Dr. N. Suryagan

PROCEEDINGS

OF

JAFFNA SCIENCE ASSOCIATION

2002

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ABSTRACTS

TENTH ANNUAL SESSIONS

HELD ON

APRIL 03, 04 & 05, 2002

AT

UNIVERSITY OF JAFFNA

JAFFNA, SRILANKA

JAFFNA , SRILANKA

2002

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The 10th Annual Sessions of the Jaffna Science Association in the year 2002 have received a special attention among the academics and the community, as it is the only regional based scientific organization in SriLanka. The volume (Volume:10, Number:1, 2002) of the proceedings of Tenth Annual Sessions of the Jaffna Science Association is the record of Abstracts of papers accepted for presentation at the Tenth Annual Sessions of the Association to be held from 3 – 5 April, 2002 at the University of Jaffna. The papers have undergone a rigorous review process by eminent scientists in the respective fields, prior to their acceptance.

This volume (Volume:10, Number:1, 2002) contains abstracts of 32 papers comprising 03 from Section A (Pure Science), 26 from Section B (Applied Science), 02 from Section C (Medical Science), 01 from Section D (Social Science).

I take this opportunity to thank Dr.S.Srisatkunarajah, General Secretary and Dr. A. Senthuran, Asst. General Secretary, JSA and the Sectional Executive Committees for their assistance in getting these abstracts refereed in time for publication.

My special thanks are due to Mrs. T. Mikunthan for her invaluable assistance in bringing this volume in time.

Dr.(Ms).Subathini Ramesh
Chief Editor.

Dept. of Linguistics & English,
University of Jaffna,
Jaffna, Srilanka.
March 20, 2002

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A_1

Influence of various kinds of organic materials on survival and reproduction of earthworm *Pheretima sp.* (Oligochaeta:Megascolicidae).

Kugathas, S. and Padmini Krishnarajah

Department of Zoology, University of Jaffna, Sri Lanka.

Laboratory experiment was conducted to study the effect of various kinds of organic materials on the survival and reproduction of earthworm *Pheretima sp.*. Five treatments namely cow dung, poultry fecal material, paper material, decomposing vegetable material and control (soil only) were used with 5 replicates in a completely randomized design. Except for control the media were prepared by mixing equal amounts of soil and material respectively. A pair of clitellate adult worms was introduced to each medium and it was maintained for 225 days. Cocoons were collected, counted and observation on survival of worms was made in 15 days interval. In each occasion weight, size and hatchability of cocoons were studied. Mean day temperature was 29 ± 3^0C and moisture content of media was maintained as 65-75%. Earthworms were unable to survive in poultry fecal material and show higher survival in cow dung and vegetable material. Hatchability (%) and cocoon production rate (cocoon per day) were 88.1 and 0.082 for cow dung, 74.8 and 0.067 for vegetable material, 54.4 and 0.046 for paper material, 33.6 and 0.037 for control and 00 and 0.0064 for poultry fecal material respectively. Rate of cocoon production, size of cocoon and hatchability were significantly high ($p<0.05$) in cow dung and vegetable material compared to that of other materials. Based on survival and reproduction, cow dung and vegetable material are suitable substrate for vermicomposting with earthworm *Pheretima sp.*.

Factors in the distribution and abundance of *Heterocypris dentatomarginatus* (Ostracoda: Cyprinotinae) at Neeraviady Pillaiyar Kovil Pond, Jaffna.

Maharagi Mahadeva

Department of Zoology, University of Jaffna, Sri Lanka

Since Brady, 1886 Ostracods were studied in Sri Lankan natural habitats, in Jaffna peninsula by Selvarajah and Costa (1979) and Rajendram (1994). It is considered as an important aquatic faunal group. *Heterocypris dentatomarginatus* was identified in Neeraviady Pillaiyar Kovil Pond, as the one and only species during July 2000 to January 2001.

The morphological distribution, that is, size groups A, B and C with respective size ranges ≤ 0.9mm, 1 – 1.4mm and ≥ 1.5mm and numerical abundance of *Heterocypris dentatomarginatus* with various abiotic factors were evaluated during this study.The numerical abundances of size groups A, B and C varied from zero to 300000,340000,100000 individual/liter respectively.

Temperature, depth, pH and conductivity were the measured abiotic factors and solar angle, Biological Oxygen Demand (BOD_5) at 5 days incubation and Chemical Oxygen Demand (COD) were the estimated abiotic factors from this study.

Depth zero to 127.5cm, solar angle $9.0909 \times 10^{-5} - 1.003 \times 10^{-5}$ degree, water temperature 25 - 32^0C and COD ¯1.2103 – 10mg Oxygen/ liter influenced the numerical abundance of *Heterocypris dentatomarginatus* to all morphological stages at four geodirectional sites North, East, South and West along the periphery of pond. Except the site South, pH 6.73 – 9.27 positively correlate with all size groups / morphological stages of *Heterocypris dentatomarginatus*. At the same time some abiotic factors characteristically varied at particular sites with particular morphological stage of *Heterocypris dentatomarginatus*.

Thus, all morphological stages of *Heterocypris dentatomarginatus* are habitat cultured in minimum volume of water, minimum light intensity with tolerable increment of water temperature, pH and COD increase the numerical abundances. On the other hand, increment of dryness and pollution decrease the numerical abundance.

A3

Isolation and culture of Protoplasts from leaf tissue of *Capsicum annuum* L.var. accuminatum Fingerh(MI_2) & *Capsicum frutescens* L.Syn.C minimum (Bird chilli).

***Jeyarani Nandakumar, **Bandara,J.M .R.S and ***Pieris.S.**

**Department of Botany, University of Jaffna, Sri lanka.*
***Department of Agricultural Biology, faculty of Agriculture, University of Peradeniya.*
****Department of Crop Science, Faculty of Agriculture, University of Peradeniya.*

Laboratory experiments were conducted on isolation and culture of Leaf Protoplasts of Chilli species *Capsicum annuum* and *Capsicum frutescens* to develop a suitable protocol for protoplast culture that could be utilized for somatic hybridization. To isolate the protoplasts from the leaves of these two Chilli species, three levels of enzyme mixtures along with three incubation periods were tested. Incubation periods of 10, 5 and 3 hours were tested for leaves in enzyme mixtures of 2% Cellulase & 0.4% Macerozyme, 1% Cellulase & 0.2% Macerozyme, 0.5% cellulase and 0.1% Macerozyme with 13% mannitol at 23-25°C temperature in the dark. It was found that incubation period of 3 hours in 2% Cellulase and 0.4% Macerozyme mixture was effective for both the species. The protoplast concentration was $5x10^8$ protoplasts /ml/g. No difference between the two species on the effect of incubation period or enzyme mixture was noticed. Of the tested NT, MS, B5 and Potato protoplast culture media modifications, it was found that in the mixed nurse method using NT medium supplemented with 2,4-D, NAA & BAP (each 1mg/l) and 1.2% Sea Plaque agarose, protoplasts of species *C. annuum* and *C. fretescens* were alive for 14 and 17 days respectively. But bacterial contamination (70% contamination) of the plates was observed and it was difficult to avoid.

Defining Grammar for Namesand Drawing Two-Dimensional Structures of Alcohols, Aldehydes, Ketones and Organic Acids

Dhushyanthi Mylvaganam and Mahesan, S.

Department of Computer Science, Faculty of Science, University of Jaffna, Sri Lanka

The objective of our project is (i) to define a grammar for the names of ketones, aldehydes, alcohols and organic carboxylic acids, and (ii) to draw a two dimensional representation of the molecular structure of these organic compounds by identifying the structures just from their names. The International Union of Pure and Applied Chemistry (IUPAC) names are used as they are generated systematically.

In this project, identification of the structure from the IUPAC name is performed based on certain facts and rules. Prolog is chosen to implement our system, as it seems to be more natural for this kind of problem that can be solved by declaring carefully chosen facts and rules regarding organic chemistry and IUPAC nomenclature system.

The task is divided into five main tasks:

1.Defining a grammar for those chemicals considered in this project.

2.Checking the syntax of inputted names.

3.Formatting the structure for checking the semantics and drawing the structure

4.Checking the semantics

5.Drawing the structures

In fact, this work is not only extension and expansion of a system produced by Dr. S. Mahesan to draw acyclic hydrocarbons with or without substituents, but also it has been improved so as to speed up the process and to save memory. As a complete system, it now has the capability of drawing aldehydes, alcohols, ketones and organic acids in addition to acyclic hydrocarbons.

The system as it is can be used by students who begin to learn organic chemistry as it gives them a picture of what the structure of a chemical compound looks like. A chemist could also use this, if s/he wishes to check the structure of a compound for which s/he has found a name, or to compare structures.

The system could be expanded even further to include amines, amides, sulphates, phosphates and also cyclic compounds using the same concepts used in this project and having a knowledgebase about atoms having a variable number of valences included in the system.

Lactic acid production by *Lactobacillus casei* from different sources of starch hydrolysates

Senthuran, A., Balasingam, V., VasanthyArasaratnam and Balasubramaniam, K.

Department of Biochemistry, Faculty of Medicine, University of Jaffna, Sri Lanka.

