Meena

PROCEEDINGS

OF

JAFFNA SCIENCE ASSOCIATION

2001

VOLUME: 9 NUMBER: 1

ABSTRACTS

NINTH ANNUAL SESSIONS

HELD ON

APRIL 04, 05 & 06, 2001

UNIVERSITY OF JAFFNA

JAFFNA, SRI LANKA

JAFFNA, SRI LANKA

2001

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This volume (Vol: 9, No: 1, 2001) contains abstracts of 26 papers comprising 01 from Section A (Pure Science), 20 from Section B (Applied Science) and 05 from Section D (Social Science).

I take this opportunity to thank Dr.S.Srisatkunarajah, 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.

K. K. Arulvel,
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Department of Commerce,
University of Jaffna,
Jaffna, Sri Lanka.
March 30, 2001.

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CONTENTS

A1

SPREAD OF *PARTHENIUM HYSTEROPHORUS* IN VALIKAMUM

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Parthenium hysterophorus is an herbaceous noxious exotic weed of the family: Asteraceae/Compositae, growing to about 1 m in height and gets dispersed very easily through the media of wind, water, animals, birds and vehicles. Its common names are " white head", "white broom weed", "worm weed" and its local name is "Indian weed". Most troublesome weeds in Sri Lanka are exotics and they have been introduced mainly through human activities. *Parthenium* seems to have been introduced by the I.P.K.F. and the data obtained establishes this.

Reconnaissance and preliminary surveys were carried out throughout Valikamum to determine the presence and the spread of this weed. Data was also collected through interviews with the public and farmers. Five sites were selected at various places of Valikamum and qualitative and quantitative surveys were carried out. Qualitative surveys were carried out to establish plant species diversity at the selected sites. Quantitative estimations were carried out to find out dominance of *Parthenium* through coverage and density estimations and to find out the effect of *Parthenium* seedlings on the germination and establishment of other species. Belt transects and quadrat methods were used for the estimations. In Valikamum area from the estimations of five sites average *Parthenium* population density was $70/m^2$, coverage was 55% $/m^2$, *Parthenium* seedling density was $48/m^2$, *Parthenium* dead plant density was $1/m^2$ and plant species diversity was 40.

Results showed that the weed has spread everywhere. Through qualitative surveys and checklists prepared, it was discovered that most of the plant species present have great medicinal significance. *Parthenium* seedlings inhibited the germination and growth of other species of plants, especially of the herbaceous types. *Parthenium* has attained dominance in most places surveyed. As such, it is turning to be an invasive weed in this area. Local farmers seem to know that *Parthenium* was introduced by the I.P.K.F. but they don't seem to realize that it is a noxious weed, being not serious regarding control. Awareness programmes will be necessary to control the spread of this weed.

B1

PREDICTION OF PERCENTAGE OF YIELD REDUCTION DUE TO WATER STRESS IN SUGARCANE USING YIELD RESPONSE FACTOR

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Sugarcane is cultivated mainly in the dry zone of Sri Lanka on reddish brown earth soil with rainfall. In rainfed cultivation, planting is done in the rainy season, either during October – November (*Maha*) or during March-April (*Yala*) to be harvested after 12 months. Due to erratic rainfall, the crop undergoes moisture stress in different growth period, which affects the yield of the sugar cane plant.

An investigation was undertaken to find the percentage of yield reduction due to water stress. The potential changes in soil moisture storage was estimated using daily rainfall data of 17 rainfall stations from 1982 – 1996 and daily pan evaporation for a period of 1990 to 1996 of Pelwatte sugar cane plantation. The potential change of soil moisture storage was correlated with actual soil moisture storage with the use of specified soil moisture content (root constant value). Then actual evapotranspiration (ET) was calculated using the value of actual soil moisture storage, runoff and precipitation. Percentage of yield reduction was estimated from the relationship of actual, potential yield to actual, potential evapotranspiration (Yield response factor).

Soil moisture stress period mostly affects the *Yala* planting crop than *Maha* planting crop because the extended stress period mostly occurs during June – September and as the crop is in vegetative phase at the time. Occurrence of moisture deficit at various critical stages of sugar crop leads to varying levels of crop yield losses. Reduction of ET of sugarcane during the period of active growth has a much greater negative effect on yield than when experienced during late growth stage. Average yield reduction during the period of *Maha* and *Yala* were 5.96 and 38.79% respectively of actual production. The average yield of sugar cane of Pelwatte was 55.9 mt/ha (SRI News letter 1994/95) under rainfed conditions but the average yield of sugar at Sevanagalle under irrigation was 137 mt/ha (Ratnaweera, 1992). Since the percentage yield loss was considerable during the period of *Yala*, moisture conservation measures and number of irrigations are very important to overcome the yield reduction. Therefore, the production of sugarcane can be considerably increased than the present yield at Pelwatte with cultural practices; soil moisture conservation and supplementary irrigation.

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EVALUATION OF SUITABLE LOW COST MATERIALS FOR DRIP EMITTERS

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In recent years, an advanced method of water application called drip – trickle – daily has spread throughout the world. It is seen that drip irrigation results in considerable economy and exploits the limited water resources efficiently and profitably. In the fact that drip irrigation has so many potential benefits, there are certain limitations also. The chief limitation in its extensive adaptation is the high initial cost of emitters.

The objectives of the study was the designing of low cost emitters from local materials as a substitute for high cost imported emitters, evaluation and selection of emitters to suit different crops. Thirteen types of emitters were fabricated namely: emitters with different ratios of cement sand (4), clay sand emitters in different ratio (3), emitter with pure sand, different numbers of thread screw in plastic (3), micro tube, and coral emitters. Assembly parts of the drip system; tank, filter, delivery tube and laterals were also designed using locally available materials. Average discharge of each type of emitters at 550 cm water pressure was measured for one hour duration at four times as replicates. In each measurement, the emitters within the laterals were interchanged. From the results, the emitters were separated as low, medium and high discharge rate recommended for different crops and evaluated using the parameter of flow variation.

Porous materials were selected after the preliminary evaluation. Only emitter with 5% of cement in sand was selected among the different ratio of cement sand emitters. 10% clay sand emitter and thread screw number 16 type emitters were rejected at preliminary level.

5% cement sand mixture (72ml/h), 30% clay sand mixture (464 ml/h) and 50% clay sand mixture (354ml/h) and coral emitters (834 ml/h) were grouped as low discharge rate emitters (less than 2l/h) and they could be used for low water requirement crops like tomato and gherkin. Sand (3861 ml/h) and micro tube (3554 ml/h) was grouped as medium discharge emitters and could be recommended for use in lime, banana, guava and grapes. However, in sand emitters the variation of discharge (712 ml/h) was significant. Thread screw number 20 (1851 ml/h) and 24 (1981 ml/h) were grouped between low to medium discharge rate emitters.

