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“Technological Adaptation in Agriculture to combat unpredicted Calamities”

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ABSTRACTS

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Compiled by:

Prof. (Mrs.) Thayamini H. Seran

Mr. R. Thivyatharsan

Mrs. E. Delina J. Prince

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MESSAGE FROM THE VICE CHANCELLOR

EASTERN UNIVERSITY, SRI LANKA

I am delighted to spell-out my message for the 4th National Symposium on Agriculture (NSA-2021) conducted by Faculty of Agriculture, Eastern University, Sri Lanka (EUSL). Research is integral part of university education and all of us are bound to engage and promote research at different levels. As per to the Goal-2 of the Strategic Plan, research is promoted in two fronts; i.e. for socio-economic development of the region and nation, and for generation of new knowledge of global significance/impact.



EUSL in its new research strategy is promoting research of global significance by recognizing research publications in reputed journals (i.e. journals indexed by Web of Science, Scopus, etc.) that would contribute to enhance the global ranking of Eastern University. We are establishing output based award schemes for established researchers who perform high quality research and produce high impact research outputs, so that these grants can be used to further enhance their research work. I would like to urge the academic community to aim at such high impact research of global significance which would enhance your research visibility and repute. I am glad to note that there have been such good research publications emanating from the Faculty of Agriculture, which is whole mark of its progressive research culture.

NSA-2021, which is organized by Faculty of Agriculture of EUSL under the theme “Technological Adaptation in Agriculture to combat unpredicted Calamities” mainly focuses on agricultural research in relation to socio-economic development of the region and nation. The conference aims to disseminate the research findings and exchange experiences and novel ideas with researchers, agriculturists, policy makers, engineers, economists, and with budding young scientists. This national forum is an ideal platform to discuss the practical challenges encountered by the participants, and solutions to be found through technological adaptation.

I thank with appreciation the enthusiasm and efforts of the Dean, the organizing committee, academics and students of the Faculty of Agriculture in organizing the conference in corroboration with the new Strategic Plan of EUSL, and congratulate all of you for the success being achieved on the objectives.

Professor F C Ragel,
Vice Chancellor
Eastern University, Sri Lanka

MESSAGE FROM THE DEAN

FACULTY OF AGRICULTURE, EASTERN UNIVERSITY, SRI LANKA

It gives me pride and pleasure to send this message to the 4th National Symposium on Agriculture 2021 (4th NSA-2021) organized by Faculty of Agriculture, Eastern University Sri Lanka. The theme of the symposium “Technological Adaptation in Agriculture to combat unpredicted Calamities” the symposium is held on highly opportune time. I wish to congratulate the Symposium Organizing Committee and select this very pertinent topic. The Symposium tracks selected are also highly appropriate for research and discussions on challenges



faced by agriculture. Agricultural activity is highly sensitive to climate change, largely because it depends on biodiversity and environmental conditions. Sufficient freshwater supplies, fertile soil, the right balance of predators and pollinators, air temperature and average weather conditions all contribute to maintaining agricultural productivity. As agriculture depends directly on environmental conditions, climate change impacts on agriculture are becoming increasingly evident. Adaptation can prevent future risks, it can reduce present adverse effects and it can refer to individual or collective action. Climate change in many cases will lead to increased climatic variability and more extreme climatic events which will directly affect agriculture. Resilience to variation and the unexpected, and the capacity to adapt to a changing world are therefore cornerstones of adaptation. Technology is a vital contributor to people’s livelihoods. It includes physical infrastructure, machinery and equipment, knowledge and skills and the capacity to organize and use all of these but also the biological technology complemented with advances in crop nutrition and crop protection (such as pesticides), equipment and knowledge, have been the primary driver of increased productivity in agriculture.

We hope that this 4th NSA-2021 develops collaborative research, to future initiatives, and to educational networks among agricultural economists, development practitioners, policymakers, academicians, researchers, and students from all over the country. Sri Lanka and other Asian countries are facing significant, complex challenges in agricultural sectors. Rising wages, aging farm labor, changing consumer preferences, and climate change are among the many issues that require intense study. This 4th NSA-2021 will serve as platform to share knowledge and experience, leading ultimately to transformation of the Sri Lankan agriculture as a whole. I wish you a fruitful symposium, and a pleasant stay Eastern, University Sri Lanka. I hope that your excursion here will be a good experience and give you a solid understanding of the agriculture sector in our country.

With best wishes,

Dr. M. Pagthinathan

Dean/ Faculty of Agriculture /Eastern University, Sri Lanka

MESSAGE FROM THE COORDINATOR

4th National Symposium on Agriculture 2021

It is with much pride and pleasure that I write this message on the occasion of the 4th National Symposium on Agriculture (NSA 2021) of the Faculty of Agriculture, Eastern University, Sri Lanka. The Faculty of Agriculture annually conducts National Symposium on Agriculture to promote research for the regional as well as national development. In the year 2021, the theme chosen “Technological Adaptation in Agriculture to Combat Unpredicted Calamities” is timely a very prominent topic. The Symposium tracts selected also highly appropriate for research and discussion on challenges faced by agriculture.



Agriculture plays a vital role in the economy of our country through provision of food and employment for the people and food security to the nation. Agriculture faces many challenges and constraints in the context of unpredicted calamities. Hence, research activities related to technological adaptation in agriculture to combat unpredicted calamities are vital at this juncture and the efforts of researchers should be directed towards this goal.

As the coordinator of NSA 2021, I am extremely happy to invite all the participants to the event on 10th March 2021 at the Faculty of Agriculture, Eastern University, Sri Lanka. There are ten tracts identified under the theme and more than two hundred scholars from across the country are participating to address and to discuss as to how we can play a vital role to combat unpredicted calamities by adopting new technologies in agriculture, where 41 research papers have been accepted for presentation and publication. This forum provides a precious opportunity for the scientists to present, discuss and exchange the newest scientific research findings.