Lactates are widely used as acidulants and preservatives of foodstuffs, precursors for stearoyl-2-lactylates, and for the production of industrial polymers such as poly lactic acid and acrylic acid. Lactic acid is produced using different carbon sources such as glucose, lactose, sucrose and hydrolysed starch. In this study the starch in locally available rice, corn and palmyrah tuber flour was hydrolysed to have DE 95 or above using Teramyl (□-amylase) and glucoamylase and used for lactic acid production. A control medium (M1, pH 6.0) contained (gl^{-1}) glucose, 47.5; lactose, 2.5; yeast extract, 10; K_2HPO_4, 0.5; KH_2PO_4, 0.5, sodium citrate 1.0; $MgSO_4$, 0.05; $MnSO_4$, 0.0031; $FeSO_4$, 0.002 and ascorbic acid, 0.05. Calcium carbonate 5.0g was added to the medium to neutralize the lactic acid produced. *Lactobacillus casei* was cultured at 42°C while shaking at 100rpm. The inoculum was prepared in the control medium M1 and 10% (v/v) inoculum was used for inoculation. Rice hydrolysate was diluted to have $50gl^{-1}$ glucose and supplemented with all nutrients present in the control medium (named as M2). To the M2 medium glucoamylase $6.3ml^{-1}$ was added (named as M3). M1 (control medium), M2 and M3 media were used for fermentation. The glucoamylase was added to complete the hydrolysis of remaining oligosaccharides. In M1, M2 and M3 media 30.3, 6.5 and $6.8gl^{-1}$ lactic acid was produced at 28h, and residual glucose was 15.5, 42 and $40gl^{-1}$ respectively. As sugar utilization and lactic acid production in rice hydrolysate media were very low compared to M1, it was decided to use corn and palmyrah tuber hydrolysate. Hence, in the next set of experiments, corn hydrolysate was diluted to have $50gl^{-1}$ glucose and supplemented with all nutrients present in the M1 medium (named as M4). To the M4 medium glucoamylase $6.3ml^{-1}$ was added and named as M5. M4, M5 and M1 media were used for fermentation. In M4, M5 and M1 media at 28h 35.5, 36.5 and $38.5gl^{-1}$ lactic acid was produced at 28h, and residual glucose was 10, 10.6 and $8.8gl^{-1}$ respectively. When palmyrah tuber flour was hydrolysed and diluted to have $50gl^{-1}$ glucose, supplemented with all nutrients present in the M1; at 28h $35.8gl^{-1}$ lactic acid was produced and $8.2gl^{-1}$ residual sugar was present. These results indicate that lactic acid could be produced from corn and palmyrah tuber hydrolysates supplemented with nutrients.

B_3

Preliminary studies on *Saccharomyces cerevisiae* cell mass production

Manohary Paramsothy, Senthuran, A., Vasanthy Arasaratnam and Balasubramaniam, K.

Department of Biochemistry, Faculty of Medicine, University of Jaffna, Sri Lanka.

This paper describes the preliminary studies on factors that affect the growth of *Saccharomyces cerevisiae* strain from Fermipan. The fermentation medium and inoculum medium were the same and contained (gl^{-1}); yeast extract, 2.5; bacterial peptone, 1.15; $(NH_4)_2HPO_4$, 0.25 and $MgSO_4.7H_2O$, 0.025. The fermentation was carried out at 30°C and pH 5.0, while shaking at 100rpm. The growth was monitored as dry weight. In the fermentation medium containing 50,100 and 150 gl^{-1} glucose, dry weight of yeast obtained was 4.7, 9.5 and 9.8gl^{-1} respectively and the residual glucose present at 24h of fermentation was 0, 12.2 and 48.4gl^{-1} respectively. As the residual sugar in 150gl^{-1} glucose containing medium was 48.4gl^{-1} it was decided to do further studies in medium containing 50 and 100 gl^{-1} glucose. The impact of addition of different amounts of inorganic nitrogen source on production of biomass and alcohol was studied. The medium containing glucose 50gl^{-1} with 0.25 and 0.50 gl^{-1} $(NH_4)_2HPO_4$ along with other nutrients the dry weight of yeast obtained was 4.4 and 4.7 and the alcohol produced was 12.5 and 10.8gl^{-1} respectively. While with 100gl^{-1} glucose medium with 0.25 and 0.50 gl^{-1} $(NH_4)_2HPO_4$ along with other nutrients, the dry weight of biomass was 9.4 and 9.9gl^{-1} and alcohol produced was 20.5 and 18.5gl^{-1} respectively. Complete glucose utilization was obtained in 50gl^{-1} glucose with 0.25 and 0.5gl^{-1} $(NH_4)_2HPO_4$ containing medium. Residual sugar present in the 100gl^{-1} glucose and 0.25 and 0.5gl^{-1} $(NH_4)_2HPO_4$ containing media were 6.7 and 1.3gl^{-1} respectively. The glucose concentration of 100gl^{-1} was selected for further studies as the glucose in the medium containing 0.5g of $(NH_4)_{2HPO4}$ was almost completely utilized by cells. In the next set of experiment, the medium contained 100gl^{-1} glucose, along with 0.25, 0.50 or 0.75 gl^{-1} $(NH_4)_2HPO_4$ and other nutrients. The dry weight obtained and alcohols produced were 7.3, 8.1 and 7.5gl^{-1} and 28.8, 25.3 and 23.0gl^{-1} respectively. Hence the growth medium containing glucose, 100 gl^{-1} and $(NH_4)_2HPO_4$, 0.5gl^{-1} along with other nutrient was selected for further studies. The effect of yeast extract on growth and alcohol fermentation was studied. In the medium containing 100gl^{-1} glucose and 0.5 gl^{-1} $(NH_4)_2HPO_4$ supplemented with 2.5, 3.5 and 4.5gl^{-1} yeast extract, the cell mass of 7.7, 9.1 and 10.7 gl^{-1} and alcohol of 24, 22.5 and 20.5 gl^{-1} were produced respectively. As yeast extract addition was economically not feasible it was decided to keep the yeast extract at 2.5gl^{-1} level and increase the $(NH_4)_2HPO_4$ to 0.5g. With increase in $(NH_4)_2HPO_4$, the pH of the medium decreased from 5.0 to 3.0 during fermentation. Hence the effect of pH on growth of the *S.cerevisieae* was studied. The initial pH was adjusted to 5.0, 6.0 and 6.5 and the pH was adjusted 4 hourly using 4N sterile NaOH. The dry weight obtained was 6.0, 7.0 and 6.7gl^{-1} respectively. The alcohol produced was 30, 28 and 25gl^{-1} respectively. Hence the pH was maintained around 6.0 during the fermentation.

Production of α-amylase by *Bacillus licheniformis* in submerged fermentation

Maheswarakumar, T., Senthuran, A., Vasanthy Arasaratnam and Balasubramanium, K.

Department of Biochemistry, Faculty of Medicine, University of Jaffna, Sri Lanka

Bacillus licheniformis M_{27} was grown in culture medium at 42°C and pH 7.0 while shaking at 100rpm. The culture medium contained (gl^{-1}) soluble starch, 2.0; diammonium hydrogen phosphate, 2.0; potassium chloride, 0.5; magnesium sulphate, 0.5; yeast extract 2.0 and peptone 2.0. Maximum α-amylase was produced (52.9μmol/ml/min) at 48h in the above medium. When Tween 80, Tween 20 or glycerol 1% (v/v) was added to the culture medium 172%, 139% and 15% of α-amylase activities respectively were obtained compared to the control. As Tween 80 gave the maximum activation, it was decided to incorporate Tween-80 into the culture medium and the medium was named as M1. The soluble starch present in the medium M1 was replaced with either potato or manioc starch ($2gl^{-1}$) and the α-amylase activities obtained were 83% and 78% of that of the medium M1. When different amounts of potato and manioc starch were added to the medium M1 instead of soluble starch, the media containing 1, 2 and $4gl^{-1}$ potato starch gave α-amylase activities of 96%, 82% and 53% of that of medium M1, whereas in the culture media containing 2 and $5gl^{-1}$manioc starch, 105% and 64% α-amylase activities respectively were obtained to that of the medium M_1. Maximum α-amylase was produced (135.9μmol/ml/min) at 52h in the medium containing $2gl^{-1}$ manioc starch. As potato is comparatively expensive to manioc it was decided to substitute manioc starch ($2gl^{-1}$) for soluble starch in the medium M1. When the soluble starch in the medium M1 was substituted with cellulose$1gl^{-1}$ or cellulose and glucose each of $1gl^{-1}$ the α-amylase activities obtained were 82 and 93% respectively compared to medium M1. Thus the *B. licheniformis* M_{27} prefers manioc starch to produce α-amylase. However the culture medium needs further investigation.

B_5

Saccharomyces cerevisiae Biomass production from rice hydrolysate

Manohary Paramsothy, Senthuran, A., Vasanthy Arasaratnam and Balasubramaniam, K.

Department of Biochemistry, Faculty of Medicine, University of Jaffna, Sri Lanka.