Discharge variation of emitter deals with maximum and minimum emitter discharge values and not with the average discharge and recommended value is less than 10% (Sivanappan *et al.*, 1987). Thread number 20 (9.2%) and 24 (8.4%) and micro tube (5.9%) emitters had value below the recommended value. The coral emitter was nearer to the standard level (12.93%) and the micro tube had the lowest value of 5.9%. Hence, these results could be used in drip irrigation. The cost of manufactured emitter available in the market is Rs.25 ± 3, however the maximum cost of low cost emitter is Rs. 7.90.

Reference:

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B3

USABILITY INDEX PRICE FITTING TO BLACK CHEWING TOBACCO

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This experiment was conducted at Vadamaradchi, an area for producing black chewing tobacco (BCT) during *Maha* 1998/1999 in Sri Lanka to prepare a classification on cured tobacco leaves by analyzing the present grading system involved in the characteristics such as leaf length, colour and weight. The system had failed to compromise with plant leaf position (PLP) earlier. PLP was the indication of cured leaf quality and physical characteristics belong to grading (Akehurst, 1981). Prediction of standard usability index to BCT for price fitting based on acceptability and trade was the objective of this study.

Five plots in five places Manthikai, Navindil, Kerudavil, Karaveddy and Thiccam were selected. Based on Hartana (1951) experimental styles in measuring fresh leaf growth measured in every weekend from establishment to harvesting on the middle lines on both directions where 25 plants were selected based on randomization. Planting/harvesting time, topping height and PLP were considered as parameters in fresh plants. Center plant was selected as sample plant, after harvesting leaves were allowed for batch processing, density, colour, taste and odour as parameters. In-line curing procedure lamina samples were selected at three stages NSS (No smoke samples) FSS (First smoke sample) and SSS (Second smoke sample) after 15 days sun drying, first firing and second firing respectively.

Early planting followed with early harvesting was ideal to fit the temperature 26.8^0C in January as harvesting time. Garner (1951) indicated 26.7^0C was suitable for tobacco plant. The higher topping height was achieved by early planting, 1053 mm. Increasing plant height was based on elongation of inter node form 70.3 to 48.4 mm, without changing the number of leaves (8) in plant at harvesting. Quality of leaves Q1, Q2, Q3 and Q4 was based on PLP, grading of leaves G1, G2, G3, G4, G5, G6, G7 and G8 were based on length or running (>90, 90, 80, 70, 60, 50, 40, and <40 cm). Running is associated with length breadth ratio (LBR), colour, density, and taste and odour. LBR range 2:1 to 3.8: 1; density 2.2 to 0.8 g/cc; Munsel soil colour chart range 6/8 to 3/3 fitted 91% level ($Y = 0.3534 X + 1.9741$, $R^2 = 0.9057$). By using 8 grades and 4 quality, 32 G and Q combinations through which slope price fitting lines were developed in parallel as usability index.

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B_4

USE OF POLLEN MORPHOLOGY AND PHYSIOLOGY TO DIFFERENTIATE THE PLOIDY LEVEL OF TEA (*CAMELLIA SINENSIS* (L.) O. KUNTZE) CLONES.

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In tea (*Camellia sinensis* (L.)) high yield and better quality had been achieved by introduction of clones. However, breeding of new genotype by artificial pollination seems to be difficult task in certain polyploids of tea. Further identifying ploidy level among the polyploids also found to be problem.

An experiment in an *in vitro* condition was carried out at Tea Research Institute, Talawakelle to study the pollen characteristics such as size, shape, colour, germination, tube length and viability in order to identify the ploidy level.

Freshly collected diploid and tetraploid pollens were cultured in different liquid nutrient media such as 10% sucrose, 5ppm boric acid, 5ppm calcium chloride and the nutrient medium combined all these three. Hundred pollens from diploid and tetraploid were randomly selected and analyzed under microscope (X10). Pollen size and tube lengths were measured using an ocular micrometer. Pollen viability studied by storing them at refrigerator condition combination with 10% RH. Pollen viability was assayed at one-month interval by germinating in combined nutrient medium. Each experiment was replicated three times. Results were analyzed using Complete Randomized Design.

No significant differences in the shape and colour between diploid and tetraploid pollens were found in all nutrient mediums tested. The mean diameter of the tetraploid pollen (75 ± 0.5μ) was significantly higher than that of diploid pollen diameter (50 ± 0.5μ).

In all nutrient medium percentage of pollen germination and length of pollen tube was found to be significantly higher in diploid than tetraploid ($p=0.05$). Comparing the nutrient media combined nutrient medium showed significantly higher pollen germination and pollen tube length than the rest of the three nutrient media ($p=0.05$). In combined nutrient medium pollen germination percentage in diploid and tetraploid were 72.3 (± 10.4) and 45.1(± 5.4) respectively. The mean length of pollen tube in diploid and tetraploid were 1641μ (± 153) and 941μ (± 72) respectively. In addition the tetraploid pollen had slower growth rate than diploid pollen in all nutrient medium tested.

In storage experiment at each interval, tested tetraploid pollens quickly dropped their pollen viability compared to diploid pollens. Pollen viability percentage after four-month storage in diploid and tetraploid were more than fifty and zero respectively. These results prove that compare to diploid the tetraploid pollens are ineffective to use as a pollen parent in conventional tea breeding program.

Further tea polyploidy level could be easily identified by measuring the pollen diameter. This is in accordance with earlier founding of Tan and Dunn (1973) who stated that pollen morphology could be used to identify polyploids in plants.

Reference

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B5

EVALUATION OF THE NUTRITIVE VALUE OF MANGO (*MANGIFERA INDICA*) SEED AND MANGO SEED KERNEL MEAL

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A major gap exists between the requirements and supplies of concentrate and fresh and dry fodder for feeding livestock in Sri Lanka. To alleviate this shortage, it is essential to increase these feeds by growing more fodder, promoting agro forestry and social forestry, improving the nutritive value of crop residues and utilizing non-conventional feeds. There are several potentially valuable non-conventional feeds. In this study, mango seed and mango seed kernel (MSK) were evaluated for its feeding value and utilization.

Average seed weight was 23g ± SD and on fresh weight basis, kernel constituted 47.17% of the seed. The mango seeds and MSK contained 46.34% and 56.68% of moisture respectively. Approximately 213 seeds were required for the preparation of 1kg MSK. Proximate analysis showed that the mango seeds and MSK contained 2.69 ± 0.02 and 4.65 ± 0.24 % CP, 3.63 ± 0.08 and 9.22 ± 0.09 % EE, 1.56 ± 0.22 and 2.13 ± 0.23 % ash, 29.95 ± 0.52 and 2.68 ± 0.61 % CF, 62.17 ± 0.27 and 81.32 ± 0.62 % NFE, 47.36 and 53.06% carbohydrates, 0.95 ± 0.07 and 0.96 ± 0.05 mg / g Ca, 1.25 ± 0.12 and 1.65 ± 0.60 mg/g Mg ,0.84 ± 0.19 and 0.57 ± 0.08 mg/g P, 0.01 ± 0.001 and 0.01 ± 0.001 mg/g Cu and 0.07 ± 0.01 and 0.06 ± 0.01 mg/g Zn respectively. While mango seeds and MSK had metabolizable energy values of 2.56 and 2.97 kcal/kg respectively, the gross energy remained same in both product as 4.07 ± 0.05 kcal/kg. The calculated TDN of mango seeds and MSK were 70.86% and 82.25% respectively.