I take this opportunity to thank the Vice-Chancellor, Keynote speaker, Dean of the faculty, members of organizing committee, members of editorial committee, technical session Chair and panel members, authors, reviewers and all other academic, administrative and academic support staff who rendered their valuable contribution to make this event success.

I wish the session a grand success.

R. Thivyatharsan
Coordinator
4th National Symposium on Agriculture - 2021

MESSAGE FROM THE SECRETARY

4th National Symposium on Agriculture 2021

I am extremely honoured to have this opportunity to write the message at this significant event. **National Symposium on Agriculture** is an annual research symposium conducted by the Faculty of Agriculture to promote research for regional as well as national development. We organized the 4th National Symposium on Agriculture (NSA) – 2021 on 10th March 2021 as a Virtual Symposium under the theme of “**Technological Adaptation in Agriculture to combat unpredicted Calamities**”.



The Virtual Symposium is designed with the objective of delivering opportunities to discuss the technological based adaptations in agriculture and other life and social sciences to combat unpredicted calamities. The symposium was conducted under 06 tracks namely Agribusiness Management and Farm extension, Agricultural engineering and waste management, Crop protection and production technology, Food nutrition and value addition, Livestock, fisheries and aquaculture & Soil, water and environment. We published 41 research papers received from academics and researchers attached to various Universities and Research Institutes of Sri Lanka.

The knowledge and the findings from the researches will be disseminated to the farming community, Agric. based Entrepreneurs, Agriculture-based Government, Non-government and private sectors to enhance eco-friendly and sustainable technological adaptations in order to improve the quality and productivity as well as mitigate the losses due to unpredicted natural and man-made disasters and to build resilience of the farming community and agriculture sector. The knowledge dissemination will be carried out by the publishing of research contents and via the other programmes conducted by the Faculty through CENSARM and University Business Linkage units.

As the Secretary of the 4th NSA -2021, I express my sincere gratitude to all those who supported and encouraged me to conduct the event successfully. I wish all the success and good luck to the authors and co-authors and request them to make this opportunity to disseminate your findings and knowledge to the community towards regional and national development of Agriculture through technological adaptation.

Thank you

E. Delina J. Prince
Secretary/ 4th NSA - 2021

ABSTRACT OF KEYNOTE ADDRESS

4th National Symposium on Agriculture 2021

There are 32 countries in the world, facing food crisis. Almost 870 million people in the world are estimated to be chronically undernourished. Unfortunately, the countries facing the extreme climate risks are the countries having food insecurity. Therefore, with the climate change effects food insecurity in these countries will become worse. The so-called modern agriculture does not have any solution to this problem as it is one of the main contributors to the climate change conditions. Therefore, the best strategy to resolve this problem is achieving food sovereignty through sustainable agriculture. On the other hand, agriculture, climate change, food sovereignty and poverty reduction are inseparably inter-linked. According to FAO, agricultural production must increase by an estimated 70% to feed the projected world population of 9 billion by 2050. Therefore, key stakeholders in the agriculture sector have a big responsibility to increase the agricultural production, while maintaining the agro-biodiversity which is inseparably linked with sustainability. This can be achieved only through new technological approach based on indigenous knowledge which is prevailing sustainably over thousands of years in this part of the world but highly neglected due to colonial imperialism.



Globally, the present agriculture directly accounts for 13.5 % of greenhouse gas emissions and indirectly for another 17% due to deforestation and unsustainable land-use changes. On the other hand, in many cases, those who have contributed the least to global warming and climate change are the ones to suffer the most from its harmful effects. About 60 % of ecosystem services are already degraded mainly due to unsustainable intensive agriculture. Intensive agriculture is heavily depending on nonrenewable energy. Further, modern agriculture is insufficiently prepared to cope with unpredictability due to climate change. Climate Change alters almost all aspects of agriculture viz., the types of crops planted, dates of planting, tillage and harvest, crop management, soil fertility, ecosystem health and pest and diseases. Therefore, we need to develop new technological models for agriculture based on our indigenous agricultural practices which have already proved their sustainability over thousands of years. Therefore, we are compelled to revert back to “nonscientific” polyculture (mixed cropping) from so-called “scientific” monoculture. Polyculture is the sustainable farming system prevailed in Asia for more than 2500 years. It ensures food sovereignty by means of diet diversity,

diversified income generation, production stability, (against the Climate Change), minimization of risk of climate change, low pest and diseases incidences, efficient use of labour, intensification of production with limited natural resources and maximization of returns under low levels of technology. It also maintains agrobiodiversity ensuring the food sovereignty in spite of Climate Change.

Requirements to build food sovereignty are climate-smart practices based on indigenous knowledge, ecosystem approach at landscape level, conservation of local germplasm and landraces, production of varieties and breeds adapted to climate change. To fulfil above requirements investments are needed in filling data and knowledge gaps and R&D on traditional technologies. The main requirement is to have a consistency between agriculture and food sovereignty policies and climate change policies. The other important thing is to develop 'agrarian citizenship', where the political and material rights and practices of rural dwellers are based not solely on issues of rural political representation but also on their relationship with the socio-ecological metabolism between society and nature. This is important because, agrarian citizenship recognizes nature's role in the continuing political, economic, and cultural evolution of a broadly-defined and evolving agrarian society, being predicated upon transcending the metabolic rift between humans and nature. Therefore, it is worth to conclude that building food sovereignty is essential to face the challenge of climate change and it can be achieved through a novel technological approach based on indigenous knowledge systems mainly prevailing in Asian and African continents.