In this study, the cheap broken rice was used. The rice flour (160g) was made to a paste with water (500ml) and the enzyme termamyl (3.3ml) and glucoamylase (2.6ml) were added. The pH was adjusted to 5.0. Total volume was made up to 1l. The hydrolysis was terminated when the dextrose equivalent (DE) was near 95. The hydrolysate was strained in a screw press. The rice extract contained (gl^{-1}) protein 5.94, elemental nitrogen 1.58, total sugar 159.7 and reducing sugar 134.4. The rice extract was diluted to have $100gl^{-1}$ reducing sugar and supplemented with (gl^{-1}) yeast extract, 2.5; bacteriological peptone, 1.15; $(NH_4)_{2HPO4}$, 0.50 and $MgSO_4.7H_2O$ 0.025. This medium was referred as M1 and used for the cultivation of *S. cerevisiae* at 30°C and pH 6.0, for 24h. while shaking at 100rpm. As controls glucose ($100gl^{-1}$) medium M2 with suppliments as on M1 and rice extract without any supplementation M3 were used. Biomass was monitored, as dry weight, reducing sugar and alcohol were determined. Biomass obtained was 18.5, 7.3 and $6.5gl^{-1}$, the alcohol produced was 27.6, 23.0, and $13.8gl^{-1}$ in M1, M2 and M3 the residual sugar present was 0.2, 8.65 and $13.9gl^{-1}$ in M1, M2 and M3 respectively. In rice flour the protein content is $59.4gl^{-1}$. If the protein present in the rice flour was hydrolysed, the requirement for yeast extract and bacteriological peptone could be either reduced or eliminated. Hence in the next set of experiments, the pH of rice hydrolysate was adjusted to 7.0, neutrase, 2.5, 5.0 and 7.5 ml^{-1} was added and incubated at 42°C with shaking at 100rpm for 5h. The hydrolysate was strained: the extract contained increasing amounts of protein (6.4, 9.0 and $11.3gl^{-1}$) and elementary nitrogen (1.7, 3.0 and $3.1gl^{-1}$) when increasing amounts of 2.5, 5.0 and $7.5ml^{-1}$ neutrase were added. This enriched medium was used for yeast cultivation without any supplementations. The biomass obtained was 12.5 15.2 and $15.8gl^{-1}$ and the ethanol produced was 18.4, 16.5 and $16.1gl^{-1}$ respectively in the hydrolysate prepared using 2.5, 5.0 and $7.5ml^{-1}$ neutrase respectively. These results indicate that the protein in rice extract hydrolysed by neutrase could be utilized for the cultivation of yeast. Thus the hydrolysis of the protein eliminated the need for yeast extract and bacteriological peptone addition to the medium.

A study on the stability of Glucamylase from *Aspergillus niger* 1105 strain at room temperature

Vasanthy Arasaratnam, Ketheeswary Mylvaganam, Senthuran, A. and Balasubramaniam, K.

Department of Biochemistry, Faculty of Medicine, University of Jaffna, Sri Lanka.

Like many products, enzymes too are produced in one place, which have to be stored as well as transported for end use at ambient temperatures. Hence this study was mooted to investigate the preservation and storage stability of glucoamylase from *Aspergillus niger* 1105 strain at room temperature. The glucoamylase produced by solid-state fermentation was extracted in water in a screw press. The glucoamylase activity was 23.18 µmol/ml/min. And its protein concentration was 0.6mg/ml. The glucoamylase was assayed using starch (0.2%) as substrate at pH 4.0 in 0.02M acetate buffer. The reducing sugar released was determined by DNS method. The preservation & storage stability of glucoamylase was studied at room temperature (30°C). The effect of protein concentration on glucoamylase stability was critical. When the enzyme was diluted from 0.6mg/ml protein to 0.1mg/ml protein, the enzyme lost 20% of its activity initially during the first 24h and thereafter no loss of activity was observed up to 55 days. When the endogenous protein concentration was 0.3 mg/ml and above or addition of exogenous protein (egg albumin) prevented this initial loss of activity. Thus protein concentration of 0.3mg/ml is a minimum to prevent any loss of enzyme activity. The effect of varying concentrations of glycerol (5%, 15%, 25%, 40% & 50%) added to glucoamylase (0.6mg/ml protein) stored at 30°C was studied over 55 days. A concentration of 5% glycerol was adequate to stabilize and preserve the enzyme at 30°C. Increasing the glycerol concentrations above 5% didn't further increase the stability. The effect of increasing concentration of ammonium sulfate (0.5%, 1%, 2.5% and 5%) on glucoamylase activity was studied. The ammonium sulfate at all concentrations inhibited the glucoamylase activity or decreased its stability by 20% to 25%. The glycerol at 5%, 10%, and 15% didn't reverse the effect of ammonium sulfate on the stability of glucoamylase.

B_7

Anti-microbial activity of Betel leaves

Nishanthan, T., Mylvaganam, K., Senthuran, A. and Vasanthy Arasaratnam

Department of Biochemistry, Faculty of Medicine, University of Jaffna, Sri Lanka.

This paper describes the preliminary study carried out to determine the anti-microbial effects of water and ethanol extracts of betel leaves and the residues obtained after water and ethanol extraction incorporated into the media on the growth of *Klebsiella pneumoniae, Escherichia coli, Staphylococcus aureus. Pseudomonas aeruginosa, Proteus vulgaris, Bacillus licheniformis, Saccharomyces cerevisiae, Aspergillus niger and Aspergillus oryzae.* The growths of the organisms were monitored by taking viable cell count at fixed time intervals (18h for bacteria and yeast, and 36h for fungi). The bacteria and yeast were cultured in nutrient agar medium while fungi were cultured in potato dextrose agar medium. Different amount of betel residues obtained after water and ethanol extraction (0.2, 0.5, 1.0, 2.0 and 3.0g/100ml media) were mixed with the above media separately. As control plates containing nutrient agar or potato dextrose agar media were prepared. When the betel residue obtained after water extraction (0.2g/100ml) was incorporated into the medium the relative viability (Relative viability (%) = number of colonies present in residue containing medium / number of colonies present in the control medium X 100) of *E.coli* and *B.licheniformis* decreased to 43.7 and 20.3 % respectively. When the betel residue obtained after water extraction (0.5g/100ml) was incorporated into the media, the relative viability were 30.4, 7.1 and 35% for *S. aureus P. vulgaris, S. cerevisiae* respectively. When the betel residue obtained after water extraction 1.0g/100ml was incorporated into the media, the relative viability of *K. pneumoniae, P. aeruginosa, A. niger and A. oryzae* decreased to 31, 44, 11 and 4% respectively. Whereas when betel residue obtained after ethanol (1.5g/100ml) was incorporated into the medium the relative viability for *P. aeruginosa* decreased to 13% and when 2g/100ml was incorporated into the medium the relative viability of *S. aureus* and *A.niger* decreased to 28.3 and 83% respectively. When 3g/100ml betel residue obtained after ethanol extraction was incorporated into the medium, the relative viability decreased to 6.4%. These results showed that betel contain some substances, which inhibit the growth of various microorganisms.

Isolation of Thermostable α amylase producing Bacteria

Vasanthy Arasaratnam, Thayaananthan, K., Senthuran, A. and Balasubramaniam, K.

Department of Biochemistry, Faculty of Medicine, University of Jaffna, sri Lanka.

This study was aimed in isolating a thermophilic bacteria that produce thermostable alpha amylase. Several bacteria were isolated from cow-dung and from "Kanchi" during cooking of rice. The bacteria were cultured in Nutrient broth and transferred to nutrient agar media containing 0.2% starch. Amylase producing strains were isolated by staining starch in media with iodine. One strain from "Kanchi" with the highest starch hydrolysing activity was selected. This is a gram positive *Bacillus* and named as BR1 because the organism is *Bacillus* and obtained from rice broth "kanchi". The BR1 strain was activated in nutrient broth containing 0.2 % soluble starch at 45^{0}C for 18h and used as inoculum. The submerged fermentation medium, had 0.2% starch peptone (0.2%) and minerals at pH 7.0 and was inoculated with 20% inoculum. The fermentation was carried out at 50°C. The activity of alpha amylase in the fermentation medium was monitored by incubating in starch phosphate buffer (pH7) and assaying for reducing sugar by DNS method. During 24h fermentation, the starch concentration in the medium decreased while the alpha amylase activity increased, indicating that strain BR1 produces alpha amylase. The alpha amylase activity was next assayed at 85^{0}C and ^{pH} 7 as the fermentation progressed. The alpha amylase activity increased with time. The alpha amylase was active at pH7 at 70^{0}C, 85^{0}C and 95^{0}C when assayed against starch. The activity decreased with increasing temperature and the activity at 95^{0}C was 71% compared with 70^{0}C activity. The growth of *Bacillus* BR1 strain reached a maximum in 24h and thereafter decreased up to 48h. However the alpha amylase activity reached a maximum at 48h of fermentation as assayed at 95^{0}C in presence of Ca (135ppm). These results indicate that the *Bacillus* BRI strain produces thermostable alpha amylase at 95°C. Further studies are in progress to characterise the *Bacillus*, alpha amylase and optimizes the fermentation medium.

Anti-microbial activity of different parts of Neem tree

Jayachakaran, P., Sritharan, K., Senthuran, A. and Vasanthy Arasaratnam

Department of Biochemistry, Faculty of Medicine, University of Jaffna, Sri Lanka.