TiO_2 was used as the indicator for the digestibility trial. The digestibility of 10% MSK diet using adult cow was 88.2 ± 0.44%. This digestibility was similar to the digestibility of reference diet (50% maize and 50% coconut poonac). It was concluded that mango seeds and MSK have good digestibility and that 10% MSK could be included in cattle diet without affecting digestibility. Finally, it is recommended that the feed mills can consider inclusion of MSK at 10% level in preparation of cattle feed.

B_6

EFFECT OF INCREASING NUMBER OF PLANTS PER HILL AND EARTHING UP ON GROWTH AND YIELD OF IRRIGATED GROUNDNUT

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A field experiment was conducted during *Yala* 2000 to study the effect of plant population by increasing the number of plants per hill under recommended spacing and earthing up on growth and yield of groundnut 3½ months variety under irrigation. The results reveal that the increasing number of plants per hill significantly increased the plant height. Same trend was also observed with Leaf Area Index (LAI). Earthing up did not influenced in both plant height and LAI. Increasing the number of plants per hill significantly increased the number of matured pods per hill. But significantly decreased the number of matured pods per plant. The same trend was also noticed in weight of pods per hill and plant. Earthing up failed to influence the number of matured pods or weight of pods. However earthing up significantly increased the number of matured pods per plant at one plant per hill level. Shelling percentage and 100-kernel weight were not influenced by treatments. Hill population of one, two and three plants per hill gave the yield of 2069.6, 3770 and 4341 kg/ha respectively. The yield increase was found to be significant.

B7

PRODUCTION COST AND PROFITABILITY OF POTATO CULTIVATION IN JAFFNA DISTRICT

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A field survey was carried-out in April 1999 to study the production cost and profitability of potato cultivation in Jaffna district. Sample farmers belonging to five potatoes growing Agrarian Service Centres (ASC) of Valikamum division were selected and interviewed with the prepared questionnaire.

It was found that in 1999 season high yield of 18 mt/ha was obtained by 14 % of farmers while 68 % obtained the yield between 9 and 18 mt/ha and 18 % obtained < 9 mt/ha. The average yield was 13 mt/ha. The cost of cultivation varied from Rs. 350025 to 406603/ha among the five ASCC and found that the difference was not statistically significant. Among the various cost components, seed tuber, labour, organic manure, fertilizers, agro-chemicals, and machineries contributed for 44 %, 18 %, 18 %, 14 % and 4% respectively. Average yield of Puttur ASC area was found to be significantly higher than that of Keerimalai, Nallur and Urumpirai ASC areas.

Comparing the extent and production of year 1998/99 with 1997/98, from 75 ha 975 mt was produced during 1997/98-season and selling price was Rs. 20/kg during the harvesting season of 1998. During 1998/99 the extent cultivated was drastically reduced to 27 ha with the production of 350 mt. This shows that the extent and production of potato during 1998/99 was 1/3 of the 1997/98 seasons.

Due to this short supply, in 1999 harvesting season the market price of potato which was Rs. 110/kg in January came down to Rs. 35/kg in February and again increased to Rs. 85/kg in March. The average market price during this season was Rs. 67/kg. As a result, farmers were able to obtain the profit of Rs. 482665/ha. This situation was vise versa during 1998 where farmers were unable to obtain profit due the very low market price. When analyzing the labour cost accounted for 18 % out of which 10 % contributed by family labour and 8 % by hired labour. Family labour contribution reduced the paid out cost by Rs. 39088/ha.

During 1968, when potato was cultivated in large extent the production cost in terms of potato equivalent was 7528 kg/ha. This was increased 19544 kg/ha during 1998. This abnormal increase was mainly due to the very low market price of Rs. 20 /kg. During 1998/99 the production cost in terms of potato equivalent was 5834 kg/ha mainly contributed by very high market price of Rs.67 /kg at harvesting time.

The study also revealed that profitability mainly depends on the market price, which fluctuates depending upon the local demand and supply

B_8

SUPPLY RESPONSE OF PADDY IN SRI LANKA

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Paddy is the staple food in Sri Lanka and it is the most important crop in the peasant economy of Sri Lanka. It provides a major source of employment to the rural population and contributes substantially to GDP of the country. Self-sufficiency in rice is a national goal since independence. So, Government made number of policies and programs to achieve this status. By these measures, area under cultivation was expanded and the productivity increased. Therefore, those in recent years the average yield of paddy in Sri Lanka is greater than other major paddy producing countries.

Data for this study were mainly collected from paddy statistics of Sri Lanka and Central Bank annual reports up to 1999. This study deals with the degree of supply response of paddy to various independent variables, such as extent harvested, guaranteed price, market price, import price, fertilizer issues and loan provided to both *Maha* and *Yala* seasons.

The objectives of this study were to examine the impact of extent harvested on supply response of paddy and factors influenced on paddy supply other than extent harvested.

This study concluded that the extent harvested determined significantly on the supply of paddy. In *Maha* season paddy production was mainly determined by market price and guaranteed price of paddy. But *Maha* production was mainly depending on the *Maha* season rainfall. The *Yala* season production was mainly depending on the availability of irrigation facilities. In each steps of cultivation activities technology played an important role to determine the yield, but it was more difficult to analyse so it was taken as a dummy variable to determine the yield of paddy.

This study suggested that the importance of high price expectation and irrigation facilities to promote paddy production to or above the point of self-sufficiency. Therefore, Government and other institutions have to expand the marketing facilities and invest on irrigation schemes in dry zone to improve the paddy sector.

B9

COMPARATIVE ANALYSIS OF POPULATION GROWTH AND PER CAPITA INCOME GROWTH ON PER CAPITA AVAILABILITY OF ANIMAL FOODS IN SRI LANKA

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In Sri Lanka, population development places an increasing strain on food supply. If population increases the availability of food will reduce unless the food production will be increased at equal or higher rate. Not only population growth per capita income also determines the availability of food. It is common that when per capita income increases consumers change their food habits from plant origin to animal based diets. Expect per capita consumption of rice remains stable even per capita income increases with time. Therefore, this study is primarily based on per capita availability of animal foods with increasing population and per capita income.

The main objective of this study is to determine the effect of population growth and per capita income growth on per capita availability of animal foods and to determine the future demand of these items.

Data for this study were mainly collected from Statistical abstracts and Central Bank annual reports up to 1999. Tabular analysis was done for per capita rice and wheat flour availability with time. The regression models were estimated for animal foods separately and tested by OLS method.