Prof. Gamini Senanayake,
Professor Emeritus and Chairman,
Sri Lanka Council for Agricultural Research Policy, Sri Lanka
gmnsenanayake@yahoo.com

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AGRIBUSINESS MANAGEMENT AND FARM EXTENSION

ORNAMENTAL FISH PRODUCTION IN COLOMBO DISTRICT: ESPECIALLY IN THE CONTEXT OF COVID-19 PANDEMIC

W.A.R.N. Weerasinghe, S.H.P. Malkanthi* and L.H.C.J. Kumara
Department of Agribusiness Management, Faculty of Agricultural Sciences
Sabaragamuwa University of Sri Lanka, Belihuloya

**Corresponding Author: malkanthi@agri.sab.ac.lk*

ABSTRACT

Ornamental fish is rapidly gaining importance due to its tremendous economic opportunities and several other benefits. Ornamental fish production in Sri Lanka has become a valuable foreign exchange earner during recent years. However, COVID-19 pandemic has expanded worldwide and has affected all the world trade and economy from different perspectives. This study was mainly aimed to explore the impact of the COVID-19 pandemic on ornamental fish production and present status in ornamental fish farmers' viewpoint and also examined the major constraints faced by ornamental fish farmers and to suggest solutions to protect ornamental fish farmers. The sample size was 60 ornamental fish farmers in selected DS divisions. Data was collected from the whole population by using a field survey from July to October in 2020. Data were analyzed using descriptive statistics, two sample Wilcoxon signed-rank test to compare the before and after impact of ornamental fish production.

Results revealed that there is both negative and positive impact on ornamental fish production due to the COVID-19 pandemic. Mainly ornamental fish farmers had problems receiving feeds and additives and death of fish during the COVID-19 period. Coping strategies have shown a significant relationship with the income and the production capacity of the farms. The majority of ornamental fish farmers do not use resilience methods for returning to the original stage. However, the main positive impact was the increase in farmers' sales volume during COVID 19 period. Other than the COVID-19 pandemic, the major constraints of ornamental fish production are lack of market information about the changes in the overseas demand, the low price given for the product, and lack of communication between farmers and exporters.

Keywords: *Colombo district, coping strategies, COVID-19 pandemic, ornamental fish, resilience methods*

PRODUCTION AND MARKETING OF MAJOR FRUIT CROPS IN ANURADHAPURA DISTRICT OF SRI LANKA

J.M.H.M. Upulwehera* and P.Sivarajah
Department of Agricultural Economics, Faculty of Agriculture
Eastern University, Sri Lanka

**Corresponding Author: harshanamiyuranga@gmail.com*

ABSTRACT

The main aim of the present study is to analyze the production and marketing of major fruit crops in Rambewa, Galnewa, Palagala and Ipalogama DS divisions in Anuradhapura district. Primary data were obtained from a sample survey in six GN divisions selected from the above DS divisions. The random sampling method was used to select a sample of 80 farmers and data were collected through a pre tested questionnaire. Secondary data were used from various sources. Data were analyzed using SPSS software and descriptive statistics. About 98.8% of farmers had owned land. Mango, banana, watermelon, guava and papaw were popular fruit crops in the Anuradhapura district. Most of farmers (38.8%) used their own seeds and some of them (20%) bought seeds from the village shop. Watermelon farmers had obtained the highest net income (1,045,500.00 Rs/ac/yr) among other fruit farmers. It was found that lack of demand for the product (98.8%), lack of new technology such as storage facilities and ineffective marketing system (97.5%) were major problems faced by farmers in the study area. The average market prices of fruits were much higher than the farm gate price. The market price of guava had the highest marketing margin (115.50 Rs/kg). Among selected four fruit crops, banana had obtained the highest income-cost ratio (6.9) and, therefore banana is the most financially profitable fruit to cultivate in Anuradhapura district. There was a requirement in more extension services and training programs related new technology, usage of quality inputs to enhance the efficiency of fruit production.

Keywords: *Anuradhapura, fruits, income-cost ratio, marketing channels*

DETERMINANTS OF FARMERS' KNOWLEDGE ON CONTROL METHODS OF MAJOR COCONUT PESTS

H.G.N.M. Ekanayaka* and T. Geretharan
Department of Agricultural Economics, Faculty of Agriculture
Eastern University, Sri Lanka

**Corresponding Author: nirashaekanayake95@gmail.com*

ABSTRACT

The coconut red weevil, coconut black beetle, coconut mite, coconut caterpillar and coconut *Plesispa* beetle are the major coconut pests in Sri Lanka. Farmers' knowledge on pest control is important to enhance coconut production. In this regard a field survey was carried out to determine coconut growers' knowledge level related to coconut pest control and to find out the determinants of growers' knowledge in Arachchikattuwa Divisional Secretariat division, Puttalam District. Random sampling method was used to select a sample of 100 coconut growers. Data were collected through a pretested questionnaire and secondary data were used from various sources. Data were analyzed using descriptive statistics and linear regression. The results of the study revealed that growers have low level (42% of farmers), higher level (36% of farmers) and medium level (22% of farmers) of knowledge regarding coconut pest control and scoring system was used to measure knowledge level. The study found that unawareness of pest control recommendations, low attention for coconut farming and poor extension support are the major reasons for low knowledge. The extend of land ($P<0.01$), education level of farmer ($P<0.05$) and number of visits to the field per week by farmer ($P<0.05$) had positive significant relationship and age of farmer ($P<0.01$) had negative significant relationship with the knowledge of coconut growers regarding coconut pest control. Accordingly, these factors need to be considered by the relevant officials when designing coconut farming related extension activities and should be provide better extension services and training programs to the coconut growers.