This paper describes the preliminary study carried out to determine the anti-microbial effect of different parts of neem tree such as young shoot, leaves, bark, seed and root. Disc diffusion method was used to study the anti-microbial activity of different parts of neem tree on *Klebsiella pneumoniae, Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa, Micrococcus roseus, Citrobacter freundi, Saccharomyces cerevisiae and Aspergillus oryzae*. Discs were impregnated with either 20 or 60µl of extract of different parts of neem tree. The bacteria and yeast were cultured in nutrient agar medium while fungus was cultured in potato-dextrose agar medium. The bacterial cells or fungus spores were spread evenly on the surface of the medium and the extract impregnated discs were laid on the surface of the medium at particular distance. The plates were incubated in an incubator at 30°C for fixed time (24h for bacteria and 36h for yeast and fungi). The clear zone present around the disc was measured. *K. pneumoniae* gave clear zones of 6, 8, 10, 10 and 7mm diameter around disc containing 60µl extract of young shoots, leaves, bark, seed and root respectively. *E. coli* gave clear zones of 9, 8 and 10mm diameter around disc containing 60µl extract of young shoot bark and root respectively. *S. aureus* gave clear zones of 12, 12, 11, 0 and 13mm diameter around disc containing 60µl extract of young shoots, leaves, bark, seed and root respectively. *P. aeruginosa* gave clear zones of 8, 8 and 7mm diameter around disc containing 60µl of extract of leaves, bark and seed respectively. *M. roseus* gave clear zones of 8, 11, 6, 0 and 7mm diameter around disc containing 60µl extract of young shoots, leaves, bark, seed and root respectively. *C. freundi* gave clear zone of 4mm diameter around disc containing 60µl extract of leaves. *S. cerevisiae* gave clear zones of 6, 8, 6, 5 and 6mm diameter around disc containing 60µl extract of young shoots, leaves, bark, seed and root respectively. *A. orzae* gave clear zones of 6, 8, 6 0 and 6mm diameter around disc containing extract of young shoot, leaves, bark, seed and root respectively. This study clearly indicated the presence of anti-microbial substances in neem tree.

Antimicrobial activities of leaf, bark extracts of *Cassia fistula* and *Azadirachta indica* and leaf, whole plant extracts of *Acalypha indica* and *Eclypta prostrata.*

Prabagar,S. and Jeyarani Nandakumar

Department of Botany, University of Jaffna.

Since ancient times medicinal plants or plant products have been used by man not only for the cure of human diseases but also for the cure of plant diseases. In this context, the study of antimicrobial activity of locally available plants may provide vital clues to extract antimicrobial compounds. In this study, two trees, *Azadirachta indica* and *Cassia fistula* and two herbs *Acalypha indica* and *Eclypta prostrata* were tested for their antimicrobial activity on six bacteria such as *Bacillus sp I, Bacillus sp II, E.Coli, Klebsiella, Pseudomonas,* and *Staphylococcus aureus* and four fungi: viz. *Aspergillus, Rhizopus, penicillium,* and Yeast. The bacteria and fungi were grown on Nutrient Agar (NA) and Potato Dextrose Agar (PDA) media and the antimicrobial activities were measured by well method and media incorporation method respectively. The anti microbial activities of defferent extracts were presented as mean diameter of inhibition zone in bacteria (in cm) and inhibition percentage of radial mycelial growth in the case of fungi.

Bark extract of *Azadirachta* has successful antibacterial activity against all tested bacteria; The mean diameter of inhibition zones (cm): *Bacillus* sp I (2.45), *Bacillus* spII(2.75), *E.Coli*(2.05), *Klebsiella* (2.45) *Pseudomonas* (2.07), *Staphylococcus aureus* (2.20). Leaf extracts of *Azadidrachta* showed antibacterial activity against *Bacillus* sp I(2.52) and *Staphylococcus aureus* (1.50) only. Bark extract of *Cassia* inhibited the growth of *Bacillus* sp I(2.20), *Bacillus* sp II (2.50), *E.Coli*(2.97), *Pseudomonas* (1.75) and *Staphylococcus aureus* (2.50). Whereas leaf extract of *Cassia* inhibited the growth of *Bacillus* sp I(2.15), *Bacillus* sp II (1.50), *E.Coli* (1.90), and *Staphylococcus aureus* (1.77). Leaf and whole plant extracts of *Acalypha* showed antibacterial activity against *E.Coli* (1.50,1.50), *Klebsiella*(1.75,1.90) and *Staphylococcus aureus* (1.85,1.45) respectively. Leaf and whole plant extracts of *Eclypta* inhibited the growth of *Staphylococcus aureus* (1.30,1.30) only. All the plant extracts reduced the growth of *Staphylococcus aureus*. Bark and leaf extracts of *Azadirachta* showed antifungal activity against all tested fungi; the % of inhibition: *Aspergillus(*55,35), *Rhizopus(*50,15.78),*Penicillium*(29.41,17.6) and Yeast (41,20.68) respectively.Bark and leaf extracts of *Cassia* showed antifungal activity against all tested fungi: *Aspergillus*(64.2,64.3), *Rhizopus(*22,22), *Penicillium* (36.8,26.3) and Yeast (64.1.10). Whole plant and leaf extracts of *Acalypha* inhibited the growth of *Aspergillus (*16.6,19.7), *Rhizopus* (16.6.16.6) and Yeast (12.1,12.1). Whole plant and leaf extracts of *Eclypta* inhibited the growth of *Aspergillus* (26.6,33.3), *Rhizopus* (23.5,29.4) only. All the plant extracts reduced the growth of *Aspergillus* and *Rhizopus.*

Isolation and Identification of some food spoilage causing microorganisms and evaluation of anti-microbial activity of selected spices against them.

Gukappiriah Perayiram and Kularajany Niranjan

Department of Botany, University of Jaffna, Sri Lanka.

Spoilage is the undesirable changes in the food. Microorganisms mainly cause this. The food spoilage bacteria and fungi were isolated from various types of spoiled foods and they were identified. Nine spices, Garlic, Onion, Ginger, Turmeric, Mustard, Pepper, Dill, Clove and Black fennel were tested for their antimicrobial activity against them. In anti bacterial activity, well method was used for the assay and in the case of antifungal activity media incorporation method was used. The anti microbial activities of defferent extracts were presented as mean diameter of inhibition zone in bacteria (in cm) and inhibition percentage of radial mycelial growth in the case of fungi.

Rhizome extract of Turmeric showed antibacterial activity against all tested fungi and bacteria except *Bacillus sp* I and *Bacillus sp* III.The diameter of clear zone: *Bacillus* sp II (1.77), *Proteus* (1.90), *Pseudomonas* (1.70), *Sarcina* (1.175), *Staphylococcus* (1.77), *Micrococcus* (1.80). Bulb extract of Garlic showed antibacterial activity against all eight bacteria tested as *Bacillus* sp I (1.85), *Bacillus sp* II (2.15), *Proteus* (2.6), *Bacillus* sp III (3.75), *Pseudomonas* (2.15), *Sarcina* (2.75), *Staphylococcus* (2.95), and *Micrococcus* (1.90). In the case of Pepper, the effect of inhibition was only observed against *Staphylococcus* (1.40). The extract of Onion showed inhibition against *Bacillus* spIII(1.80), *Sarcina*(1.65), *Staphyllococcus*(2.075), *and Micrococcus*(1.70). Ginger inhibits the growth of *Bacillus* sp III (2.05) and *Sarcina* (1.575) only. Mustared only inhibit the growth of *Staphyllococcus*.But it only reduced the growth around the well without forming a markable clear zone. Dill failed to inhibit any bacteria tested. Black fennel showed a wide range of antibacterial activity. The diameter of clear zone; *Bacillus* spI(1.40), *Bacillus* sp II (2.15), *Proteus* (2.30), *Bacillus* sp III (1.35), *Pseudomonas*(1.60), *Sarcina* (1.30), *Staphylococcus* (1.38). In the case of Clove, a successful bactericidal activity was observed on all bacteria tested as *Bacillus sp* I (2.00), *Bacillus* sp II (1.95), *Proteus* (2.20), *Bacillus* sp III (2.45), *Pseudomonas* (2.10), *Sarcina* (1.55), *Staphylococcus* (1.52) and *Micrococcus* (2.40).

Turmeric showed a remarkable percentage of inhibition on all four fungi *Aspergillus* (32.20%), *Rhizopus* (27.70%), *Penicillium* (22.30%) and Yeast (12%). Ginger inhibits the growth of *Rhizopus* (31.80%), *Aspergillus*(50.0%), and Yeast (42.2%).Onion bulb extract also inhibits the growth of the fungal species *Aspergillus* (41.37%), *Rhizopus* (11.12%), and Yeast (43.11%) and not the *Penicillium*. Garlic extract inhibits the radial mycelial growth of all fungi *Apergillus* (44.40%), *Rhizopus* (51.23%), *Penicillium* (23.07%) and Yeast (51.25%). Pepper also has some fungicidal activity on *Aspergillus* (21.20%),*Rhizopus* (44.50%), *and* Yeast (6.54%). It fails to inhibit *Penicillum*. Mustard inhibits *Aspergillus* (42.40%), *Rhizopus*(13.30 %) and

Yeast (48.90%).Black fennel also inhibits the four fungi tested. The percentage of inhibition is *Aspergillus* 63.00%, *Rhizopus* 20.00%, *Penicillium* 3.80% and Yeast 19%. Extract of Clove showed a remarkable antifungal activity and it inhibits the growth of all fungi completely (100%).

When using UV sterilized powder of dill, it was found that all plates were covered with the growth *Mucor* - seedborne fungi among the nine plants we tested, Clove has the best antimicrobial activity. But Mustard, Dill, and Pepper have poor antimicrobial activity.

Determination of Trypsin inhibitor content of soy products

*Nirmala Ravimannan and ** Sivakanesan, R.

*Department of Botany, Faculty of Science, University of Jaffna, Sri Lanka.
** Faculty of Medicine, University of Peradeniya, Sri Lanka.