The level of food consumption associated with changes in population growth and per capita income was noted. The regression result suggested that with increasing population per capita availability of animal foods reduce when other factors remain stable. But because of increasing per capita income and animal food production the availability of animal foods increased. It was noted that in 1999 the average growth rate of animal production was (2-3%) greater than population growth of 1.4 percent (CBSL, 1999). The meat consumption was highly income responsible than other animal foods. Changes in Govt. policies related with food prices, food ration, trade etc. affect the food production and food consumption among very poor only.

The findings suggest that the importance of food subsidy schemes to uplift the consumption of animal foods for the growing population. In long term, men and their institutions will have to successfully use their accumulated expertise with animals and fish to satisfy their protein requirement of the expanding population.

EFFECTS OF MULCHING MATERIALS ON BIOLOGICAL AND PHYSICAL PROPERTIES OF TEA SOIL

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Mulching is the one of the important cultural practices in tea plantations to reduce the soil erosion and evaporation. The objective of this study was to assess the impact of various mulching materials on decomposition rate and some soil biological and physical properties in young and mature tea fields. Three most commonly available mulching materials were used in these investigations namely mana (*Chrysopogon confertiflora*) lopping, dadap (*Erythrina lithosperma*) lopping and refuse tea. All the above materials have different C/N ratios and phenol contents. The investigations were carried out at St. Coombs Estate, Tea Research Institute, Talawakele.

Decomposition rate was measured by estimating the half-life. Biological property was evaluated by assessing the soil Microbial Biomass Carbon (MBC) by Fumigation Extraction Method (FEM). Bulk density and saturated hydraulic conductivity were measured by core method and disc infiltrometer method respectively. The plot treated with dadap had the lowest half-life of 6-8 weeks followed by refuse tea of 10-12 weeks and mana had the highest half-life of 14-16 weeks. In young tea, MBC was improved by mulching materials. Refuse tea was superior to mana and dadap in improving the soil MBC. The bulk density was not affected by mulching in young tea field and dadap treated plots showed the highest saturated hydraulic conductivity.

In mature tea field, all the mulch treatments improve the soil MBC compared to control. Both refuse tea and dadap treated plots had similar magnitude of soil MBC approximately. Mana treated plots showed the lowest MBC. All the mulch treatments decreased the bulk density compared to control. The saturated hydraulic conductivity was higher in mulched plots than control.

B11

EFFECTS OF MULCHING MATERIALS ON SOME CHEMICAL PROPERTIES OF ULTISOL AND GROWTH OF TEA.

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Mulching is an agronomic practice adopted to reduce erosion and evaporation in soils. The objective of the present investigation was to assess the effects of adding different mulches to young and pruned tea land on some important chemical parameters and plant growth and yield of tea. Two studies were carried out, at St. Coombs Estate, Talawakele, one in the two years old young tea field and another in a mature tea field after pruning.

Clone TRI 2025 was used for both investigations. Treatments used in this study were, T1 – without mulch (soil exposed), T2 – Refuse tea (waste tea) at a rate of 25 tons ha^{-1}, T3 – Mana grass (*Chrysopogon confertiflora*) at a rate of 35 tons of fresh material ha^{-1} and T4 – Dadap (*Erythrina lithosperma*) at a rate of 35 tons of fresh material ha^{-1}. RCBD design with five replications was used.

For the chemical analysis, topsoil samples (0-15cm) were taken and analyzed for pH, organic carbon, total nitrogen, exchangeable potassium, total phosphorus and available phosphorus. Plant growth was assessed in terms of yield, girth of the selected newly developing branches for pruned tea and at the base of the stem for young tea.

All the mulched plots clearly showed, marked increase in chemical parameters and plant growth, when compared to control plots. However, dadap and refuse tea treated plots showed better results than the mana treated plots. Soil pH, organic carbon and exchangeable potassium recorded highest values in refuse tea plots in both studies. Where as available phosphorus was the highest in dadap treated plots in both categories.

B_{12}

EFFECT OF *NEEM (AZADIRACTA INDICA* A. JUSS) MATERIALS ON NITROGEN LEACHING AND PLANT RESPONSE TO APPLIED NITROGEN IN *RHODUSTALF* OF SRI LANKA

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Leaching of nitrate nitrogen not only causes economic loss to farmers but also pollutes surface and ground water. Nitrate leaching could be reduced using nitrification inhibitors. Locally available neem *(Azadirachta indica* A. juss) cake and its extract have been identified to posses nitrification inhibition properties. Leaching experiments were conducted using undisturbed soil columns under laboratory conditions to investigate whether blending neem cake with nitrogen fertilizers reduces nitrate leaching in reddish brown earth (Rhodustalf) soils of Sri Lanka. The treatments were urea/ammonium sulphate at the rate of 250 Kg N/ha, urea/ammonium sulphate + 20% neem cake (w/w), Urea ammonium sulphate + 30% neem cake (w/w), and a control, without neem or fertilizer. Green house pot experiments were also conducted with radish (*Rhaphanus sativus*) to examine whether neem materials when blended with nitrogen fertilizers affect the response of nitrogen fertilizer. Treatments in pot experiments were urea/ammonium sulphate at recommended level, urea/ammonium sulphate + 20% neem cake (w/w) urea/ammonium sulphate + 20% neem extract (w/w of N) and control without neem or fertilizer.

Neem cake treatments, at both 20% and 30% levels significantly reduced leaching losses of nitrate with both urea and ammonium sulphate. Application of neem cake and extract with both nitrogen fertilizers gave significantly higher yield compared to the fertilizer alone treatments. Results indicate the possibility of using neem materials to increase the efficiency of applied nitrogen and to reduce pollution caused by nitrate leaching.

A VISUAL GEOGRAPHICAL INFORMATION SYSTEM FOR THE DISTRICT OF JAFFNA

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A database retrieval system is essentially an important technique designed to visualize data for practical use. Our system is a database system with graphical user interface built mainly for retrieving geographical information of the Jaffna district. The main components of this database fall into 4 categories: Topography, Demography (Education and Health), Physical characteristics and Agriculture.

The geographical system provides facilities to display the desired information in a form of maps, graphs and tables on screen or to get them on a hard copy.

It consists of several normalized database. The user's selection from the menu through our graphical user interface is transferred into a set of queries of Structured Query Language (SQL) that drives the data from the database and produces information as per the user's need and choice. 'Help' facilities are also added to the system in order to enlighten the user to run system easily.

Visual BASIC and Microsoft ACCESS are used to create this system. A useful feature in Visual BASIC is to provide to databases such as Microsoft ACCESS, ORACLE etc. We have made use of this feature to get connected to the database created by Microsoft ACCESS, which provides an easy- to –use interface for database creation once designing and normalization is done.

This system can be used by anyone who needs a variety of geographical information about the District of Jaffna. Further, adding more data is more or less straightforward. It can be done with a few modifications in the coding.