Keywords: *Coconut growers, coconut pests, knowledge level, pest control*

IMPACT OF AGRICULTURAL TRAINING ON TECHNOLOGICAL KNOWLEDGE APPLICATION BY FARMERS IN BANDARAWELA AGRICULTURAL ZONE

W.M.C. Rasanjali^{*1}, P. Sivashankar¹, R.D.M.K.K. Wimalachandra² and S.H.P. Malkanthi¹

¹Department of Agribusiness Management, Faculty of Agricultural Sciences
Sabaragamuwa University of Sri Lanka, Belihuloya.

² In-Service Training Institute, Bindunuwewa, Bandarawela

**Corresponding Author: chamikarasanjali123@gmail.com*

ABSTRACT

Farmer training programs on advanced agricultural techniques are essential for knowledge and capacity development of farmers. Impact assessments are done to measure the impacts of these programs. This study examines the level of the technological knowledge of the farmers due to training imparted by in-Service Training Institute Bindunuwewa, Bandarawela. About 82 farmer trainees were randomly selected. Non parametric test was performed to check the differences in technological knowledge before and after the trainings (Chi-square and Wilcoxon sign rank tests). Chi-square test reveals that there is no significant difference ($P>0.05$) between demographic factors and adoption of practical knowledge. Further, number of training days, time for practical and theoretical training, practical knowledge shared and presentation of the lecturers were considered to be sufficient by farmers. The following measures were compared for before and after scenarios: From partial to full adoption, Results revealed that there was a significant difference between before and after scenarios ($P<0.05$): cultivation of high yield varieties; from non-adoption to full adoption: recommended seeding rate, recommended pesticide usage, new irrigation methods. Further, partial adoption of online marketing started after the training. Nevertheless, there was no effect from training on new packaging methods ($P>0.05$). Study concludes there was an impact of training on farmers' technological knowledge.

Keywords: *Agriculture technology, impact assessment, technological knowledge, training*

**PADDY FARMERS' PREFERRED SOURCES OF PESTICIDE-RELATED
INFORMATION IN THAMANKADUWA DS DIVISION OF
POLONNARUWA DISTRICT**

R.M.Y.Ritigahapola* and T.Geretharan
Department of Agricultural Economics, Faculty of Agriculture
Eastern University, Sri Lanka

**Corresponding Author: yosheeda567@gmail.com*

ABSTRACT

Thamankaduwa Divisional Secretariat (DS) division is one of the major paddy cultivating areas in Polonnaruwa district. Farmers in this area were exploiting or overdosing pesticides rather than the recommended levels. Question remains like do they not have proper knowledge or guidance about pesticide usage. Therefore, it is necessary to find out the various information sources utilized by paddy farmers in the Polonnaruwa district. For this purpose, two AI ranges of Thamankaduwa DS division, Sewagama AI range was selected based on the higher number of paddy farmers' records. Simple random sampling method was used to select a sample of 100 paddy farmers from this area. Pre-tested questionnaires were used to collect primary data, and secondary data were collected from various published sources. The collected data were analyzed by using the Likert scale method, and three scale limits were used. The results reveal that the farmers in the study areas utilize multiple information sources to get pesticide-related advice. Among the individual, group and mass information sources, the paddy farmers preferred and frequently get information from agricultural instructors (mean score value 1.88), group meeting (mean score value 0.58) and television (mean score value 0.22), respectively. Accordingly, the study concludes that, despite many sources, paddy farmers in the area highly depend on formal extension source to get pesticide-related information. Therefore, these preferred information sources need to be promoted further in disseminating relevant information, and the sources should be made accessible to farmers.

Keywords: *Information usage, paddy farming, pesticide overdosing, pesticide usage*

OPPORTUNITY COST OF PRODUCING SUGARCANE, SWEET ORANGE, AND SOYBEAN IN DRY ZONE OF SRI LANKA: AN ECONOMIC ANALYSIS

Tharshinithevy Kirupanathan*
Department of Agricultural Economics, Faculty of Agriculture
Eastern University, Sri Lanka

**Corresponding Author: freebirdever04@yahoo.com*

ABSTRACT

This study analyzed the opportunity cost of producing three different crops. A total of 75 farmers of each crop was randomly selected and interviewed via questionnaire-survey in Dry Zone areas. The profit based on the variable cost of production and total income at the first harvest of the crops was used to examine the opportunity cost. The variable cost of production of sugarcane, sweet orange and soybean were Rs. 112,418.76, Rs. 13,463 and Rs. 10,928.08, respectively per acre in the dry zone of Sri Lanka. The yield of the sugarcane, sweet orange and soybean were 49.33 tons, 25,595 fruits and 1,032 kg, respectively per acre. The market price of the sugarcane, sweet orange and soybean were Rs. 4,200 per ton, Rs. 14.66 per fruit and Rs. 89.69 per kg, respectively. The market value or the total income of the sugarcane, sweet orange and soybean were Rs. 207,194.4, Rs. 283,090.74 and Rs. 92,560.08, respectively. The accounting profit of the sugarcane, sweet orange and soybean were Rs. 94,775.64, Rs. 269,627.74 and Rs. 81,632 LKR, respectively per acre. The study found the opportunity cost of sugarcane per acre was Rs. 269,627.74 profit from sweet orange and Rs. 81,632 profit from soybean. The highest opportunity cost was found when growing soybean instead of sweet orange by using the resource per acre of land. Therefore, growing sweet orange has the least opportunity cost among the three crops considering the first harvest whilst the duration for first harvest varies among the crops. Given the analysis of descriptive, sweet orange farming is a profitable venture.