Edible soy protein is one of the world's least expensive and highest quality plant protein sources available in large quantities. Anti-nutritional factors are present in raw soybeans. The most important is the trypsin inhibitor, which has the characteristic of inhibiting the activity of the proteolytic digestive enzyme trypsin. Thus the protein nutritional value of a soy product is decreased by about 50% if trypsin inhibitor is not destroyed. The objective of this study is to determine the trypsin inhibitor content and to assess the protein quality of soy products (Soy flour, Soy meat, Tempeh,Thriposha, Nutra (Soy milk powder), Soy sausage, Soy cutlet and Soy ice-cream). The Trypsin inhibitor (TI) contents of the soy productrs was determined by the method of Kakade et.al.(1969). Soy flour is a finely ground product processed from full-fat cotyledons or defatted flakes. Tempeh is produced in Sri Lanka by fermenting soybeans with Rhizopus. Soymilk can be processed from whole soybeans or full-fat soy flour. Thriposha is a cereal-based weaning food. It contains 30% of soy flour, 70% of maize flour and 5% of non-fat dry milk etc. Sausages are prepared from isolated soy protein. The isolated soy protein is added to a hot solution of trisodium phosphate in a mixer and the other ingredients are added. Soy ice cream is prepared from the soymilk in as much the same way as conventional dairy ice cream. Soy cutlets are prepared as the usual cutlets. Here, soy pulp is added as an ingredient along with potato, spices and salt. As Soybean trypsin inhibitor is a low molecular weight peptide, it must have been destroyed during the preparation of Nutra(soy milk powder), tempeh due to the excessive heat treatment during its preparation. Similarly the processing condition used in the preparation of various soy products gave different values for the trypsin inhibitor content. During the heat treatment or extrusion process there is inactivation of trypsin inhibitors. Therefore only residual amounts of trypsin inhibitors can be seen in these products. By careful processing, products of good nutritional quality can be obtained.

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B_{13}

A study of the microbial quality of selected dried fish and the occurrence of salt tolerant bacteria

Tharshini Thevarajah and Thavaranjit, A. C.

Department of Botany, Faculty of Science, University of Jaffna, Sri Lanka.

To study the microbial quality, dried fish samples were collected from Velani, Vadamarachchi, Jaffna town and Manipay areas. Three different fish species were selected such as Soodaii (*Sardinella melanura*), Villai (*Lathirinus rhodopterus*) and Manalai (*Mugil cephalus*).

Dried fish samples were examined for total bacterial count, total coliform count, moisture content and sodium chloride content separately. Different bacteria were isolated from these samples, purified and identified as much as possible by using various characteristics.

In this study about 19 different bacterial isolates (12-gram (+)ve, 7-gram (-)ve) were identified and among them 5 different genera were present. Twelve isolates were short, gram-positive rods and spore formers. It was reported that the genera of *Pseudomonas*, *Yersinia* and *Acinebacter* were frequently found not only in dried fish but also in fish and they are more capable of causing fish spoilage.(James,M.J. 1986)

Based on the microbial quality only, the dried fish collected from Jaffna town only Villai and Soodaii and from Manipay only Soodaii were suitable for human consumption. But according to the Sri Lankan standards (total bacterial count, total coliform count, moisture content and sodiumchloride content) none of the samples were suitable for human consumption.

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Effect of *Lantana camara* on prevention of cut tuber decay in Potato and its anti-microbial properties

***Sathiyavaani Kanagasingam,* Rajadurai, S.,**Vasanthy Arasaratnam and** Senthuran, A.**

**Department of Agronomy, Faculty of Agriculture, University of Jaffna, Sri Lanka.*
*** Department of Biochemistry, Faculty of Medicine, University of Jaffna, Sri Lanka.*

Lantana camara (Family: Verbaceae) is a native of West Indies and introduced to Sri Lanka as an ornamental plant. It has become one of the most widely spread weed in this country. This plant contains an unidentified chemical called "Lantanine"and it was already reported that the lantanine has an anti-microbial property.

Laboratory experiments were carried out to study the effect of *Lantana camara* leaves in controlling bacteria and fungi infection with this view of using this leaves to prevent cut tuber decay in potato when cut tubers are used as planting material.

Results obtained from this experiment reveals that fungus growth in PDA media was found within 24 hours in the media treated with leaf extract and leaf residue of water and ethanol. But in the leaf extract of ether, the fungal growth was observed only after 48 hours of inoculation. In the bacterial inoculated plates of Nutrient Agar, the bacterial growth was observed both in the waterleaf extract and residue within 24 hours of inoculation. Same observation was also noticed in the ethanol and ether extract and not in the residue. In the residue of ether and ethanol bacterial growth was not observed up to 14 days. In an experiment where the potato cut tuber were covered with *Lantana camara* leaves and buried in the soil, cut tuber decay was not found up to 45 days. These conclude that the *Lantana camara* leaves could be used to prevent cut tuber decay when cut tuber of potato are used for planting purpose.

Comparison of natural and commercial flavours by Gas Liquid Chromatographic Analysis

*Meera Dharmendran and**Sultanbawa, Y.

*Dept. of Agric. Chemistry, Faculty of Agriculture, University of Jaffna, Sri Lanka.
**Food Product Development Group, Industrial Technology Institute, CISIR, Colombo.

Flavours are complex ingredients that play a key role in food acceptance. The flavour of a foodstuff is an integrated response, composed primarily of the sensations of aroma and taste. All volatile substances present in a food product contribute to the overall odour, which make the flavour of every food product unique. The flavouring substances could be divided in to naturals, nature identical (synthetics), and artificials. As supply and demand continues to evolve, there is a growing consumer interest in health and well being which mainly consider the quality of flavours. In recent years there has been a strong upsurge in the demand for natural flavours. The trend towards natural ingredients in foodstuffs is evidenced by consumer acceptance of natural foods and the various national regulations, which completely or selectively ban artificial colours and flavours from foods. Nowadays there is a critical question, which arises among most of the people in the world whether the flavours used in the commercial production of foodstuffs are naturally originated or artificially produced. This trend leads to analyse the relative contribution of natural and synthetic compounds in commercial flavour powders, which are normally used to coat the snack products. To detect whether the commercial flavours are made up of a natural or synthetic base, paprika (red bell pepper), sweet corn and seafood (prawn shell &crab meat) flavour powders were obtained from a private food manufacturing company (commercial flavours). These flavours were developed by using the natural ingredients described by the manufacturers of commercial flavours (Rajapakse Associates, Pannippitiya). The commercial flavours & developed natural flavours were separately extracted by steam distillation process and the extracted volatile substances were trapped in n-Hexane layer. The Hexane layer was concentrated in a roto evaporator and the concentrated natural paprika, sweet corn and seafood flavour volatile substances and commercial paprika, sweet corn and sea food flavour volatile substances in Hexane layer were separately injected in a Gas Liquid Chromatography (Shimadzu 9A model) with helium as carrier gas with a flow rate of 50ml/minute and has a bonded phase of 5% Diphenyl and 95%Dimethyl siloxane. The operating temperature was 50°C for 5 minutes, then rose to 225°C for 5 minutes at the rate of 4°C/minute. The injector temperature was 230°C and the detector temperature was 240°C.The split ratio was1: 40 and the sample size was 0.5 µl The chromatograms with flavour profiles were obtained for each flavour and the chromatogram obtained with natural & commercial flavour profiles were compared based on their respective retention time. The retention time of each volatile compound is unique. In the commercial & natural paprika flavour profiles, the overall complexity of both chromatograms was same and the highest peak in the natural flavour profile and that of the commercial paprika flavour profile showed the same retention

time. Like wise, the natural sweet corn flavour profile showed three peaks similar to three peaks of commercial flavour profile, showing same retention times. The complexity of both profiles was similar. There was only one peak of the natural and commercial seafood flavour profile only one matched with each other and commercial flavour profiles were less complex than natural profile. From the above results, it can be concluded that the commercial paprika flavour, and sweet corn flavour were obtained from a natural base while it is difficult to confirm that the commercial seafood flavours were from natural sources.

Desorption Isotherm of Tea Leaf

*** Varatharajan, V. and ** Abeysinghe, I. S. B.**

**Dept. of Agric. Chemistry, Faculty of Agriculture, University of Jaffna, Sri Lanka.*
***Biochemistry division, Tea Research Institute, Talawakelle.*

This study was designed to provide experimental desorption isotherm interpretation for tealeaf by fitting the data to well- known sorption isotherm equation – Henderson equation (1952). The standard static gravimetric method was employed to establish the experimental desorption isotherm data. The desorption isotherm of tea leaf TRI 2025 was determined at 30°C & 40°C with in the range of 0.065 to 0.974 water activity levels. To obtain the experimental desorption isotherm data, eight saturated salt solutions NaOH, $MgCl_2$, K_2CO_3, $NaNO_2$, $Na_2Cr_2O_7$, NaCl, KCl, and K_2SO_4 were prepared to achieve constant water activity. Weight of the tea leaves were monitored periodically using micro balance having an accuracy up to 0.1mg until there was no change in weight of the tea leaves. After equilibration the equilibrium moisture content was determined by moisture oven technique and Henderson equation was tested to fit the experimental data.

The general sigmoid type of sorption isotherm elucidates the sorption mechanism of tealeaf and fitting equation, Henderson 1952 to tealeaf provides good correlation between the predicted values and experimental data at 30°C and 40°C.

Effect of some Botanical extracts on Grapevine adult Flea beetle, *Scelodonta strigicollis* (Coleoptera: Eumolphidae)

Jeyaseelan,B. and Mikunthan,G.