EFFECT OF LIGHT IRRADIATION ON RIPENING OF TOMATO

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Post- harvest losses of tomato are estimated to be 40 per cent in Sri Lanka. It can be reduced if they could be harvested when fruits are firm in texture for transportation to distribution outlets and ripening is carried out at the outlets. However it has been observed that mature green tomatoes kept at temperature above 30 °C such as tropical regions often become yellow instead of red, there by loosing their commercial value.

Present study was carried out to investigate the effect of light irradiation on ripening and over-all quality of tomato. Fruits were harvested at mature green (bright green to whitish green in colour), breaker (turning pink at blossom end) and turning (10-30% of fruits pink in colour) stages. Two irradiating treatments were given namely; red light (650 to 700nm) alone, and a combination of both red and blue (400 to 450nm) light at ambient temperature (27°C±2°C). Physico-chemical analysis was carried out to determine the quality of tomato before and after light treatments.

The results revealed that fresh tomatoes when harvested at turning stage irradiated by red light alone or a combination of both red and blue light developed good red colour. The hue values were 49.5 and 51.8 respectively. This maturity stage recorded significantly higher firmness as well (0.46kp cm^{-2}). The irradiation of a combination of both red and blue light induce the red colour development at breaker and mature green stage. Recorded hue values were 54.7 and 54.16 respectively. However, irradiation by red light alone at breaker and mature green stage did not induce the red colour development significantly. Recorded hue values were 58.7 and 56.8 respectively.

Total soluble solids content of tomato harvested at breaker stage was significantly increased (4.99°Brix) compared to mature green (4.86°Brix) and turning (4.89°Brix) +stages. The content of ascorbic acid was significantly higher at breaker(25.3ml $100ml^{-1}$) and turning (25.5mg$100ml^{-1}$) stages than mature green stage (22mg $100ml^{-1}$).

The study therefore revealed that red colour development of tomato could be induced by light irradiation with red light alone or a combination of both red and blue light at ambient temperature. Tomato at turning stage is more suitable to light irradiation than tomatoes at mature green and breaker stages.

B_{15}

IMPROVING TRYPSIN COUPLING TO EUDRAGIT S-100 WHILE AVOIDING NON-SPECIFIC PROTEIN BINDING

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The optimum time required for the coupling of trypsin to Eudragit S-100 by carbodiimide (EDC) method was 1.5 (with N α-Benzymal-DL-Arginine p-Nitroanilide hydrochloride and BAPNA) and 3h (with azocasein). With an increase in trypsin concentration, protein coupled to Eudragit decreased and 29-39% of the total activity was expressed. Trypsin treated under coupling conditions while avoiding Eudragit and mixed with EDC and ethanol amine was 37.1% and treated only with EDC was 56.4%). 3M Glycine-NaOH buffer (pH 10.6), 1N HCl, 0.0 - 1.25M $CaCl_2$ and 0.2M $(NH_4)_2SO_4$ did not remove the non-specifically bound trypsin completely. Non-specifically bound trypsin was completely removed by 0.1M Tris^{-3}gl^{-1} Triton X-100 buffer (pH 7.6, Buffer W3) in the second cycle. The expected activity expressed by trypsin was 21.9, while at the end of the coupling procedure when the preparation was washed with Buffer W3, 34.7% of the activity was expressed. Removal of the excess EDC after activation prior to coupling has given an activity of 29.3%. When the activated polymer was precipitated, washed with 0.01M acetate buffer (pH 4.5) and used for coupling 39.8% of the activity was expressed, while washing two times with Buffer W3 decreased the activity to 13%. The normal coupling procedure while avoiding EDC and 54.7% of the activity was expressed while washing with Buffer W3 at the end of coupling completely removed the enzyme activity. When trypsin (50mg) was mixed with benzamidine (3.2mg) prior to coupling to Eudragit for 3rd and 24th and after final coupling step, washed two times with Buffer W3, activity expressed was 76.6 and 45% respectively. The activated polymer was precipitated, washed with acetate buffer (pH 4.8) and normal coupling procedure was adopted after treating the trypsin with benzamidine, the activity expressed was 14.7 and 24.3 respectively. To improve the activity expressed, the normal coupling procedure can be followed while protecting the active site of trypsin with benzamidine and finally washing with 0.15M Tris-3gl^{-1} Triton X-100 buffer (pH 7.60) two times.

B_{16}

BEHAVIOR OF SOLUBLE AND PRECIPITATED TRYPSIN IMMOBILIZED TO EUDRAGIT-100

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Trypsin of two different concentrations was coupled to Eudragit S-100 by using carbodiimide hydrochloride as the coupling agent. When 5 and 500 mg trypsin was used, the protein coupled per mole of Eudragit was 0.022 and 2.0 mg respectively. Eudragit can be precipitated in presence of ethanol and $CaCl_2$ on the activities of free and immobilized trypsin (5mg g^{-1} Eudragit) were determined with N α-Benzyl-DL-Arginine p-Nitroanilide hydrochloride (BAPNA, low molecular weight substrate) and Azocasein (high molecular weight substrate). $CaCl_2$ did not affect the activities of free and immobilized trypsin with BAPNA and Azocasein, while ethanol, and ethanol & $CaCl_2$ reduced the activities of both free and immobilized enzyme. The Km value of free trypsin to BAPNA was higher (22.2μg) than for soluble immobilized preparations (94.9 and 116 μg with 5 and 500mg trypsin g^{-1} Eudragit respectively). The Km in presence of ethanol and $CaCl_2$ was 544.7 μg while the precipitated forms of 5 and 500mg trypsin g^{-1} Eudragit respectively showed 295.6 and 493.6 μg. When Azocasein was used as the substrate, the free and 5 and 500 mg trypsin g^{-1} Eudragit immobilized preparations had the Km value of 0.91, 1.17 and 1.33 respectively. The same preparations in presence of $CaCl_2$ and ethanol showed 1.9,1.7 and 2.4mg of Km. to inhibit 15μg of trypsin 15 μg of soy bean trypsin inhibitor (STI) was required when either BAPNA or Azocasein was used as the substrate and in presence or absence of ethanol and $CaCl_2$. The activities of soluble and precipitated forms of 5 and 500mg trypsin g^{-1} Eudragit never reached zero in presence of different concentrations of STI. The activities of soluble and precipitated immobilized (5mg trypsin g^{-1} Eudragit) with Azocasein reached zero in presence of 25 and 15 μg of STI respectively. The activity of soluble form of 500mg trypsin g^{-1} Eudragit reached zero in presence of 1.8mg of STI, while the activity of the precipitated form was completely inhibited by 0.75mg of STI.