Keywords: *Crops, dry zone, opportunity cost, Sri Lanka*

SOCIO- ECONOMIC DETERMINANTS OF SMALL-SCALE PADDY FARMING: A CASE IN KALUTARA DISTRICT

Kanishka C. Fernando¹, Krishnal Thirumarpan^{1*} and J. Jeyapragash²

¹ Department of Agricultural Economics, Faculty of Agriculture
Eastern University, Sri Lanka

² BT/ BC/ Valaichenai Anoor Maha Vidyalam (NS), Valaichenai

**Corresponding Author: skrish_16@yahoo.com*

ABSTRACT

Sri Lanka's economy has traditionally been agriculture based and paddy production has been contributing for food security and National economy. This study explored the key factors influencing small holder paddy farmer's income in Kalutara district. Primary data were gathered through personal interviews with randomly selected 100 paddy farmers in the district. Descriptive statistics, frequency distribution, chi square test and multiple regression analysis were done for the collected data. The findings of the study revealed that majority of the respondents (58%) were from the age group of above 47 years. 40% of farmers were educated up to secondary level, while 12% were educated up to primary level. BG 300 and BG 358 were the most popular paddy varieties cultivated by 41% of respondents. Results of the regression analysis revealed that age, extent of land under paddy cultivation and education were positively and significantly contributed to income from paddy cultivation ($p < 0.1$). Whereas contamination of irrigation water, negatively and significantly affected the income from paddy farming ($p < 0.05$). Findings further demonstrated that 39% of respondents earn an income between Rs. 40,000 to Rs. 60,000 in Yala season and 31% of respondents reached same income level in Maha season. Results of Chi-square analysis revealed, a significant association between the income from paddy farming and education level of paddy farmers ($X^2=18.14$, $p < 0.1$). Majority of the farmers were not satisfied with the extension services. It is recommended to strengthen the agricultural extension systems combined with education, to improve the economy of paddy farmers in the district.

Keywords: *Income, extension services, small holder paddy farmers, socio-economics*

**PARTICIPATORY APPROACH FOR WATER SECURITY: A
METHODOLOGICAL INQUEST BASED ON STAKEHOLDERS'
PERSPECTIVES, NALLUR DS DIVISION**

S. Srikanthan* and S. Jeevasuthan
Department of Sociology, University of Jaffna, Sri Lanka

**Corresponding Author: srikanthan80@gmail.com*

ABSTRACT

This study attempts to discuss the methodological review on the applications of participatory approach in the project on water security in Northern Province. The thought on water security appeared as a new perspective to treat the water related matters in a holistic view instead of the themes such as water issue, water pollution, and water management in the beginning of 1990. Participatory approach is widely applied in the health and social science fields to achieve real outcome in their research and project activities. This project on water security is also based on participatory action research. This study explores on what are the benefits of using participatory approach in this project and in which ways it helps to direct the future plans of the project. The world café method was used to organize the meetings with various participants of research area at one place in various times. The types of participants were: Officials from the Government sector, relevant non-state actors, trade people, activists, media persons, educators, researchers, school students and teachers and typology of participants are not confined to these categories. The organized meetings with the stakeholders belong to the Nallur DS Division opened a platform to discuss on various aspects of water security in Northern Province based on their personal and professional experiences. The discussion themes of meetings enlarge the understanding of nature of water security in the region and extend what kind of actions or plan regarding the regional water security should be formed and implemented in future. The emerged key strategies were handling salinity, looking into water level in water bodies, coordination between authorities and activities and lack of awareness among the communities on the potential water issues. This meeting gave an opportunity to make awareness on water and water security among the different stakeholders. The spectrum of the respondents should be more inclusive and finding could be utilized for formulating a Provincial level drinking water policy in the future.

Keywords: *Multi-stakeholders, Northern Province, participatory approach, water management, water security*

**AGRICULTURAL ENGINEERING AND WASTE
MANAGEMENT**

TESTING AND EVALUATION OF FABRICATED TWO-WHEEL TRACTOR MOUNTED ONION HARVESTER

R. G. Ishan Randika Rajapakshe, M. Prabhakaran* and T. Sellathurai
Department of Agricultural Engineering, Faculty of Agriculture
University of Jaffna

**Corresponding Author: aenpraba@gmail.com*

ABSTRACT

Mechanization of Onion crop (*Allium Cepa* L.) harvesting is considered as a great importance to reduce time, labour and cost of hand lifting the bulbs. Therefore, a study was conducted with an objective to fabricate a machine to be suitable for harvesting onion bulbs. A low cost two-wheel tractor (15Hp) trailed Onion harvester was developed to assist in onion harvesting. The design performance of the onion harvesting machine was tested for setting up a small scale, low-cost rural industry. The harvester consists of frame, lifting device (blade and collected roller), elevator and collecting device. The Onion harvester was able to dig and lift the onion plants with blub and sand laid these on the surface of bed elevator. The testing field capacity of harvester was found to be 0.0150 ha/h, while effective field capacity was 0.0108 ha/h, with the field efficiency of 78.66%. The following operational parameters were recorded for the Onion harvester, i.e., depth of operation of 12 (cm), width of operation of 70 (cm), lifted bulb percentage of 85(%), Un-lifted bulb percentage 13 (%), bulb damage percentage of 1.5(%) and digger efficiency of 86(%). Satisfactory field performances were shown for second lower gear speed (2.0km/h). The fuel (Diesel) consumption was found to be 3.35 l /h. The design performance and precision of harvesting operations of onion harvester were found to be satisfactory in field testing conditions.

