were compared with standard antibiotics, those produced larger clear zones at small volume (20 µL). The standard antibiotics and their concentrations used were nalidixic acid, cephalexin, amoxicillin, nitrofurantoin, ampicillin and gentamycin and 1.5, 0.5, 0.1, 3, 0.5 and 0.5 µg/ µL respectively. Nalidixic acid and cephalexin produced clear zones of 1.5 & 1.3 cm respectively against *Klebsiella* spp. while gentamycin produced inhibition zone of 1.5 cm against *Pseudomonas* spp. *Escherichia coli* were sensitive to antibiotics such as gentamycin (2.6 cm), nitrofurantoin (1.5 cm) and nalidixic acids (2.2 cm). *Proteus* spp. was resistant to antibiotics like amoxicillin, nalidixic acid and cephalexin. Thus antibacterial activity found in the aqueous extracts of unboiled & dried palmyrah root tuber is less compared to most of the standard antibiotics except against *Proteus* spp.

Hydrolysis of Starch in Palmyrah Root Tuber Preparations

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The objective of this project was to hydrolyze the starch in unboiled and boiled dried palmyrah root tubers. The starch contents of the two flour preparations were 120 gL^{-1}. When 160 gL^{-1} unboiled & dried root tuber flour suspensions at pH 5 were hydrolyzed with the commercial α-amylase, glucoamylase and their mixture at 70°C; 9.56, 2.94 and 9.92% of starch were hydrolyzed respectively. Here the activity of glucoamylase was more inhibited than α-amylase by the substances in unboiled & dried root tuber. In order to compare the inhibitory effect of the substances in unboiled & dried root tuber with boiled & dried root tuber, both the preparations were hydrolyzed with glucoamylase and commercial starch was used as the control. When the unboiled and boiled dried palmyrah root tubers and commercial starch suspensions (160 gL^{-1}) were treated with glucoamylase 3, 12.5 and 73% of the starch (at 70°C and pH 5) was hydrolyzed respectively. Thus the activity of glucoamylase was more inhibited by the substances in unboiled & dried root tubers than that of boiled & dried root tubers. Since the commercial enzymes were inhibited by some active principles in palmyrah root tuber the fungus which contaminated unboiled & dried root tuber were isolated and identified as *Aspergillus* sp, *Mucor* sp, *Fusarium* sp and *Rhizopus* sp and the amylase produced by one of them was used. Since *Aspergillus* sp is well known for amylase production, it was selected. The fungal amylase hydrolyzed 4, 38.8 & 12.5% of starch in unboiled and boiled dried root tuber, and commercial starch suspensions (160 gL^{-1}) respectively at 60°C and pH 7.0. Hence the activity of fungal amylase was more effective on starch in boiled dried root tubers than unboiled dried root tubers.

Analysis of the Constituent of the Ice creams sold in Jaffna municipality Area

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Analysis of the carbohydrate, protein and fat content of the ice cream obtained from Municipality area in Jaffna was carried out. Ice creams from sixteen industries were selected, of which included seven large scale (Average production > 25 kg/day) and nine small scale products (Average production < 25 kg/day). Each ice cream sample was collected three times with one month interval. The sugar contents of the ice cream samples were very high and varied from 19.44 to 29.2 g/100g with the mean of 24.6 (± 0.7) g/100g. The mean sugar content of the ice cream from large and small scale producers were 23.6 (± 0.6) and 26.8 (± 0.9) g/100g respectively. The protein content of the ice cream samples varied from 1.5 to 4.0 g/100g and the mean protein content of the ice cream samples from large and small scale ice cream producers were 3.19 and 2.7 g/100g respectively. The fat contents of the ice cream were low and varied from 5.8 to 9.0 g/100g with the mean of 7.2 (±0.8) g/100g. The mean fat content of the of the ice cream samples from large and small scale ice cream producers were 7.0 (±0.4) and 7.2 (±0.8) g/100g respectively. Only 13.3% of the ice creams contained fat content above the minimum permitted level (8 %) by Bureau of Sri Lankan standard. The studies show that the ice cream produced in Jaffna Municipality area do not comply with the Sri Lankan standards by having higher amount of sucrose and low amount of fat.

Key words: Total sugar, ice cream, protein, fat, nutrients.

Microbial Analysis of Ice cream sold in Jaffna Municipality Area

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Studies on the microbiological quality of ice cream obtained from Municipality area in Jaffna was carried out. Ice cream produced by seven large scale (average production > 25 kg/day) and nine small scale (average production < 25 kg/day) manufacturers were studied. Each ice cream sample was collected three times with one month interval. The aerobic bacterial count ranged from 8.3 $x10^2$ to 7.6 $x10^5$ colony forming units per gram (cfu/g). About 18.75% of products contained high amount of aerobic bacterial counts than the Sri Lankan standard level (2.5 x 10^5 cfu/g) and the mean aerobic bacterial count of the large scale and small scale ice cream samples were 1.5x 10^5 and 2.2x10^5 cfu/g respectively. There was no significant difference ($p < 0.05$) between the mean aerobic bacterial count of large scale and small scale ice cream products. The anaerobic bacterial counts of the ice cream samples varied from 0 to 22.5 cfu/g and the mean anaerobic bacterial count of the large scale and small scale ice cream samples were 10.7 and 25.5cfu/g respectively. There was significant difference ($p < 0.05$) between the mean anaerobic bacterial count of large scale and small scale ice cream products. Out of the sixteen ice cream products considered fifteen ice cream samples were contaminated with coliform bacteria and four products contained faecal contamination. This was confirmed by analysing the ice cream samples for *Escherichia coli.* Among the four ice cream samples one was from the large scale producer and three were from small scale producers.