Dept. of Agricultural Biology, Faculty of Agriculture, University of Jaffna, Sri Lanka.

Grapevine flea beetle, *Scelodonta strigicollis* (Coleoptera: Eumolphidae) is causing serious loss to grapevine (*Vitis vinifera*) in Jaffna District. The beetles feed on the foliage of the vine whereas their grubs feed on roots (Kulkarni, 1971). The severely affected vines showed a characteristic symptom of wilting and finally die. This ultimately forced the farmers to apply highly toxic chemicals (Dimethoate, Admire and Carbofuran) as a mixture in 3-4 days interval to minimize the flea beetle damage. Grape berries are mainly consumed as fresh fruit and this may affect the consumers by the residues of these pesticides. This study focused on test the effect of some locally available plant extracts on adult *S. strigicollis* to avoid the hazardous effect of these pesticides. The selected plant extracts posses' phytochemicals that interfere with insect feeding, growth, metamorphosis, reproduction and behaviour.'

The efficacy of water extracts (25g/100 ml) of Neem seed kernal, *Allium sativum* (Garlic bulb), *Calotropis gingantea* (Erukkalai) leaves and *Vitex negundo* (Nochchi) leaves extracts were tested against this pest. Approximately same size fresh grape leaves sprayed separately with these extracts and one maintained as control (100 ml water). Newly emerged 30 adults of *S. strigicollis* were randomly selected and introduced for feeding (Sex ratio 1:1). The experiment was replicated four times. The damage areas were measured after 24 hours of feeding in each treatment. The results were analysed by using ANOVA and the means were compared using Duncans' Multiple Range Test. The percentage of mortality of adult beetles also recorded in each treatment and the data was transformed to arcsin value and statistically analysed.

The results of showed that a significant variation in leaf feeding rate among these tested botanicals. Neem seed kernal extract and *Allium sativum* extract were showed as very effective antifeedent effect than other tested botanicals. The decreasing orders of effect of botanicals were Neem seed kernal, *Allium sativum*, *Calotropis* and *Vitex negundo* leaves extracts. Garlic and Neem seed kernel extract caused greater mortality than others. The mortality of adult flea beetle caused by *Vitex negundo* and *Calotropis* were low. Hence, Neem seed kernel extract and Garlic extract (*Allium sativum*) could be used to minimize the damage due to the feeding of adults *S. strigicollis*.

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Control measures of Whitefly *Bemisia tabaci* (Hemiptera: Alerodidae) on Fire cracker *Crossandra infundibuliformis*

***Jeyagowri Kiddinamoorthy, ** Kudagamage, C. and ** Wijesekara, G. A. W.**

**Dept. of Agricultural Biology, Faculty of Agriculture, University of Jaffna, Sri Lanka.*
*** Horticultural Crop Research and Development Institute, Gannoruwa.*

Crossandra infundibuliformis is a newly introduced Srilanka's flowering potted landscape plant, which has been damaged by White fly *Bemisia tabaci*. Occurrence and infestations of *Bemisia tabaci* in the *Crossandra* cuttings are a threat to export trade especially with pest zero tolerance countries. Due to its rapid development, high reproductive rate and resistance to most recommended insecticides, whiteflies are difficult to control. There fore, to screen insecticides for control *Bemisia tabaci* and also to search for a suitable biological control system, this study was carried out at Green farms Ltd, Marawila.

Experiment plots were arranged in CRD design with 4 replicates. The 8 treatments included locally produced botanical pesticides (Neem, Garlic, tobacco), cinnamon based pesticide (Cinnamite), least toxic pesticide (Safer- Insecticidal soap), chemicals, already used in the farm (Dimethoate, Appluad) and control. Each treatment and each replicate had twelve *Crossandra* plants with same height, canopy and under same environmental conditions. Thirty leaves were collected from each replicate separately and numbers of each life stages of whitefly except the adult were counted under microscope. Ten plots were selected randomly; parasitized pupa and pest stages of whitefly were counted under microscope to determine the parasitism in the field. Though, all treatments showed significant treatment effect in mean survival percentage of whitefly at $P<0.05$, Garlic 100g/l, Safer10ml/l and Cinnamite 6ml/l had significantly lower mean survival percentage of whitefly than other treatments. Preparation of garlic extract for large extent needs further labor cost and Safer in continuous application phytotoxicity should be concerned. Among these treatments, Cinnamite was the best insecticide.

5.37% of parasitism by *Encarsia* spp (local) was also observed in the field level and parasitism was not observed in the cages with high population of whitefly (< than 100 eggs/cm^2). But in cage with low population (> than 10 eggs/cm^2), 9.57 % of parasitism was observed. Therefore, mass production and augmentation this local parasitoid may be possible if proper technique will be adopted.

Preliminary screening of plant species as diversionary hosts or repellant species in the management of *Xyleborus fornicatus* (Coleoptera: Scolytidae) of tea

***Tharshinidevy Nagalingam, **Amarasinghe, L. D.**

**Dept. of Agricultural Biology, Faculty of Agriculture, University of Jaffna, Sri Lanka*
*** Entomology Division, Tea Research Institute, Talawakelle.*

Plant species were screened to use them as diversionary hosts or repellant species in the management of *Xyleborus fornicatus* at Tea Research Institute, Talawakelle. Twenty-nine different plant species belonging to different families collected from St. Coombs estate, nearby estates, Passara and one species collected from Haggala botanical garden were compared with tea. Most of the collected plants are used as shade trees, Green manure crops and used to control erosion in tea plantations. Nine, 10 cm long pieces were cut from thirty plants and kept in jars of 20 cm height and 7.5 cm diameter. Three pieces in each set were inoculated with 12 adult active female *X.fornicatus* beetles and incubated at 25^0C for 14 days. Observations were made based on the mean number of gallery formation and the beetle behaviour in the cut stems of each species.

Jakerenda mimosifolia, Eupatorium iniulifolium, Azadirecta indica, Grevillea robusta, Acacia decurrens, Calliandra calothyrusus and *Flemingea conjesta* were found to be harboured with more galleries than in tea. Of which *Jakerenda mimosifolia, Eupatorium iniulifolium, Acacia decurrens* and *Flemingea conjesta* did not produced brood but live beetles were always found inside the galleries; *Grevillea robusta* was trapping the beetles effectively.

Azadirecta indica, Calliandra calothyrusus together with *Coffea arabica, Lantana camera, Psidium guava, Cassia sps, Erythrina lithosperma* and *Albizzia moluccana* harboured the *X.fornicatus* beetles and influenced their brood development significantly. As these species serve as source for a new infestation, Management of *Xyleborus fornicatus* is impossible by using these plants. *Tithonia diversifolia* and *Solanum indicum* did not allow the beetle to bore them and hence these plants can be used as repellant species (as extract or cut stems) in the management system of *X.fornicatus*.

B_{20}

Effect of different treatments to prevent cut tuber decay when cut tubers are used as planting material in Potato

Sathiyavaani Kanagasingam and Rajadurai, S.

Department of Agronomy, Faculty of Agriculture, University of Jaffna, Sri Lanka.

Potato is an important tuber crop in Sri Lanka. It's cultivation started in 1957 in Jaffna district. High cost of seed tuber and its limited supply were identified as major constraints in Jaffna. Research was carried out at Thirunelveli to study the possibility of using cut tubers as planting material with the view of reducing the seed cost. Different treatments to study its effect in controlling cut tuber decay along with control were tested in the Randomized Complete Block Design in the field. In this experiment large tubers were cut longitudinally in to two pieces for planting purpose.

It was found among the various cut tuber treatments, treatment of cut tuber covered with *Lantana camara* leaves and cut tubers treated with captan fungicide used as planting material after callus formation were recorded highest germination percentage compare the rest of the cut tuber treatments. However the differences between these two cut tuber treatments and control (using whole tuber as planting material) in germination was found statistically not significant. The same trend was also observed in the case of number of main stem produced per tuber and Leaf Area Index. Number of tubers and weight of tuber produced by single plant and the plot yield were statistically analyzed. The result reveals that the cut tuber covered with *Lantana camara* recorded the highest tuber yield per plant and per plot among the various cut tuber treatments. This treatment gave 3.97kg/plot while the whole tuber gave 4.15kg. The difference of tuber yield per plot between these two treatments was found not significant. Further tuber size distribution also reveals that the weight of large size tubers produced from cut tubers treated with *Lantana camara* was higher than that of the whole tuber used as planting material.

From this study it could be concluded that the large size tubers (45-55mm diameter) can cut longitudinally in to two pieces and used as planting material by covering with *Lantana camara* leaves. Seed box of 50kg contain 20% of large tubers. By cutting these large tubers in to two pieces for planting purpose seed tuber cost could be reduced by 18%.

The Effects of mulching materials and pH amendments on soil properties and yield of tea.

***Ganesrajh, T., ** Luxmi De Silva and Anandacoomaraswamy, A.**

**Department of Agronomy, Faculty of Agriculture, University of Jaffna, Sri Lanka.*
*** Agronomy Division, Tea Research Institute, Talawakele, Sri Lanka.*

Incorporation of organic materials and liming are two agronomic practices undertaken to improve the fertility of tea lands. Mulching improves the soil organic carbon, reduces the evaporation and conserves soil. Liming increases the soil pH. In this investigation, combined effect of mulching and liming on soil fertility was investigated in both young and mature vegetatively propagated tea fields.