Keywords: Drawn harvesting Implement, onion Harvester, trailed Onion Harvester

EFFICIENCY OF HYDROPONIC SYSTEM IN REMOVING THE SELECTED POLLUTANTS FOUND IN THE RICE MILL WASTEWATER IN ANURADHAPURA

S.R.A.S. Rajapaksha* and R. Thivyatharsan
Department of Agricultural Engineering, Faculty of Agriculture
Eastern University, Sri Lanka

*Corresponding Author: ayesharajapaksha765@gmail.com

ABSTRACT

Paddy parboiling is a widely used method in Sri Lanka. Since, parboil wastewater contains large quantity of organic material, it may cause surface and groundwater pollution when large quantities are discharged repeatedly over localized areas. A study was conducted using hydroponic technique to determine the efficiency of Kang Kong plant (*Ipomoea aquatica*) in removing some selected pollutants from the rice mill wastewater. Three treatments such as T1(two plants), T2(three plants) and T3(four plants) were tested using well rooted Kang Kong plants for 45 days in Tescolanka rice mill, Anuradhapura. Water quality parameters such as BOD₅, COD, pH, EC and TDS were measured during the study period. Samples were collected at 15 days intervals and analyzed at the laboratory of CEA of Anuradhapura. Data analysis was done using Minitab statistical software and mean variation was determined using ANOVA according to Complete Randomized Block design (CRD). The maximum removal of COD, TDS, BOD₅, and EC and increase of pH was found in T3 than T2 and T1. The initial value of COD, TDS, BOD₅, EC and pH were 1504mg/l, 2012mg/l, 564mg/l, 3090 μ S/cm and 6.3, respectively. At the end of 30th day the COD, TDS, BOD₅, EC and pH were found as 128mg/l, 1860mg/l, 48mg/l, 2998 μ S/cm and 7.9 in T1, 96mg/l, 1820mg/l, 33mg/l, 2658 μ S/cm and 8 in T2 and 64mg/l, 1840mg/l, 30mg/l, 2568 μ S/cm and 7.3 in T3. The treatment T3 has reduced the COD, TDS, BOD₅, EC by 95.74%, 8.5%, 94.68%, 16.89%, respectively while increased the pH by 15.87%. The rice mill wastewater treated with Kang Kong plant (*Ipomoea aquatica*) in hydroponic techniques in T3 had shown the significant difference ($p < 0.05$) in the reduction of above-mentioned parameters and reached the values below the maximum permissible limit of CEA standards for the safe discharge of industrial wastewater on land for irrigation purpose. In conclusion, treatment of rice mill wastewater using Kang Kong plant (*Ipomoea aquatica*) in hydroponic techniques is effective in reducing some pollutant such as COD, TDS, BOD₅ and EC found in rice parboiling wastewater.

Keywords: Hydroponic technique, kang kong, pollutants, wastewater

A REVIEW ON COMPOSITION OF MUNICIPAL SOLID WASTE IN SRI LANKA

W. Shamini Irusha* and R. Thivyatharsan
Department of Agricultural Engineering,
Faculty of Agriculture, Eastern University, Sri Lanka

**Corresponding Author: shaminiwaranakula1994@gmail.com*

ABSTRACT

The review on municipal solid waste (MSW) composition analysis provides an efficient way to integrate knowledge on the analysis of municipal solid waste composition in Sri Lanka. The aim of the study was to review and document the data of MSW composition in Sri Lanka. The data were collected from various research articles and books. The review provided the information about the MSW composition in some Pradeshiya Sabha (PS), Urban Council (UC) and Municipal Council (MC) and in some selected cities of Sri Lanka. Further, district wise daily wastes quantities and percentage of biodegradable/non-biodegradable wastes were also presented in the report. The MSW composition in Sri Lanka mostly consists of 62% of biodegradable waste, 7% of paper waste, 6% of polythene & plastic waste, 6% of wooden waste, 2% of glass waste, and 17% of other wastes. Sri Lankans generate approximately 0.62kg/capita/day of solid waste on average. This rate varies on some factors such as income level of individuals and households as well as on the degree of urbanization settlements. The highest amount of MSW per capita day was 0.85kg in Colombo MC and 0.75 kg in other MCs. Solid waste generation rate increases not only due to rise of urban population, but also due to their socioeconomic and cultural factors which have an influence on it. Living standards, number of members in a household unit, cultural patterns also make an effect on the amount of generation of solid waste.

According to a World Bank study, the current urban MSW generation in Sri Lanka is 0.8 kg/capita/day. The same study estimates that by the year 2025 the urban MSW generation rate will increase to 1.0 kg/capita/day. Among all districts in Sri Lanka, Colombo district has shown the highest amount of daily waste which are 78.8% of biodegradable and 21.19% of non-biodegradable wastes. Gampaha, Jaffna, Kandy districts have also shown higher amount of daily waste. Mullathivu, Mannar and Killinochchi district have shown low amount of daily waste. In conclusion, the review provided an important dataset of the composition of MSW in Sri Lanka and waste generations in some districts. This information is very useful for developing a suitable waste management strategy in Sri Lanka.