Keywords: Aerobic bacteria, Anaerobic bacteria, Coliform, Faecal coliform, *Escherichia coli, Tubercle bacilli.*

Nitrate Content of Selected Vegetables Grown In Jaffna and Potential to Reduce Nitrate Accumulation in *Amaranthus*

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Nitrate content of some selected vegetables from local market was analyzed to find whether they have nitrate risk or not. Organic manure usage could reduce the potential nitrate accumulation in edible tissues because of their slow release of nitrogen. Moreover, locally available nitrification inhibitors namely *neem* and *Lantana camera* leaf powder could also be used to reduce nitrification of applied fertilizers and consequently reduce nitrate accumulation risk. A pot experiment with *Amaranthus* was carried out to quantify nitrate accumulation in edible tissues for different treatments. Treatments were T_1 (urea), T_2 (compost), T_3 (poultry manure), T_4 (urea + *neem* leaf powder), T_5 (compost + *neem* leaf powder), T_6 (poultry manure + *neem* leaf powder) and T_7 (urea + *Lantana camera* leaf powder). Complete randomized design was used with three replicates. Average nitrate content in mg/Kg of fresh weight were Amaranthus 162, Brinjal 152, Cabbage 392, Carrot 391, Onion 65, Potato 95, Radish 332 and Tomato 177. Analysis of local vegetables available in market revealed that none of the tested vegetable samples had nitrate content above the risk level of 3.7 mg/kg body weight/day when consumed alone. Results of pot experiment showed that nitrate content of *Amaranthus* varied from 50.97 to 126.26 mg/Kg of fresh weight. Fertilization with organic nitrogen sources significantly reduced nitrate accumulation in edible portion. Further 16%, 26% and 42% reduction in nitrate content was also possible through incorporation of *neem* with urea, compost and poultry manure respectively and 26% reduction achieved by incorporation of *Lantana camera* with urea.

Key words: Nitrate, *Neem*, *Lantana camera*, Urea, Compost, Poultry manure.

Preliminary Studies on the Isolation and Selection of Bacterial Strains to Produce Thermo Active A-Amylase

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The present study is aimed at isolating thermostable α-amylase producing bacterial strains. For this purpose 72 bacterial strains capable of hydrolyzing starch at pH 7.0 [in medium containing (gL^{-1}) nutrient agar, 25.0; agar, 10.0; and soluble starch, 3.0] were isolated from different sources such as soil (42), gruel of rice (09), kitchen waste (06), bakery waste (08), flour mill waste (04) and tea waste (03) by incubating at 37°C for 24h. Single colonies with different sizes [2-4mm (48) and 5-7mm (24)], shapes [round (55), irregular (12) and flamentous (5)], elevations [flat (42) and low convex (30)], colours [pale (34), white (29) and yellow (9)] and margins [entire (55) and irregular (17)] were selected. α-Amylase producing strains were selected based on halo formation with Gram's iodine on starch-nutrient agar plate. Strains which produced clear halos were grown on starch-nutrient agar slants, transferred in to activation medium and incubated in a shaker water bath at 42°C and 120 rpm for 12h. The activated strains were transferred to fermentation medium under the same conditions. Among the 72 strains, 5 strains showed the highest colony diameter to halo diameter ratio. They also produced the highest α-amylase activities in the range of 1-7 UmL^{-1} at 24h. Among these 5 strains, 3 strains were selected based on their α-amylase production and named as S_1, S_2 and S_3. When the three strains were grown in fermentation medium at 80°C and at pH 7.0 α-amylase activities produced by S_1, S_2 and S_3 at 24h were 7.0(±0.21), 5.52(±0.31) and 4.73(±0.27) UmL^{-1} respectively. The optimum temperature of the fermentation to produce highest α-amylase activity was 42°C for all three strains. When the effect of fermentation period on α-amylase production was studied all three strains produced highest α-amylase activities at 24h. Even though the strains S_2 and S_3 produce enzymes with similar kinetic properties they show differences in colony morphology. [The colony morphology (shape, elevation, margin and colour) of the strains S_2 and S_3 were circular, low convex, entire and pale and circular, flat, irregular and pale respectively.] Therefore the strains S_1, S_2 and S_3 were selected for further studies.

Key words: α-Amylase, Thermostable, strains and halo.