Two studies were carried out at St.Coombs Estate, Talawakele with young tea and pruned mature tea of TRI 2025. The experiment was arranged in a way of different mulching materials x pH amendments as a factorial design with five replicates. Refuse tea (25 tons ha^{-1}), Mana (35 tons ha^{-1} fresh material), Dadap (35 tons ha^{-1} fresh material) and Pangirimana (live mulch) with different C/N ratios and inoculation of *Tricoderma* fungi were used in this study.

Dolomite and Minplus (crushed basaltic rock) were used to amend the soil pH. Soil samples collected after 8 months were analyzed for organic carbon, pH, CEC, total nitrogen and phosphorus, soil microbial carbon. Thermal conductivity was measured on the collected soil samples. In addition, yield of tea was monitored after application of treatments.

Both in young and mature tea fields refuse tea and Dadap improved the CEC, microbial biomass carbon, total phosphorus, total Nitrogen and yield. Dolomite was superior to Minplus in improving the soil pH and CEC. Improving the soil organic carbon by $1mgg^{-1}$ increased the CEC by 0.12 cmole kg-1 and reduced the thermal conductivity by 0.25 $Wm^{-1}K^{-1}$.

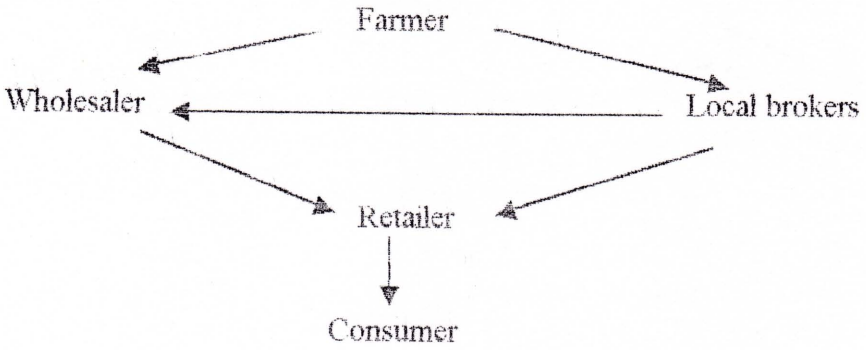
Production and marketing of selected local vegetables in Vallikamam region of Jaffna district

***Vathana Thatparanantheswara sarma and **Rajadurai, S.**

**Dept. of Agric. Economics, Faculty of Agriculture, University of Jaffna, Sri Lanka.*
***Depatment of Agronomy, Faculty of Agriculture, University of Jaffna, Sri Lanka.*

A field survey was carried out to study the production and marketing of selected local vegetables in Valikamam region of Jaffna district. The survey was conducted in six agrarian service centres (ASC) of Valikamam region. Proportionate sample farmers (total of 50) based on the extent of vegetable cultivation was selected from the six ASC divisions and interviewed by the author with the prepared questionnaire. Further the Farm gate price (FGP) and Retail price (RP) for the selected vegetables were also collected at weekly interval form the four main markets.

Vegetables reach consumers through the following marketing channels.



The study reveals that, the production cost was very high for brinjal (Rs 83,410/ac) than the rest of the vegetables. Forty percentage of the production cost accounted for the application of agrochemicals for this crop. Among the six vegetables high profit was obtained from tomato cultivation (Rs 151,381/ ac). Among the different cost components labour cost accounted for 31 to 37 percentages for all six vegetables. This was the highest cost components for all vegetable crops except brinjal. Family labour contribution accounted for 12 to 19 percentage of the total cost for different vegetables. This reduced the paid out cost by from Rs 7,015/ac to Rs 11,105/ac for different vegetables.

The variation between FGP and RP was ranging from Rs 2 to 56 for different vegetables. The highest variation of Rs 56 was observed for tomato crop. The variation for the rest of the vegetables was ranging from Rs 2 to 17. This shows the farmers' share (FS) for the product was ranging from 70-93 %. Seventy percentage was observed in snake gourd and 93 % in okra. The total gross margin (TGM) ranging from 7-30% on an average for all the vegetables. However FS are not indicating the profitability of vegetables. It was also found that, the farmer's profit was reduced further by market discount of 10 % for the amount of vegetables they sell and the tax of 3% for their sales.

The FGP for most of the vegetables was found to be more than the cost of production per Kg. Anyhow the FGP was lower than the cost of production for okra and snake gourd during some months of May and June in all markets. Transport cost of vegetables was not accounted since farmers have self brings the product to the markets. No wastage during the transport or storage was found. Further no vegetables were stored after harvest.

$$\text{Famers' share} = \frac{\text{Farm gate price}}{\text{Retail price}} \times 100$$

$$\text{Total gross margin} = \frac{\text{Retail price} - \text{Farm gate price}}{\text{Retail price}} \times 100$$

Organization and Operation of food retail market: A case of Wellawatte market

*Vanathy Jeyananthan and ** Rupasena, L. P.

*Dept. of Agric. Economics, Faculty of Agriculture, University of Jaffna, Sri Lanka.
** Hector Kobbekaduwa Agrarian Research and Training Institute, Colombo.

The field survey of this study covered the entire project area in order to gather information regarding the existing condition of organization and operation of food retail market of Wellawatte in the Colombo Municipal Council area and concentrated on the vegetable marketing. Furthermore the study aimed to

1) Find out the source of supply
2) Identify the market participants and their problems
3) Examine the marketing activities and
4) Review the performance of the market.

The assessment was predominantly based on primary data collected by questionnaire survey that employed 75 randomly selected sample retailers. Moreover some respondent retailers and consumers were interviewed directly at the market place. Secondary data also used for this survey apart from the primary data relevant.

Collected data were scrutinized and analysed extensively. Analysis was carried out by making use of qualitative analysis, quantitative analysis, some tabular analysis and graphical illustrations using excel work sheet. Price analysis for seasonal variation had been carried out by using secondary source of information.

Finally the study revealed the following important findings. That are;

1) Principal retail outlets in the area is 147 grocery stores, two public markets, two MPCS, one vegetable co-operative, two super markets: Cargills; a private super market, Sathosa; a semi government institution, 9 roadside permanent stall retailers and 63 pavement retailers.
2) Most important marketing participants are wholesalers of Pettah market, retailers of Wellawatte market and different type of buyers.
3) Individual consumers are the most important type of buyers.
4) Marketing channel mainly comprises producers, collectors/ wholesalers, pola traders, manning commission agents or traders, public market retailers/ public & private supermarket managers/ Roadside traders/ contractors, hotels & restaurant managers/ traditional pola traders, consumers
5) Supply depends on Pettah wholesale market.
6) Based on secondary source of information there was substantial price variation due to seasonality
7) Retail margin for vegetables ranges from 20-66%.
8) Retail margin for grocery products is much lesser than the vegetables.
9) Average daily turn over ranges from 82-86 kg. /stall for the selected vegetables.

High rent associated with the space, traffic congestion at the market place, considerable wastage, high retail margin, etc... are the major problems identified during the period of study.

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Finally this study proposes some recommendations to overcome the problems, which have to be removed urgently for further improvements of the market such as introduction of pola, reconstruction of old market, increasing the efficiency of the marketing system, arrangement of separate parking places, implementation of marketing regulations, introduction of scientific packaging methods, provision of marketing credit, etc...

Consumption pattern of fast food: A case study in the Wellawatte area

***Chandravathani Nadarajah and ** Rupasena, L. P.**

**Dept. of Agric. Economics, Faculty of Agriculture, University of Jaffna, Sri Lanka.*
** Hector Kobbekaduwa Agrarian Research and Training Institute, Colombo.

To day the role of fast food has increased in urban diet due to the changes in life style and influence of western culture. But there is no detail study focus on this. This study is aimed to find out the overall consumption pattern, factors influencing consumption pattern and current problems and their solutions in fast food sector in Wellawatte area.

To obtain primary data questionnaires for consumers and shopkeepers were prepared. Relevant secondary data was also obtained from appropriate departments. 25 shopkeepers and 50 consumers and 50 workingwomen who live closer to Galle road were selected by purposive random sampling. Frequencies graphs and percentages were used to analyze the collected data. Chi-square method was used as a statistical tool to find out the correlation between fast food consumption and income level, educational level, family size age and workingwomen. For this statistical calculation the excel work sheet in computer was used.

The findings of the survey show the present features of fast food sector in Wellawatte area. Vegetarian food outlets are higher in number than non- vegetarian food outlets. Among the consumers employees occupy the highest percentage, and regular customers are high in number than irregular customers. Females, children and elders come occasionally to fast food centres. Weekdays have higher demand than week ends. Business peak hours are from 11A.M – 2 P.M. From 2- 4 P.M. is off peak. Selection of type of food items varies throughout the day with consumer's age, and income level. Middle-income people occupy highest percentage among fast food consumers. It was found out statistically there is no correlation between fast food consumption and income level, educational level, family size age and workingwomen. People belong to all income groups consume fast food. But the selection of fast food was influence by income level. To day not only working women move towards fast food but to days house wives also move towards fast food due to the changes in their life style.

Consumption pattern of fast food varies individual to individual according to their preference, taste and time availability. Due to the limitation imposed by time, sample size and selection of particular small area for this study the conclusions derive from the study cannot be generalized without further studies

Low cost emitters and their performances due to pressure differences

Kalki, P., Thushyanthy Mikunthan and Vijayaratnam, R.

Dept of Agric Engineering, Faculty of Agriculture, University of Jaffna, Sri Lanka.