Keywords: *Composition analysis, municipal solid waste, Pradeshiya sabha, urban council*

EVALUATION OF DIFFERENT COMPOSTING METHODS FOR ORGANIC WASTES GENERATED WITHIN EASTERN UNIVERSITY, SRI LANKA

L.B. Kongahawatta* and R. Thivyatharshan
Department of Agricultural Engineering
Faculty of Agriculture, Eastern University, Sri Lanka

**Corresponding Author: lahiru.lbsw@gmail.com*

ABSTRACT

Composting has become a preferable option to treat organic wastes to obtain a final stable sanitized product that can be used as an organic amendment. From home composting to big municipal waste treatment plants, composting is one of the few technologies that can be practically implemented at any scale. The objective of this study was to determine the efficiency of three different methods of composting and to select suitable method for Eastern University, Sri Lanka. The study was conducted from March, 2020 to June, 2020 at Crop farm, Eastern University. The methods tested were Windrow, Static pile (passive aerated) and Changu. Physical and chemical analyses were conducted during the stabilization (composting) period. The samples from piles were collected at 2 days interval to determine the parameters such as moisture content, temperature, pH, Total Organic Nitrogen (TON), Total Organic Carbon (TOC) and C:N ratio. The data were statically analyzed using Minitab (version 17&18). Treatment means were compared using one-way ANOVA and 95% confidence level. The temperature profiles for all three treatments were almost similar and the temperature was above $41^{\circ}\text{C}\pm 0.78$ for more than 30 days. The initial C:N ratio was 25-35:1 in all three methods of composting. At the end of 62nd day of composting, the C:N ratio was 20-21:1 in Static pile while 44-46:1 in other two treatments. The moisture content for all three piles was maintained between 45% and 55%. The pH was ranging in between 5.0 to 8.0. Electrical conductivity (EC) of all treatments followed the same pattern. The EC reduced gradually within the composting period. In all treatments, the TON was reduced gradually especially in the mesophilic phase and increased in the subsequent thermophilic phase. The TOC of all three treatments reduced with the composting period but more reduction was observed in Static pile than other two treatments. It can be concluded that based on the evaluation of above-mentioned parameters the Static pile is better than the other two treatments. Therefore, this method can be recommended for large scale composting.

Keywords: *Composting, solid waste, organic wastes*

MAPPING OF PALMYRAH TREE USING GEOSPATIAL TECHNOLOGY

Shanmugalingam Vinujan* and Srithayalan Srivijeindran
Palmyrah Research Institute, Palmyrah Development Board, Jaffna, Sri Lanka

**Corresponding Author: vinujans1989@gmail.com*

ABSTRACT

This paper calls an application that permits the user to direct the detection of trees from satellite imagery and spatial vegetation data. In the plant science physical interpretation of aerial pictures and practice of digital photogrammetry methods are common for estimating tree species composition. Numerous circumstances surrounding trees, such as the density of grass and other trees, will disturb tree recognition and counting. Panchromatic and multispectral imageries can progress and surge the classification accuracy of land use and land cover using WorldView-2 imagery. From the acquiesced data, after geometric and radiometric corrections, image enhancement was undertaken through image fusion techniques using multispectral and panchromatic images. Then, the data on the canopy pattern of palmyrah was extracted out by feature recognition and finally been produced the distribution map and report on number of trees. In this study, the total number of trees, true positive values, false negative values and final accuracy percentages were estimated. In the nine Grama Niladhari (GN) divisions from Karainagar District Secretariat (DS) division, it was observed that highest number of palmyrah trees in Karainagar east and lowest number was observed in Karainagar north GN division. False negative values were in the range of 9 – 62 and highest accuracy (95.3 %) was gained in Karainagar east, where least accuracy (83.2 %) was from Karainagar south west GN division. This study will facilitate further to compare the crown changing pattern of palmyrah in future.

Keywords: GIS, palmyrah, remote sensing, tree counting

**CROP PRODUCTION AND PROTECTION
TECHNOLOGIES**

SCREENING OF PLANT EXTRACTS AND OILS AGAINST SOFT ROT BACTERIUM, *Pectobacterium carotovorum*

E. Vinobia, N. Thiruchchelvan, K. Pakeerathan* and G. Mikunthan
Department of Agricultural Biology, Faculty of Agriculture
University of Jaffna, 44000, Ariviyal Nagar, Kilinochchi, Sri Lanka

*Corresponding Author: pakeerathank@univ.jfn.ac.lk

ABSTRACT

Soft rot disease in vegetables is mainly caused by *Pectobacterium carotovorum*, which is one of the destructive pre- and post-harvest bacterial pathogens of vegetables. Post-harvest losses due to soft rot disease in vegetables vary between 15-30%. In the absence of effective eco-friendly bactericides, the present investigation was planned to screen out effective plant based antibacterial compounds against *P. carotovorum*. Fifty percent concentrations of methanol based crude extracts of medicinal plants such as *Gliricidia sepium*, *Calotropis gigantean*, *Ocimum* spp., *Thespesia populnea*, *Borassus flabellifer*, *Phyllanthus emblica*, *Terminalia chebula*, and *Tamarindus indica*, and edible oils such as castor, gingelly, mahua, cinnamon, neem, and clove were tested against the soft rot bacterium on onion, tomato and carrot using disk diffusion, well diffusion and poison food assays. Data on growth performance of *P. carotovorum* were collected and the percentage of inhibition was calculated. One-way ANOVA was performed using the SAS software. Duncan's Multiple Ranges Test (DMRT) was used to determine the least significant differences among the treatments at $P < 0.05$. Results show that significantly highest growth inhibition (100%) was recorded from the *T. indica* fruit pulp extract and castor oil applied treatments on carrot followed by *P. emblica* fruit extract (95.6%) and neem oil (95.6%). However, lower growth inhibition percentages were recorded in tomato and onion compared to carrot. In tomato and onion, the highest growth inhibition percentage was recorded from the *T. indica* fruit pulp extract (92%) and clove oil (78%), respectively. These results suggest that different plant extracts have different effects on the same pathogen when attacking different hosts. The studies on host influence on pathogenicity and active ingredients present in these plant-based extracts are in progress.

Keywords: *Castor oil, Pectobacterium carotovorum, soft rot, Tamarindus indica*

EFFECT OF IBA ON *in vitro* ADVENTITIOUS ROOT FORMATION IN TUBER EXPLANTS OF POTATO (*Solanum tuberosum* L.)