Isolation and Selection of Thermo Stable Alkaline Protease Producing Bacterial Strains

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The objective of this study is to select the best alkaline protease producer from locally isolated bacterial strains. For this purpose 92 bacterial strains were isolated from dog (61Nos), beef (17Nos) and fish (14Nos) decaying soil. Single colonies of the isolated bacterial strains were cultivated in nutrient-agar medium at 40°C for 24h. The nutrient agar medium contained (gL^{-1}) nutrient broth, 10.0; peptone, 10.0; sodium chloride, 5.0; and bacteriological agar, 17.5 at pH 7.0. The bacterial cells grown on nutrient-agar medium were transferred to the activation medium, incubated in shaker water bath at 40°C and 120 rpm for 18h.Then they were inoculated to the fermentation medium and incubated in a shaker water bath at 40°C and 120 rpm for 144h. Both the activation and fermentation media were same and contained (gL^{-1}) glucose,10.0; peptone,5.0; yeast extract, 5.0; KH_2PO_4, 10.0; $MgSO_4.7H_2O$, 0.2; and Na_2CO_3, 10.0; at pH 9.5. Among the 92 bacterial strains, selected 36 strains produced the alkaline protease activity, above 4 UmL^{-1} when the protease activity was measured at 70°C and pH 9.5. These 36 strains showed different morphological characters. Single colonies with different size [1mm (5), 2-4mm (17) and 5-7mm (14)], shape [round (19), irregular (4), tip-splitting (2), chiral morphotype (1) and filamentous (10)], elevation [flat (22) and low convex (14)], colour [pale (17), white (4) and yellow (15)] and margin [entire (16) and irregular (20)] were observed. Among the 36 alkaline protease producer's, five strains which gave alkaline protease activity in the range from 90 to 1760 UmL^{-1} were selected and labelled as DS_1, DS_2, DS_3, DS_4 and DS_5 respectively. The strains DS_1, DS_2, DS_3, DS_4 and DS_5 showed maximum proteases production at 72, 80, 108, 66 and 96h respectively and gave the highest protease activities of 140.7 (72h), 1760 (80h), 1420 (108h), 92 (66h) and 1512 (96h) respectively. The half lives of the enzymes from the strains DS_1, DS_2, DS_3, DS_4 and DS_5 were 26, 44, 41, 11 and 39 minutes at 70°C and pH 9.5 respectively. Among the 5 strains, the strain DS_2 produced the highest protease activity and the enzyme showed highest thermo stability. Strain DS_2 was isolated from dog decaying soil.

Key words: Protease, thermostable, isolation, strains and half life.

Isolation and Selection of Thermo Stable Alkaline Xylanase Producing Bacteria from Corn Cob Decaying Soil

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This study focuses on the isolation of thermostable alkaline xylanase producing bacteria and xylanase production from the isolated bacteria. Bacterial strains were isolated from corn cob decaying soil. Bacterial colonies capable of hydrolyzing xylan were selected. Selected 108 bacterial colonies were purified and transferred the xylan- nutrient agar slants. Activated bacterial strains were transferred into the fermentation medium and highest xylanase producing isolates were selected. Strains CS_1 (20.6UmL^{-1}), CS_2 (15.4UmL^{-1}), CS_3 (11.76UmL^{-1}) and CS_4 (11.2UmL^{-1}) were selected for further studies. In order to select the best thermophilic and alkalophilic xylanase producing bacteria, effect of fermentation temperature and initial pH of the fermentation medium on xylanase production were studied in the range of 42-55°C and 7.0-10.0 respectively. At 45°C, strains CS_1 [132.0(±0.09)], CS_2 [120.6(±0.11)] and CS_4 [120.6(±0.44) UmL^{-1}] showed highest xylanase production at pH 8.5 while strain CS_3 [124.0(±0.01) UmL^{-1}] showed highest xylanase production at pH 8.0. Strain CS_1 produced highest xylanase activity [158.5(±0.7) UmL^{-1}] at 32h while strain CS_4 gave 117.1(±0.78) UmL^{-1} at 20h and growth of both strains showed lag phase up to 8h and log phase upto16h. Strain CS_1 produced lowest dry cell mass than strain CS_4 at 45°C and pH 8.5. Under stationary condition strain CS_1 and CS_4 gave highest activities of 100.6(±9.9) and 61.8(±2.2) UmL^{-1} respectively at 48h under aeration (60-65 bubbles/min) strain CS_1 [105.2(±2.4)] and CS_4 [69.2(±3.2) UmL^{-1}] produced highest xylanase activity at 48h.When the medium was mixed in a shaker waterbath (120 rpm) xylanase activity produced by CS_1 and CS_4 were 175.6(±2.9), 79.6(±4.5) UmL^{-1} respectively at 24 h. Therefore, CS_1 could be selected for further study under shaking in waterbath at 45°C and at the initial pH of 8.5.

Key words: Xylan, Xylanase, Thermostable and pH optimum and temperature optimum.

Kinetic Studies of the Alkaline Thermostable Xylanases from Selected Bacterial Strains