CHANGES IN TRICHLOROACETIC ACID SOLUBLE ANTHRONE POSITIVE CARBOHYDRATE LEVEL IN *SACCHAROMYCES CEREVISIAE* S1 UNDER STRESS CONDITIONS

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Saccharomyces cerevisiae S1 inocula were prepared in PYN medium which consisted of (gl^{-1}) peptone, 35; yeast extract, 30; KH_2PO_4 20; $(NH_4)_2SO_4$, 10 and $MgSO_4.7H_2O$; with glucose 50gl^{-1} with reciprocal shaking (100rpm) for 18h at 28, 32 and 36^{0}C. From these cultures, aliquots were transferred to a set of pre-equilibrated sterile flasks at 58°C. In another set-up 50ml culture from 28°C was transferred to 36°C, incubated for 90min and then transferred to pre-equilibrated flask at 58°C. Viability of the cultures was monitored. The cultures grown at 28,32 and 36°C showed 1, 12 and 28% viability at 58°C after 5min. When heat shocked, (28 to 36^{0}C) culture was subjected to 58°C, 20% viability was observed. The cells directly transferred from 36 to 58°C showed 2% viability at 10min. The rapid shift in growth temperature from 28 to 36°C has resulted in significant increase in viability (50%). Therefore, by effecting appropriate growth temperature, the thermotolering capacity of the yeast could be enhanced. The effect of temperature shift cultivation on ethanol tolerance was studied. *Saccharomyces cerevisiae* S1 inoculum was prepared in PYN medium at 36°C with reciprocal shaking (100rpm) for 18h. The aliquots of inocula were given different treatments, which included ethanol shock (200gl^{-1}added ethanol to the medium) or heat shock at 45°C for 30min, or the combination of the both. Consequently, the cultures were grown at either 36°C or 40°C and viability of the cells was monitored. The viability of cultures, which had no treatments (heat shock or added ethanol) at either 36 or 40°C remained 100%. Heat shocked cells (at 45°C for 30min) showed 100% viability when they were grown at 40°C without the added ethanol. When 200gl^{-1} ethanol was added to the culture (18h) grown at 36°C, complete cell death was observed at 60h. When the temperature was increased from 36 to 40°C in the presence of ethanol, the time taken for the complete cell death was 60 and 30 min, respectively. Therefore, the toxic effect of ethanol was aggravated by the increase in temperature. However, the temperature-induced toxicity was nullified by a brief heat shock (30min) at 45°C. Heat shocked culture showed 37% viability at 30min as against complete cell death of the cells, which were not given heat shock at 40°C in the presence of ethanol. Effect of heat shock on thermotolerance and Trichloroacetic acid (TCA) soluble anthrone positive carbohydrate was studied. The cultures of *Saccharomyces cerevisiae* S1 grown at 36°C was given a heat shock at 45°C for 30 min, another portion of the culture was allowed to grow at 36°C without heat treatment (control). From control and heat shocked cultures 1ml aliquotes were kept at 58°C for 5min and, viability & TCA soluble anthrone positive carbohydrate contents were determined. The TCA soluble anthrone positive carbohydrate content increased by 90% in heat shocked cells, while 28% viability was observed for heat shocked cells as

against complete cell death for culture not undergone heat shock. Therefore, the increase in TCA soluble anthrone positive carbohydrate could be linked to enhanced thermotolerance of the *Saccharomyces cerevisiae* S1 cells. Since the heat stress has increased the anthrone positive carbohydrate content in the cells, the effect of ethanol stress on the anthrone positive carbohydrate content of the cells was studied. A 44% increase in anthrone positive carbohydrate content was induced by ethanol shock. Ethanol shock as well as heat shock has induced the accumulation of TCA soluble anthrone positive carbohydrate. In the mean time heat shocked cells showed better ethanol tolerance. The stress conditions have been circumvented by the production of TCA soluble anthrone positive carbohydrate.

B18

PRELIMINARY STUDIES ON α-AMYLASE PRODUCTION FROM *BACILLUS LICHENIFORMIS* 6346 BY SOLID STATE FERMENTATION

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α-Amylase is used in the starch industry in the preparation of glucose and other sugars having different dextrose equivalents. The submerged fermentation process needs close control of the conditions and is expensive. In Jaffna, where there is no continuous, electricity supply is unavailable; it is advantageous to carry out solid state fermentation than the submerged fermentation. Hence, solid-state fermentation was selected to produce α-amylase. *Bacillus licheniformis* 6346 was grown in a basic medium containing paddy husk (35g) and 50ml of 0.04M phosphate buffer (pH 7.0) containing 1.13g of $(NH_4)_2HPO_4$ at 42°C. The α-amylase activity obtained was 139 μmole/g/min. When paddy husk was replaced with either rice bran or parboiled rice bran the α-amylase activity obtained was 24.5 and 63.7μmole/g/min respectively. To the cultivation medium (100g) containing paddy husk (30g), rice flour (1g), soy meal flour (3.2g), gingili oil (0.9ml), coconut oil (0.3ml), $(NH_4)_2SO_4$ (0.65g) and water (44ml), and inocula prepared (20ml) by different methods were mixed. The inocula were prepared by inoculating 2 loops of *Bacillus licheniformis* from slants to 25ml of activation medium (containing $250gl^{-1}$ nutrient broth and $3gl^{-1}$ soluble starch) and incubating by keeping first set stationary while the second and third sets under aeration (60 bubbles/min) and shaking (100 rpm) at 42°C for 24h. Highest activity was obtained with the medium inoculated with the inoculum prepared under stationary conditions. When the rice flour (1g) was replaced with the same amount of wheat flour, maximum activity obtained was 1483 μmole/g/min on 4th day. When the rice flour substituted with wheat flour containing cultivation medium was supplemented with different amounts of soy meal powder (0.8 to 5.6g), the highest α-amylase activity (1516.9 μmole/g/min) was obtained on the 4th day in the medium containing 4.0g of soy meal powder. The control medium was the cultivation medium containing rice flour substituted with wheat flour and supplemented with 4.0g of soy meal powder and the test medium contained soy meal powder replaced with soy bean flour (6g), which contained equal amount of protein as that of soy meal powder. The α-amylase activity obtained in the control and test media was 1464 μmole/g/min and activity obtained in the control and test media were 1464 and 1559 μmole/g/min respectively. Thus the optimum medium for α-amylase production from *Bacillus licheniformis* 6346 at 42°C and pH 7.0 should contain paddy husk (29.2g), wheat flour (1g), soy bean powder (6g), gingili oil (0.9ml), coconut oil (0.3ml), $(NH_4)_2SO_4$ (0.65g) and water (44ml).