Drip irrigation plays a vital role in the national agricultural economy and exploits the limited water resources efficiently and profitably. The major limitation in its extensive adaptation is high initial cost and discharge variation of emission points due to pressure variation with in the lateral, which leads to low application efficiency.

The objective of the study was deriving the flow chart of emitters with different pressure head for locally available porous emitters. Assembly parts of the drip systems were fabricated. Four types of emitters namely: 30% clay sand mixture, thread screw (20 threads in one inch length plastic pipe), micro tube and coral emitters were selected for evaluation. The pressure was adjusted from 600 cm to 100 cm of water head. The pressure differences between initial and terminal end of the lateral were measured. The discharge of emitter was quantified for an emitter to a particular pressure for one hour with four-replicates. The emitter was interchanged within the lateral in each measurement

The models between changes of pressure to discharge showed non-liner relationship with acceptable higher correlation values (greater than 90%) except clay sand emitter ($Y=162.12\ Ln(X) - 683$, $R^2= 84.44\%$). Coral emitter was closer to 90% ($Y = 327.05\ Ln(X) - 1258.6$, $R^2 = 88.23\%$) and micro tube had the highest value of R^2 ($Y = 1537.6\ Ln(X)-6088.9$, $R^2 = 96.82\%$). Thread screw type had the function of $Y= 550.43\ Ln(X)- 2294.4$, $R^2 = 94.3\%$. In all functions Y denotes discharge in ml/h and X denotes the pressure in cm. At the same time all these emitters achieved linear relationship between pressure and discharge above 300 cm of a water head except 30% clay sand emitter with high correlation values. The maximum observed pressure variation was 1.75 cm (0.32%) water head for micro tube emitter at 550 cm water pressure head with 13 feet lateral.

Hence the lateral line could be extended up to 10% of pressure variation considering the uniformity and operating the pressure above 300 cm head of water was desirable to achieve better uniformity.

B_{26}

Spatial distribution of groundwater salinity in the northern inland area of the Vadamaradchi north lagoon

Sivakumar, K., Thushyanthy Mikunthan and Vijayaratnam, R.

Dept of Agric Engineering, Faculty of Agriculture, University of Jaffna, Sri Lanka.

Excessive exploitation of groundwater in coastal agricultural lands is results in the draw down of water table and subsequent contamination of the aquifers by seawater intrusion. Certain parts of Jaffna peninsula also experienced such catastrophe and the groundwater became saline due to the effect of saltwater intrusion into the inland area of the lagoon. Groundwater of such areas affected the agricultural production. The salinity distribution pattern was studied for the ground water of the northern inland areas of Vadamarachi north lagoon by grouping the salinity classes of ground waters using the electrical conductivity values of the month of May 2001. The electrical conductivity value method is one of the most efficient geophysical tools used in detecting and delineating salinity.

Systematic sampling method was done using 2 x 2 square cm grid pattern from 1": ½ mile topographical sheet. Groundwater sample was taken from the center point of the grid to group the salinity distribution pattern. The soil samples were also drawn from some selected places to correlate the electrical conductivity of soil saturation extracts and the ground water.

Electrical conductivity values of groundwater were found to range from 950 to 19,990 μScm^{-1}. Of the 190 wells tested, 38.95% had medium salinity water (750 – 2250μScm^{-1}; Chhabra, 1996), 36.84% had high salinity water (2250 – 5000 μScm^{-1} ; Chhabra, 1996) and 24.21% had very high salinity (> 5000 μScm^{-1} ; Chhabra, 1996) water. Out of the 70.61 km^2 tested, 41.1 km^2 had good quality water to be used for domestic purpose. The electrical conductivity values of this were less than the recommended value of Sri Lankan Permissible limit of 3500 μScm^{-1} (Sri Lankan standard). This good quality water should be supplied to the remaining 29.5 km^2, which has salty ground water to satisfy the domestic requirement. There was no correlation between electrical conductivity values of soil saturation extract and ground water in al tested areas. The distribution of salinity from the lagoon side to the inland area was higher than the distribution from the seawater side.

Integrated costal zone management should be implemented to prevent the sea and lagoon water intrusion and to eliminate the salinity problem in the inland agriculture areas.

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Prevalence of iron deficiency anemia in pre-pubertal, post pubertal and post menopausal females

Uma Nagendran, Nithianantharajah, N., Senthuran, A. and Vasanthy Arasaratnam

Department of Biochemistry, Faculty of Medicine, University of Jaffna Sri Lanka.

Iron deficiency anemia is a common type of anemia in developing countries especially among females. This research was carried out to find the prevalence of iron deficiency anemia in pre-pubertal, post-pubertal and post-menopausal females. Subjects 100, 175 and 100 were selected randomly from schoolgirls in pre-pubertal and post pubertal categories and in medical wards for post-menopausal category. From these subjects, anemia subjects were selected according their Hemoglobin (Hb) level and anthropometric (height and weight) measurements. Those who were having Hb% below 70% or Hb level below 9g% with abnormal anthropometric measurements were considered as anaemic subjects. Among the randomly selected subjects 30, 32 and 28 subjects were found as anemic in pre-pubertal, post-pubertal and post-menopausal females respectively. Ten normal subjects were also selected from each category having Hb level above 11 g % or Hb % above 80 % with normal height and weight for their age. Blood samples from normal and anemic subjects were analysed for total iron binding capacity (TIBC), bound iron (BI) and total serum protein levels. TIBC saturation % was also calculated. The iron deficiency anemic patients were identified as those having TIBC, BI & TIBC % levels deviating from the two standard deviation of the normal mean values. From the selected anemic patients 10,19 and 13 were identified as iron deficiency anemic in pre-pubertal, post-pubertal and post-menopausal females respectively. The prevalence of iron deficiency anemia was found to be 10 %, 10.9 % and 13 % for the above categorized groups of females in Jaffna. The mean serum protein levels were 51, 61 and 58gl^{-1} in pre-pubertal, after pubertal and post-menopausal females respectively. The serum protein levels correlates with the prevalence of the iron deficiency anemia.

C_2

Impact of wearing wooden sandals on the control of Hookworm infection

Rajarajeswaran, R.

Department of Pathology, University of Jaffna, Sri Lanka.

Hookworm infection is a major disease of man where open yard defaecation is practiced. The individuals, who walk barefoot on defaecation grounds, are liable to get the infection. Control progrmme includes treatment of infected persons, health education and assistance to construct sanitary latrines. The basic objective of this study is to assess the impact of wearing wooden sandals on the control of hookworm infection.

A total of five hundred subjects in two villages were given chemotherapy until they became negative for *Necator americanus* infection and no further anthelmintic treatment was given to them during the rest of the study period. All of them were from households, which lack latrines, and they all had the habit of stepping barefoot into defaecation grounds. Two hundred and fifty of them formed the experimental group and were provided with wooden sandals and advised to use same whenever they walk into defaecation yards. The control group formed of two hundred and fifty subjects, were not given wooden sandals and they all continued to go barefoot into defaecation grounds. Stool examination was done on all subjects after a period of one year and repeated after another three months period and the rate of re-infection was calculated. A significant difference was found in the re-infection rates among the two groups. The use of wooden sandals by the experimental group had prevented the re-infection with *Necator americanus* and kept the prevalence rate at 3% where as the prevalence rate had risen to 8.8% in the control group, which was not using wooden sandals.

Statical analysis shows that there is significant reduction ($\chi^2 = 6.94$; df = 1; $p < 0.05$) in the rate of re-infection with *Necator americanus* in the experimental group.

It is noted that wearing of wooden sandals by the experimental group does have a significant impact on the control of *Necator americanus* in households, which lack latrines.

D_1

An Analysis of Inflationary trend in medical periodical Prices in Sri Lanka.

***Komathy Murugathas and **De Silva, W.R.G.**

**Medical Library, Faculty of Medicine, University of Jaffna, Sri Lanka.*
***Main Library, University of Ruhuna, Sri Lanka.*

Medical periodical is of prime importance in the field of health science as it is the method by which new knowledge is imparted as quickly as possible in a brief and a usable form. Increasing price of medical periodicals creates challenges to health science librarians in Sri Lanka. The paper examines the origin of country of publications of available medical periodicals in Sri Lanka, currency exchange rate changes, the trend in price increases of medical periodicals during the period from 1981 to 1999 and the impact of price changes of medical periodicals on purchasing power of health science libraries in Sri Lanka. Twenty- one medical periodicals were randomly selected and their prices of every three-year period from 1981 to 1999 were taken from the respective years of Ulrich international periodical directory. Price information was compared to the general inflation rate experienced in Sri Lanka as reflected by the Consumer Price Index (CPI). Purchasing power of libraries was analyzed based on the calculation method followed to update on inflation of journal prices in the Brandon-Hill list of journals. (Kronenfeld, 1996).

The study showed that the fluctuation in the currency exchange rate of Sri Lanka rupee against USA dollar and UK sterling pound significantly influence the purchasing power of health science libraries in Sri Lanka due to over dependence of medical periodicals in USA and UK. The value of money spent on acquisition of medical periodicals deteriorated relatively to that of money spent in the general economy when considering 1981 as base year. It is readily apparent from the study that despite the current low general rate of inflation, the purchasing power of Sri Lanka health science libraries continues to dwindle. The study will allow people to understand better what is happening to a health science library's real purchasing power. The information should help the librarians to justify budget increase needed to maintain their collection.

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