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The number of potential applications of microbial xylanases in the pulp and paper industry is gradually increasing and several are approaching commercial use. This industry needs a xylanase, which is very active under alkaline and thermostable conditions. The objective of this study is to determine the kinetic properties of thermo stable alkaline xylanases from locally isolated strains named CS_1, CS_2, CS_3, & CS_4. Xylanase obtained from these four strains showed zero order kinetic for 4 minutes. Activities of the crude xylanase from all four strains were measured at different temperature ranging from 45- 65°C and different pH 7.0- 9.0. Xylanase from CS_1 gave highest activity [145.3(±0.26) UmL^{-1}] at 55°C and pH 8.4 while CS_2, [236.1(±0.17) UmL^{-1}] gave at 55°C and pH 8.0 and CS_3 [188.8(±0.43) UmL^{-1}] showed highest activity at 50°C and pH 8.0. Xylanase from CS_4 gave highest activity [92.1(±0.86) UmL^{-1}] at 60°C and pH 8.4. Michaelis constant of the crude enzymes from CS_1, CS_2, CS_3 and CS_4 to soluble birchwood xylan were 9.9, 15.5, 12.8, 9.2$gL^{-1}$and the Vmax values were 132.4, 282.5, 180.0 and 9.24$mgmL^{-1}$ respectively at the respective optimum conditions of the enzymes. In the absences of additives xylanases produced by CS_2, CS_3 and CS_4 lost all their activities at 30 min at 60°C and pH 8.4 while xylanase from CS_1 retained 5(±0.92) % of its initial activity. Xylanase from CS_1 showed 38(±1.0) % of its initial activity at 55°C and pH 8.4, while xylanase from CS_2 retained 31(±0.86) % of its initial activity. Among the xylanases produced by CS_1, CS_2, CS_3 [retained 26(±0.83) % of its initial activity] and CS_4 [retained 29(±0.92) % of its initial activity] the enzyme from strain CS_1 is more stable at 55°C and pH 8.4.

Key words: Xylan, Xylanase, Thermostable, pH optimum and temperature optimum.

Kinetic Properties of the A-Amylases Produced By the Locally Isolated Bacterial Strains

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α-Amylases have had many commercial applications for several decades. These enzymes are used in textile, paper industries, starch liquefaction, food, adhesives, and sugar production. Due to the industrial importance of α-amylases there is ongoing interest in the kinetic studies of new bacterial strains. The present study deals with the kinetic properties of α-amylases from locally isolated bacterial strains, named S_1, S_2 and S_3. α-Amylases from the strains S_1, S_2 and S_3 showed zero order kinetics for 5.0, 4.0 and 4.0 minutes respectively. When the activities of the enzymes were measured at pH 7.0 and different temperatures ranging from 30- 95°C, enzymes produced by the strain S_2 and S_3 gave highest activities at 80°C and that from the strain S_1 gave the highest activity at 90°C. When the activity of the α-amylases were measured at different pH values ranging from 6.0 – 10.0, the enzymes produced by the strains S_2 and S_3 gave the highest activity at pH 7.0 and 80°C and that from the strain S_1 gave the highest activity at pH 7.0 and 90°C. Michaelis constants (K_m) of the enzymes from the strains S_1, S_2 and S_3 to soluble starch were 2.8, 3.8 and 6.0 gL^{-1} respectively at the respective optimum conditions of the enzymes. When thermal stability of the enzymes were studied without additives, the enzyme produced by the strains S_1, S_2 and S_3 showed 37.6, 33.5 and 35.5% of their initial activities respectively at 30 min and 90°C, and 68.75, 63.19 and 60.14% of their initial activities at 80°C and pH 7.0. Half lives of enzymes from the strain S_1 was 21 minutes at 90°C and pH 7.0 and those from the strains S_2 and S_3 were 51 and 42 minutes respectively at 80°C and pH 7.0.

Key words: α-Amylase, thermostable, pH optimum, temperature optimum and half life.

Identification of a Best 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 best 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 (from 90 to 1760 UmL^{-1}) which were active at pH 9.5 and 70°C. The strain DS_2 produced highest alkaline protease activity (1760 UmL^{-1}) and considered for identification. Strain DS_2 cells are rod shaped, gram positive, motile, facultative anaerobic, catalase positive and formed round or oval spores in swollen sporangia. No soluble pigment was produced by the strain DS_2 on nutrient agar. It had the ability to produce oxidase, urease and indole. It gave negative results to Vogues Proscaeur test. Hydrogen sulfide is not produced by strain DS_2. It did not reduce nitrite and hydrolyse tyrosine. It had the ability to hydrolyse starch and casein. Strain DS_2 grown at 40, 45 and 50°C, with 5, 7, 10 % of NaCl and showed tolerance to the pH values of 7, 8, 9, 10 and 11. Based on the above characters the strain DS_2 expected to belong to genus *Paenibacillus*. The colonies of strain DS_2 had tip-splitting, irregular margin, 1.4(±0.3) mm in diameter, pale in color, low convex elevation, moist and shiny surface, at 24h of growth. It possessed the ability to produce acid from glycerol, D-ribose, D-adonitol, D-galactose, D-glucose, D-mannose, methyl-α-D-mannopyranoside, methyl-α-D-glucopyranoside, N-acetylglucosamine, esculin, D-cellobiose, D-maltose, amygdalin, arbutin, salicin, D-lactose, D-melibiose, D- sucrose, D-trehalose, D-melezitose, D-raffinose, amidon, glycogen, gentiobiose, D-turanose, D-fucose, L-fucose and potassium gluconate and did not produce acid from erythritol, L-arabinose, D-arabinose, D-xylose, L-xylose, D-fructose, L-rhamnose, methyl-ß-D-xylopyranoside, L-sorbose, dulcitol, inositol, D-mannitol, D-sorbitol, inulin, xylitol, D-tagatose, D-lxyose, D-arabitol, L-arabitol, potassium-2-ketogluconate and potassium 5-ketogluconate. Based on the morphological characters, the strain DS_2 expected to be belonging to the genus *Paenibacillus* or *Clostridium*. Based on the biochemical test the strain DS_2 was expected to belong to *Paenibacillus dendritiformis*. By the 16S rDNA sequencing, the strain DS_2 was confirmed to be belong to the Kingdom: Procaryotae; Division: Bacteria; Order: Bacillales; Family: Paenibacillaceae; Genus: *Paenibacillus*; Species: *dendritiformis*.