B_{19}

COMPARISON OF CITRIC ACID PRODUCTION BY *ASPERGILLUS NIGER* UV_2 IN LIQUID SURFACE CULTURE AND SOLID STATE FERMENTATION

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Citric acid was produced by inoculating spores of *Aspergillus niger* UV_2 to the liquid medium (50ml) consisting (gl^{-1}) glucose 140.0; NH_4NO_3, 0.5; KH_2PO_4, 0.5; $MgSO_4.7H_2O$, 0.1; peptone, 7.0; $ZnSO_4.7H_2O$, $0.01x10^{-3}$; ferrous ammonium sulphate, $0.1x10^{-3}$ and $CuSO_4.5H_2O$, $0.06x10^{-3}$ and (ml^{-1}) methanol, 30 and gingili oil, 2.0 and incubated at 30°C. The final concentration of spores was $1x10^{-7}$ spores ml^{-1}. Highest amount of citric acid obtained was 38.6gl^{-1} at 15d. Citric acid production decreased after the complete utilization of sugar. When the fungus was grown in solid state medium where paddy husk (42.5g) was impregnated with liquid medium (50ml) at 50% water content, 5.9 gkg^{-1} of citric acid was produced at 3d with complete utilization of the reducing sugar. Even though citric acid productivity was higher in solid state fermentation (0.198 gd^{-1}) than in liquid surface fermentation (0.129 gd^{-1}), the product yield and efficiency were lower (8.9, 9.01%) in solid state fermentation than in liquid surface fermentation (26.3, 26.4%). In the optimization of inoculum for citric acid production, 38h old mycelium produced 30.6gl^{-1} citric acid at 20th day and increased production (49.5 gl^{-1}) was observed at 18th day when 65h old mycelium was used as inoculum. But 46.8 gl^{-1} citric acid was produced at 21st d when the medium was inoculated with spores. When the solid-state medium was inoculated either with 40 or 60h old moldy husk 4.8 and 3.5 gkg^{-1} citric acid was produced at 3rd day respectively. When the medium was inoculated with spores, 6.0 gkg^{-1} citric acid was produced at 3rd d. The spore inoculum was best among the three types of inocula used for citric acid production. Though citric acid production in the media inoculated with 40 and 60h old mycelia was 20 and 30% lower than that obtained in the medium inoculated with spores. To avoid the difficulties in the preparation of spores 40h old moldy husk could be used in solid-state fermentation while in liquid surface culture 65h old mycelial inoculum must be used for high citric acid production.

B_{20}

EFFECT OF DIFFERENT PARTS OF BLACK PLUM TREE (*SYZYGIUM CUMINI*) ON THE MICROBIAL ACTIVITIES

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Inhibitory effect of different parts (tender leaves, bark, seeds and root) of black plum (*Syzygium cumini)* tree on the microbial growth was studied by using disc diffusion method at different incubation times (14 and 24h). The aqueous extract filtrates of bark and root inhibited the growth of *Saccharomyces cerevisiae* more than that of the extract filtrates of tender leaves and seeds. The aqueous extract filtrates of the tender leaves and seeds had greater inhibitory effect on the growth of *Bacillus licheniformis* than the extract filtrates of bark and root. Inhibitory effect of tender leaves and seeds was very low on the growth of other bacteria used, viz. *Citrobacter fruendi, Escherichia coli, Pseudomonas aeruginosa* and *Klebsiela pneumonia.* Aqueous extract filtrates of various parts of the black plum tree did not show inhibitory effect on the growth of fungi; *Aspergillus oryzae* and *Aspergillus niger.* The ether extract filtrates obtained from the above said parts of black plum tree did not produce inhibitory effect on the growth of the microorganisms used in the experiment. When the fermentation medium was inoculated with palmyrah toddy mixed culture, the ethanol production was not decreased effectively by the aqueous extract filtrates of the plant parts. The plant parts as well as their residues added to media exhibited higher inhibitory effect on ethanol production and sugar consumption by palmyrah toddy mixed culture than the aqueous extract of the respective plant parts of black plum tree. The ethanol production and sugar consumption by palmyrah toddy mixed culture in the palmyrah inflorescence sap were decreased by the addition of bark and seeds of black plum tree when compared with tender leaves and root. Thus bark and seeds of black plum tree showed inhibitory effect on air born microbes present in toddy sediment than tender leaves and root. Therefore bark and seeds of black plum tree are useful to collect palmyrah inflorescence sap instead of slaked lime to avoid fermentation.

D_1

MAPPING OF LAND USE/ LAND COVER USING SATELLITE REMOTE SENSING TECHNIQUES – A CASE STUDY.

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Land use / land cover mapping and inventory is a pre – requisite for land use planning. The information on land use/ land cover available today in the form of thematic maps, published statistical figures in records and publication are inadequate, inconsistent and do not provide up-to –date information of the changing land use patterns, process and their spatial distribution. In this contest Satellite Remote Sensing has emerged as powerful technology for the construction of land / land cover map with high degree of accuracy and reliability. Construction of land use / land cover map and estimation of its area for Valikamam region of the Jaffna Peninsula by using satellite digital data was taken as an objective in this study.

The digital data of Indian Remote Sensing Satellite (IRS IC – LISS III) of March 1999 were used for land use/ land cover mapping. Toposheets of the study area and land use map of Jaffna District published by the Survey department of Sri Lanka (1989) and field data were used as ancillary information. Digital image processing and digitization were carried out using raster based GIS and Remote Sensing software, ILWIS. The land use/ land cover map was produced by *supervised* classification of the IRS – IC satellite digital data, by applying maximum likelihood classifer. In this process, suitable training sets were taken from the sample strips during the fieldwork and amended with ancillary data on land use/ land cover to the study area to produce the final map.

The results on land use/ land cover mapping by digital image processing showed that the area under board land use/ land cover categories; the agricultural area is 22179 or 67%, waste land 5256 ha or 16%, the area under abandoned land from habitation and cultivation but presently under dense bush vegetation 2629 ha or 8%, seasonal grass land 2146 or 6.5%, 418 ha or 1.5% and built up land 337 ha or 1 % to the total geographical area of the Valikamam region. According to the land use/ land cover statistics, divisional secretary's divisions of Valikamam west are leading in rain-fed paddy cultivation (1260 ha) in the area. Irrigated arable region are found mostly in divisional secretary's divisions of Valikamam east, Valikamam north, Nallur and Valikamam south. It is interesting to note that 40 percent of the total area of Valikamam north division comes under abandoned land from habitation and cultivation due to the high security zone and restricted zone. These land use/ land cover information drawn from satellite data are mostly useful to planners and decision makers involved in development actives in Valikamam region.

CONFIDENCE LIMITS OF EXPECTED MONTHLY AND WEEKLY RAINFALL OF JAFFNA

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Precise confidence limits of expected monthly and weekly rainfall must be regarded as fundamental to the specification of the climatic regions of an agricultural region. The science of weather forecasting is necessarily based on extensive statistics of experience. However, the means and standard deviations calculated from such statistics are not accurate enough and may be mislead unless skewness is not accounted.

In this study, 105 years monthly rainfall data from 1887 to 1990 of Jaffna meteorological station and 52 standard week rainfall of a year from 1964 to 1994 (30 year) were used to predict weekly and monthly-expected rainfall.