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

Extraction of pectin from banana peel and its' characterization

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This study was carried out in order to extract pectin from banana peel (BP), and to characterize the extracted pectin. Pectin from BP was extracted using five different methods. In Method IA, fresh BP was blended with water (1:10 w/v), extracted in Con.HCl (pH 1.34) at 65°C for 2hours and filtered. Then pectin was precipitated using 96% ethanol, filtered again and washed with 70% acidified ethanol, 70% & 96% ethanol and finally dried at 30-40°C. In Method IB, dried BP powder was blended with water (1:20 w/v) and extracted as said in method IA. In Method IC, fresh BP was used, but extraction was carried out with Con.HCl at pH 2.2. In Method ID, dry powder was prepared after steaming of BP and extracted similarly as in IA. In Method II, diethylene glycol (10ml) was added to distilled water (400ml) and heated up to 87-90°C, then Con.HCl (2ml) was added. After that 20g of steamed BP dry powder was added in it and extracted similarly as in IA. Pectin yield from IA, IB, IC, and ID were 7.4, 8.9, 5.4 and 9.1% in dry weight basis (dwb), respectively. Highest pectin yield of 13.6% (dwb) was obtained in Method II. The chemical characteristics of banana peel pectin (BPP) were as follows, methoxyl content (MC), 8.5%; degree of esterification (DE), 84.3%; acetyl value (AV), 0.36; and anhydrogalacturonic acid content (AUA), 73.4%. The above values of standard citrus pectin were, 8.6, 78.2, 0.32 and 77.4%, respectively. Physical properties were determined by Jelly firmness testing after preparing jelly with BPP and citrus pectin. The physical properties of BPP were determined as, Jelly grade (JG: 150); Jelly unit (JU: 1102.5-2038.5); setting time (7-10 mins); and Gel strength (GS: 492.2g). The above values for citrus pectin were, 100, 2000-3000, 10-15 mins and 289.2g, respectively. BPP was identified as high methoxy rapid set pectin with higher gel strength. Molecular weight of both BPP and standard citrus pectin was determined as 30,725 and 58,000 respectively, using intrinsic-viscosity method. From the studies it was found that, most of the chemical and physical properties of BPP were comparable to those of standard citrus pectin. Thus it can be used as a versatile functional agent in many foods, for instance in high sugar jams and in dairy products as protein dispersion stabilizer.

Key words: *Pectin, Extraction, Degree of esterification, Gel strength, Molecular weight*

Prevalence and Herbal Management of menorrhagia among Female College Students

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Menorrhagia is the most common type of abnormal uterine bleeding characterized by heavy and prolonged menstrual bleeding. It affects half of all female adolescents today and represents the leading cause of periodic college/school absenteeism among that population. The purpose of this study was to evaluate the menstrual problems (heavy and prolonged bleeding) in female adolescent college students and its effect on their regular activities and their herbal management. This is a cross-sectional descriptive study carried out among the 153 unmarried female undergraduate college students aged 16 - 21 at government college of Kunthavai Nachchiar arts and science college, Thanjavur, South India, India. Data were collected using self administered structured questionnaire; questions were related to menstruation elucidating variations in menstrual patterns, history of menstrual bleeding, and absenteeism from college; and their management. Chi-square test was used to analyse the data. The mean age of the subjects at menarche was 12.5 (±1.82) years, with a range of 10-16 years. The prevalence of heavy and prolonged bleeding were 33(21.57%), 14(9.15%) respectively. The average duration between two periods and the duration of menstrual flow were 29.27 (±4.22) days and 6 (±0.83) days respectively. Among female college students who reported heavy and prolonged bleeding 61.7% were frequently missing college. Among the 47 subjects, 22 subjects (46.81%) treated themselves with herbal extract or decoction. Majority 22(46.81%) participants do not seek medical advice and self treat them with herbal therapy. Most of them were satisfied with *Saraca indica* decoction. Thus it can be concluded that *Saraca indica* decoction could be valuable herbal therapy in managing heavy, prolonged menstrual bleeding.

Key words: menorrhagia, artava vriddhi, perumpadu.

A Preliminary Study on the Efficacy of Dianova on Diabetes mellitus Type - II Patients

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In diabetics in addition to blood glucose level, lipid level is also altered. Therefore the drugs used in the treatment of diabetes should have the effect on blood glucose and lipid profile. Present study was undertaken to determine the effect of Dianova, a poly herbal Sidda formulation on the blood glucose and lipid profile of Diabetes mellitus Type-II patients. The churanam (powder) of Dianova consist of 6 herbs, such as *Gymnema sylvestre (leaves) 1part: Eugenia jambolana (seeds) 1 part: Salasia reticulata (bark) 1 part: Curcuma longa (rhizome) ¼ part: Terminalia chebula (fruit) ½ part: and Phyllanthus embilica (fruit) ½ part.* The best quality of six herbs were initially cleaned with water. Then the ingredients were dried in sunlight. Dried powered was packed in airtight containers. A total of 10 voluntaries of either sex, aged between 55- 65, were included in this study. Diabetes mellitus type-II patients with acute complications and severe hypertension were excluded from this study. Before the administration of the drug under trial, and after the administration of the drug of post prandial blood sugar level and lipid profile were determined at the end of 1^{st}, 2^{nd} and 3^{rd} weeks of a dose of 3 gram Dianova was orally administered with water twice a day for 3 weeks. Post prandial blood sugar levels on 0, 1^{st} , 2^{nd} and 3^{rd} weeks were 120.02 (+/-37.5), 112.09 (+/- 23.23), 92.06 (+/-21.24) and 88.81 (+/- 27.7) mg/dl. Administration of Dianova decreased blood glucose significantly ($p<0.05$). The Cholesterol levels were 182 (+/-2. 30), 174 (+/- 2.8), 162 (+/- 2.9) and 148 (+/- 2.6) mg/dl respectively on 0, 1^{st}, 2^{nd} and 3^{rd} week; Dianova decreased the total serum cholesterol significantly ($p<0.05$). Serum HDL levels were 45.5 (+/- 1.30), 58 (+/- 1.9), 50 (+/- 1.2) and 46.5 (+/- 2.6) mg/dl respectively on 0, 1^{st}, 2^{nd} and 3^{rd} week; Dianova had no significant effect on serum HDL ($p>0.05$). Serum LDL levels were 103 (+/- 2.40), 98.7 (+/- 1. 2), 90.5 (+/- 2.0) and 84 (+/1.7) mg/dl; Dianova decreased serum LDL significantly ($p<0.05$). Triglycerides levels were 184 (+/- 2.40), 178 (+/- 2.10), 163.5 (+/- 2.1) and 158 (+/-2.8) mg/dl respectively on 0, 1^{st}, 2^{nd} and 3^{rd} week; Dianova decreased serum triglycerides significantly ($p<0.05$). The present study shows that the Dianova has the hypoglycemic effect and hypohyperlipdaemic effect. The present preliminary study with a larger sample size and longer duration should be undertaken to conform their effect of Dianova.

Key words: *Diabetes mellitus, Dianova., Siddha formulation, antihyperlipidaemic poly herbal.*

Effect of *Cassia Auriculata* Hot Infusion (Herbal Tea) on Mathumekam (Diabetic) Patients - A Pilot Study

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Cassia auriculata has been widely used in Siddha medicine as avara panchangam chroornam and the main constituent of herbal tea. In folk remedies avarai panchangam of *Cassia auriculata* are supposed to be having anti-diabetic activity from literature survey. It is recommended in diabetes. The best quality of Csssia auriculata leaves, flowers, seeds, bark and root were purified first. Then the ingredients were dried in sunlight. Dried ingredients were later roasted in low flame. It is then powdered and packed in airtight containers. The present pilot study was planned to find out the effect of the clinical efficacy and safety of *Cassia auriculata* herbal tea in the management of diabetic mellitus. All the patients selected for the study were registered after their detailed history and thorough clinical examination. The study was conducted with the consent of the patient in Jaffna and they were informed about the study drug, its effects, duration of the trial, and overall plan of the study. The patients were included in the clinical study only after issuing written informed consent. Twenty patients of either sex, between the ages of 40 – 60 years with Type – II diabetes mellitus were selected for the clinical trial. 5g *Cassia auriculata* herbal tea powder is dissolved in 180 ml of hot water at the time of administration. After the collection of initial FBS (Fasting blood sugar), *Cassia auriculata* herbal tea hot infusion (powder 5g) were administered two times a day for a fortnight. Similar dietary instruction was given to the Patients. The fasting blood sugar measurements were taken baseline, after 1st wk and 2nd wk of the trial. All adverse events were recorded with information about severity, date of onset, duration and action taken regarding the drug, except for two patients who complained of nausea. There were no other reported side effects of the drug. Statistical analysis was done. All values are expressed as mean +/- SD. Difference between means were tested. This study helped to observe the results of fasting blood sugar levels among diabetic patients treated with *Cassia auriculata* herbal tea. The FBS values for patients treated with *Cassia auriculata* herbal tea are: initial 186.67 +/- 7.28 mg /dl, 1st wk 162.42 +/- 4.32 mg/dl and final 146.47 +/- 3.52 mf/dl. In the case of patients using *Cassia auriculata* herbal tea, a decrease in fasting blood sugar level is observed. The present pilot study should be extended into a detailed study with a larger sample size and longer duration to evaluate the *Cassia auriculata* herbal tea's hypoglycaemic actions and also its effects on microaluminuria and lipid profile.

Key words: Diabetes mellitus, *Cassia auriculata, Siddha medicine.*

Effect of Mukkudu Maathrai (Korosanai) Treatment on Serum Prolactin Secretion in Rats

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The Mukkudu Maathrai (Korosanai) is an indigenous medicine which is a mixture of kasthuri, saffron and bile granules of cow in 1:2:3 ratios respectively. It has been prescribed to six month old babies and to adults by Ayurvedic doctors in Jaffna Penninsula. Since ancient period it has been believed by the practitioners that the above mixture causes a strong effect on hypothalamo-pituitary axis. The prolactin (Prl) is secreted by the pituitary gland and is reported to have over 300 separate biological activities. But so far no studies have examined the possible effect of korosanai on serum prolactin secretion. Thus the present study was undertaken to elucidate the effect of korosanai treatment on serum prolactin secretion in rats.