The frequency distributions of monthly and weekly rainfall were demonstrable skewed. Then the data were suitably transformed by logarithmic transformation using Manning's method (1950). On new scale, they approximated closely to theoretical normal distribution. In the transformation, manipulated C values were 102.17 and 15.41 for monthly and weekly rainfall respectively. High correlation values were obtained between mean rainfalls to standard deviation of rainfall of transformed data in straight-line formula. The derived R^2 values were 0.9896 and 0.9460 for weekly and monthly respectively. Hence, a logarithmic transformation of skew rainfall data is suitable since the ratio of mean to standard deviation is constant and it could be used to derive confidence limits of expected rainfall.

Practical applications of these confidence limits include the more accurate representation of rainfall patterns, valuable guide to agricultural operations, planning and designing of irrigation schemes and better estimates of the range of mean monthly and weekly rainfall. The true break of the season during 40^{th} to 41^{st} weeks for *Maha* and 12^{th} standard week for *Yala* were observed by sharp upward trend of lower and upper confidence limit curve respectively. The possibility of getting torrential rainfall is reveled during 31^{st} week.

Hence, the 1:1 rainfall confidence limits of monthly and weekly-expected rainfall or within which this expected rainfall will occur, could be effectively used to obtain valuable guide in agriculture rather than on mean monthly or weekly amount for long period

Reference

1. Manning, H.L. (1950). Confidence limits of expected monthly rainfall. *Journal of Agricultural Science*. pp. 169-176.

D3

INTRODUCTION OF BIOLOGY IN THE ADVANCED LEVEL CLASSES AND ITS EFFECTS ON TEACHING – LEARNING PROCESS

(With Particular Reference to the IAB School of Jaffna Educational Division)

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The new educational reforms, introduced in 1997, bring in a different concept regarding the education set up that has prevailed in Sri Lanka since independence. Particularly significant changes have been introduced in higher classes.

Among these, introduction of biology is one of the important proposals introduced.

As far as biology is concerned, the fundamental objective is to make the students develop the skills regarding awareness and attention to significant factors in their environment. Besides this biology provides information regarding management of natural resources, scarcity of food and diseases to man.

The objective of this study was to find the effects, the chances of successful implementation and the attitude of the teachers and students regarding the introduction of biology

The study comprised of the teachers and students who were preparing for the first G.C.E (A/L) examination under the new educational reforms. These teachers and students were from IAB schools of Jaffna education division. As far as the students were concerned from each school, 50% of the duly filled questionnaires were selected randomly and analysed. Questionnaires were issued to all (10) biology teachers of grade thirteen classes to elicit information. Information was obtained by interviewing the Assistant Director of Education (science) and the In – Service Advisors of biology in the Jaffna education of Zone as well.

On analysis of the data the following problems were brought to light.

- Insufficient guidelines regarding the curriculum.
- Insufficient time allocation for subject lessons.
- Lack of continuity in the biology lessons of G.C.E (O/L) and G.C.E (A/L)
- Lack of clarity among teachers regarding the extent and content of subject lessons
- The failure of In –Service training programme to produce the desired results.
- Lack of library and laboratory facilities.
- Biology being taught by more than one teacher in private tuition centers.

The above factors appeared to be counter productive to the programme.

It was observed that some of the above factors could be remedied by the teachers and students easily. Others have to be remedied by Department of Education and Ministry. The benefits of the reforms depend on the early action to remedy the shortcomings mentioned above.

D4

A SURVEY ON THE TEACHING OF ENGLISH IN THE ADVANCED LEVEL CLASSES

(With particular reference to the schools of Jaffna Education Division)

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Today everyone has felt that one cannot communicate with the outside world without the knowledge of English – " the International English". English plays a vital role in moulding a personality and giving access to a large part as learning in the current world.

Although English, as a medium of instruction in schools, was abolished half a century ago, only now does its adverse effects are being felt. The standard of English in schools and Universities is on the decline, and hence the introduction of "General English" in the Advanced level classes.

In this survey, the general attitude towards the introduction of "General English" and problems faced by the teachers and students are studied through analysis of data collected from department officials, teachers and students of Grade twelve.

In this survey, students and teachers of all Grade I schools in the Jaffna Division are considered. From the total population of 851, a random sample of 180 students were selected and from the population of Grade twelve teachers a random sample of 15 teachers were selected.

Data from these samples was collected through distribution of questionnaires and informal discussions. This survey does not limit itself to statistical data but data collected through personal observation and informal discussions too were taken into account as valid data.

On this basis, analysis was done and solutions were suggested for problems, which need attention. Some of the solutions can be implemented immediately where as some can be implemented with time.

The findings of this survey revealed that although the introduction of 'General English' has several good objectives, it faces some problems in implementation. The home environment, unfavorable attitude of students, avoidance of communicative approach in teaching, inadequate library and language room facilities, shortage of qualified teaching personnel, inadequate audio- visual facilities, non – availability of text books, high student teacher ratio etc., were pointed out in this survey as negative factors influencing the implementation of 'General English', in the advanced level classes.

The proposal presented as solution to the problems brought out in this survey may not be the final solution to all the problems but it will help to reduce the intensity of the problems considered.

RELIABILITY AND VALIDITY OF THE MEASURES OF MARKET ORIENTATION: A CONFIRMATORY FACTOR ANALYSIS

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The construct of market orientation is central to the discipline of marketing, indeed the marketing concept is a 'cornerstone of the marketing discipline', 'represents the foundation of high quality marketing practice', with the premise that market oriented organizations will, ceteris paribus, improve their market performance. Despite the significance of the construct of market orientation to the theory and practice of marketing strategy, there has been little critical inquiry into the multi-item scales of market orientation, MKTOR and MARKOR. When rigorous validity checks are performed using confirmatory factor analysis, the results for both MKTOR and MARKOR are disappointing. This paper examines the MKTOR and MARKOR measures of market orientation using a confirmatory factor analysis to determine unidimensionality and within-method convergent validity.

The results from 99 private and 107 public companies suggest that both measures were problematic, with an acceptable fit obtained only when several items were deleted. The original MARKOR measure was a 32-item scale, of which ten items captured market intelligence generation, eight items captured intelligence dissemination, and fourteen items captured responsiveness. Of the original scale, only one item was dropped from the intelligence dissemination dimension. The subsequent 20-item MARKOR scale was poor by conventional standards. Our preferred MARKOR measure of 10 items maintains a reasonable balance between the various sub-constructs, with 5 items (intelligence generation), 2 items (intelligence dissemination) and 3 items (market responsiveness). Moreover, it is more practical to administer a shorter scale. Similarly, our findings regarding the MKTOR scale suggest that a shortened 8-item version of the scale produces a better fit of the model, and is easier to administer, than that with 20 items. With regard to both MARKOR and MKTOR, future assessments of the scales should also include both customers, suppliers and other key players within the organization's environment.

ERRATUM

The authors of the following research paper published in the Proceedings of the Jaffna Science Association, **Volume 8, Number 1, 2000** should be read as indicated.

Title of the research paper:

"Comparison of lactic acid purification by precipitation and ion-exchange chromatography"

Authors:

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

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