Male rats (*Rattus norvegicus*, 3-4 months old, weight 120 ± 10 g) bred and maintained under uniform conditions were fed orally with the korosanai mixture (1% w/v) in a time dependent manner and the controls were with the distilled water alone. Blood sample was collected every 2 days by tail bleeding and serum Prl levels were measured using rat prolactin enzymeimmunoassay. All experiments were conducted in duplicates. Statistical analyses were performed using Prism 2.01. Geometric mean ± SEM was used to describe data. Repeated measures analysis of variance (ANOVA) with Dunnett's post test for multiple comparisons was used on log transformed data to detect the effect of korosanai and duration of treatment.

When korosanai was used at 1% w/v daily for 6 days, prolactin secretion increased progressively in a time dependent manner and the Prl concentrations significantly increased after 4 days and 6 days of treatment (geometric mean (+/- SEM) pretreatment : 4.543 (1.080 – 1.056) ng/ml, after 2 days: 6.490 (1.488 – 1.324) ng/ml ANOVA $P>0.05$, after 4 days: 9.429 (1.356 – 1.240) ng/ml ANOVA $P<0.05$, after 6 days: 9.792 (1.059 – 1.041) ng/ml ANOVA $P<0.05$. Thus korosanai appears to be regulator of serum prolactin secretion at the duration used in the present study.

Key words: Prolactin, *Rattus norvegicus*, saffron, kasthuri.

Comparison of Core Exercise and Stretching Exercise towards Abdominal Strength and Flexibility among Male Athletes

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Core muscle activity is best understood as the pre-programmed integration of single-joint muscles and multi-joint muscles to produce stability and motion. The Purpose of this study was to find out the Comparison of core exercise and stretching exercise towards abdominal strength and flexibility among male athletes. To achieve the purpose of this study, forty five male athletes aged 18 – 21 years were randomly selected from Y.M.C.A College of Physical Education, Chennai, India. Subjects were divided into core exercise group (n=15), stretching exercise group (n=15) and control group (n=15). Prior to the experimental period, initial tests scores on abdominal strength measured by sit ups and flexibility measured by sit and reach test were recorded. After the experimental period of eight weeks, the post experimental scores were recorded. Experimental groups received 8 weeks core, stretching exercise and the Control group did not receive any training. All the dependent variables were tested for significance using Analysis of Covariance (ANCOVA).The final means were adjusted for difference among the initial differences and the adjusted means were tested for significance by F-ratio. The significant mean differences were tested at 0.05 level by using Scheffe's test. The obtained F-ratio of 2.54 was lesser than the required table value of 3.37 at 0.05 level of significance. It was concluded that Core exercises and stretching exercise improved abdominal strength significantly and Core exercises and Flexibility exercise had not affected much on flexibility of the subjects. Control group did not show any improvement.

Key words: core exercise, stretching exercise, flexibility, abdominal strength.

Comparative Effect of Dynamic Stretching Exercise and Static Stretching Exercise towards Flexibility among College Women Students

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Physical activity is regarded as an essential element in maintaining and improving the quality of life. The purpose of the study was to find out the Comparative Effect of Dynamic stretching exercise and Static stretching exercise towards Flexibility among college women students. To achieve the purpose of this study, 45 women students were selected from Kalakshetra Foundation, Rukminidevi College of Fine Arts, Chennai and their age were 18-22 years. They were assigned into three groups of which one served as dynamic stretching group, other as Static stretching group and the third served as control group. They were measured their flexibility using sit and reach method. The interventional training programmes for this study were six weeks dynamic stretching exercise for group I and six weeks Static stretching exercise for group II and the control group was following the routine. Data were collected on the flexibility of the subjects before and after the training period. The differences between the initial and final scores were subjected to statistical treatment using Analysis of Covariance (ANCOVA). In all the cases 0.05 level of confidence was fixed to test the significance. The effect of static stretching and dynamic stretching on the groups among post test scores showed F value of 4.93, which was significant at 0.05 level. Taking into consideration of the pre test means and post test means adjusted post test means were determined and analysis of covariance was done and the obtained F value 26.85 was greater than the required value of 3.22 and hence it was accepted that the static stretching and dynamic stretching improved flexibility of the subjects. This proved that there were significant differences between the groups due to Dynamic stretching exercise and Static stretching exercise among the college women students. Dynamic stretching and Static stretching exercises significantly improved the flexibility of the women students. However Dynamic stretching exercise was found to be the best to improve flexibility. Control group did not show any improvement.

Key words: Dynamic Stretching, Static Stretching, Flexibility.

Relative Effect of Continuous Running and Interval Training on Physical Performance

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Regular physical activity has many wonderful benefits for people of all ages. It reduces risk of many chronic diseases such as heart disease, high blood pressure, high blood cholesterol and type II diabetes. The purpose of the study was to find out the Relative effect of Continuous running and Interval training on Physical performance. To achieve this purpose of the study, thirty students age group of 14-18 were selected from Chennai city schools. They were divided into two groups of fifteen each. First one saved as Continuous running group, second grouped saved as Interval training group. The Experimental training programme was a period of eight weeks. The Physical performance was assessed by 2.4 Km run test and Data were collected before and after the experimental training programme. The collected data were statistically analysed by using one way analysis of variance (ANOVA) for significant different. The experimental groups had a significant ($p<0.05$) gain in Physical performance with obtained t-ratio value of continuous running and interval training groups being 6.42 and 3.63. There was in magnitude improvement in interval training group was 6.39% than that of continuous running (5.22%) groups. It was Conclude that all the two groups significantly ($p> 0.05$) improved Physical performance. But Interval group showed maximum gain than Continuous running group.

Key words: cardiorespiratory endurance, continuous running, interval training.

The Use of Mother Tongue and Local Culture in the Teaching of Proficiency English to Undergraduates: An Ethonographical Study

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It is a well-known fact that Sri Lankan students' proficiency of English related to communication is very low. Therefore, the effort attempted was to make students use English in contexts created in the classrooms based on local culture with the judicious use of mother tongue. The literacy skills and knowledge of L1 will help the learner to learn the second language and not interfere with the learning process. The objectives of the study were to see whether the general language proficiency could be promoted using mother tongue and local culture in an activity-based classroom to undergraduates who studied in the mother tongue medium at schools and to explore the possibilities of promoting their personality development through the use of mother tongue and local culture. An ethnographical study was conducted with a group of Third year students twenty in number for three weeks at the Vavuniya Campus. This paper makes an attempt to analyse the performance and show how the students' language development promoted and enriched through the use of local culture and mother tongue. Thus, it was observed that the students' affective filters could be lowered and they would be promoted to communicate without inhibition. At the end of the three-week programme, a lot of language learning seems to have taken place.

Keywords: activity-based classroom, affective filters, personality development

Classroom Management and Career Satisfaction: A Study on the Staff from the Faculties of Management Studies and Commerce and Arts

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There have been reports on threats from the university students to the staff of the universities. There are incidents of shooting school teachers taking place in the city schools. Parents, staffs and administrators are anxiously seeking the remedies to bring harmony in the universities as well as in schools. Teachers and various unions are trying to find solution to bring harmony in the class rooms. A great number of parents are complaining about the disobedient children. The researchers too are looking for a solution to bring the tug of war going on between the teaching staff and students to an end. Many professional teaching staffs have already left and many others are looking for other jobs as they are unable to get career satisfaction due to the unruly behavior of the students. Considering the urgent need for a solution to these issues it is attempted to study whether classroom management can lead to career satisfaction. In order to carry out the research twenty staffs from the Faculty of Management Studies and Commerce and Arts were randomly selected and the questionnaire consisting of two parts was administered to them. The views of the staff on classroom management and career satisfaction were tested by interviewing them. It was hypothesized that classroom management has positive influence on career management. Various factors related to classroom management were tested through the first part of the questionnaire. The second part of the questionnaire was based on career satisfaction. The data gathered from the two parts were examined with the view of finding how far classroom management influences the career satisfaction of the staff. The hypotheses was tested using the data collected from the questionnaire survey and interview with the staff and the results have been discussed in favour of the research questions formed in this study. The data collected from the respondents reveal the fact that classroom management has influence on career management and the influence is a positive one. The findings show that the staffs from the Faculties of Arts and Commerce and Management have high career satisfaction due to the positive influence of their classroom management.

Key words: Classroom management, Career satisfaction.

Factors Indicating Business Performance in Small Scale Industries in Vavuniya District: An Application of Exploratory Factor Analysis

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Small and medium enterprises (SMEs) play a vital role in the economies of both developed and developing countries through creation of employment opportunities, the mobilization of domestic savings, poverty alleviation, income distribution, regional development, training of workers and creating an economic environment in which large firms flourish and contribute to export earnings. Therefore, this paper attempts to analyze the main factors that are perceived to indicate to the performance of these industries. The analysis based on the owner or managers who responded to a questionnaire survey conducted on sample of small scale industries in Vavuniya district. Secondary literature reviews and primary data collections methods were used to conduct the study. The sophisticated statistical technique like exploratory factor analysis (EFA) has been used for analyzing the data. The results indicate that a set of five separately identifiable factors that have positive and significant influence on the performance of the participant firms. These factors, when ranked in order of their importance are as follows: (1) Customer Satisfaction with Managing Change; (2) Growth in Business and Income Level; (3) Growth in Profitability; (4) Growth in Turnover; and (5) Growth in Number of Employees and Retaining Key Employees.

Key words: Performance Indicators; Small Scale Industries; Exploratory Factor Analysis (EFA).

Abstracts not presented at the 16th Annual Sessions

The following abstracts which were accepted for presentation at the 16th Annual Sessions were not presented; therefore they shall not be considered as publications.

Section A

In vitro study of antibacterial effect of Emblica officinalis on Gram positive bacteria.

Growth inhibition of Bacillus sp and Klebsiella sp by Allium sativum.

Preliminary evaluation on the larvicidal effect of crude extracts of *Ocimum sanctum* L against *Aedes aegypti* L.

Larvicidal effect of crude extracts of *Curcuma longa* against *Anopheles* sp.

Effect of aqueous neem (*Azadirachta indica*) leaf extract on development of ovary of rice weevil *Sitophilus oryzae* Linnaeous.

Section B

Low Temperature Storage of Avocados: Changes in Fatty acid Composition during Ripening.