S.Kirija devi^{1*}, P.D.Abeythilakaratha² and T.H Seran¹

¹Department of Crop Science, Faculty of Agriculture
Eastern University, Chenkalady, Sri Lanka.

²Agriculture Research and Development Center, Sitaeliya, Nuwaraeliya

*Corresponding Author: girija001devi@gmail.com

ABSTRACT

Potato (*Solanum tuberosum* L.) is one of the most economically valuable crops which consumed widely in the world. In developing countries, many cultivars have undesirable traits which reduce their market value. Mutation induction in potato produces mutants for diverse traits. Mutants can be produced in potato by mutagenic treatment of tuber buds of potato. Adventitious buds that arise from adventitious roots of *in vitro* explants of tuber disc are used for mutation breeding of potato. In this aspect, this study was carried out to determine the optimum concentration of IBA for induction of *in vitro* adventitious root formation in potato tuber disc. A preliminary study was done to determine the morphogenic response of the potato tuber discs which were in 0, 50 and 100 mg/l IBA concentrations. It was noted that higher concentration (100 mg/l) of IBA did not induce callus formation in tuber discs and the cultured explants at the concentration of 100 mg/l IBA turned into brown colour. In addition, it did not show any response to form adventitious roots. Therefore, the tuber discs were cultured in MS medium supplemented with 0-50 mg/l concentrations of IBA (5, 15, 25, 50 mg/l) to induce adventitious roots. Results revealed that IBA concentration significantly ($P < 0.05$) affected the tested parameters such as days taken for root formation, root length, root diameter, number of roots, root formation percentage as well as amount of callus formed and time taken for callus initiation in granola potato variety. IBA at 25 mg/l IBA concentration gave the best performance for root initiation and amount of callus formed in potato tuber disc explants compared to all other treatments. Hence, it could be concluded that 25 mg/l IBA concentration is the most favorable concentration for *in vitro* adventitious root formation in tuber disc explants of potato cv granola.

Keywords: *Adventitious root, IBA, in vitro culture, potato tuber explants*

EFFECT OF SELECTED MEDICINAL PLANTS ON THE MANAGEMENT OF PULSE BEETLE, (*Callosobruchus maculatus* F.) IN STORED SEEDS OF GREEN GRAM, (*Vigna radiata* L. Williczek) UNDER LABORATORY CONDITION

M. T. F. Rumaisa* and R. F. Niranjana
Department of Agricultural Biology, Faculty of Agriculture
Eastern University, Sri Lanka

*Corresponding Author: hfathimarumaisa@gmail.com

ABSTARCT

The present study was conducted to evaluate the efficacy of 1% *Acorus calamus* rhizome powder, 1% *Piper longum* fruit powder, 1% *Aloe vera* aqueous extract, and 1% *A. vera* methanol extract against *Callosobruchus maculatus* infesting stored seeds of green gram under laboratory condition ($30 \pm 2^\circ\text{C}$ and $70 \pm 5\%$) based on of adult mortality, reduction in adult emergence, and weight loss in the Agricultural Biology laboratory, Faculty of Agriculture, Eastern University, Sri Lanka during July to September 2020. The experiment was laid out in a complete randomized design consisting of five treatments and four replications. Data were subjected to the analysis of variance aided by SAS 9.4 version, and means were separated by using DMRT. The results revealed that almost all treatments were significantly ($p < 0.05$) effective against *C. maculatus* compared with untreated check. 1% *P. longum* and 1% *A. calamus* powders evoked 100% mortality within two days after treatment and completely inhibited the emergence of F1 adults; therefore, no weight loss was observed. *A. vera* methanol extract caused 40% mortality and moderately controlled the emergence of F1 adults and weight loss. Furthermore, *A. vera* aqueous extract was found to be the least efficient for protecting stored green gram seeds. Though none of the studies have been conducted related to the efficacy of *P. longum* against *C. maculatus*, the efficiency of *A. calamus* has been confirmed by previous studies. The study further recommended evaluating the consumer acceptability of the green gram seeds, as it is treated with medicinal plant materials.

Keywords: Green gram, mortality, pulse beetle, stored seeds

**EFFICACY OF TRADITIONAL PRACTICES FOR CONTROLLING
COWPEA WEEVIL (*Callosobruchus maculatus* L.) IN STORED COWPEA
(*Vigna unguiculata*)**

S. Karunakaran* and R. F. Niranjana
Department of Agricultural Biology, Faculty of Agriculture
Eastern University, Sri Lanka

*Corresponding Author: selvikaruna23311@yahoo.com

ABSTRACT

Grain production is the main occupation of people worldwide, and cowpea is unique among them, including in Sri Lanka. Cowpea weevil, *C. maculatus* is mainly infesting the legume grains, especially *Vigna* spp. and exhibit 80% seed losses under favorable conditions. Thus, the present study was conducted to find the efficacy of 20% (w/w) inert materials *viz.*, burned paddy husk (Paddy husk ash), dry salt, and tiny bricks against the development and survival of the cowpea weevil on stored cowpea (*V. unguiculata*) under laboratory conditions. The sun-dried cowpea grain lots, each with 500 g, were treated with the above-listed treatments according to the experimental setup and 5 replications. The result exhibited a significant difference ($p \geq 0.01$) in levels weevil attack during the storage. Maximum 100% mortality was recorded in the seeds incorporated with paddy husk ash followed by dry salt (84%) after 120 hours of the treatment. The finding of this study revealed, the smaller number of eggs on the cowpea grains treated with paddy husk ash (9.8 ± 0.58 eggs/female) within 5 days after the treatment as that of control (101 ± 2.2 eggs/female) and tiny bricks (93.28 ± 1.76 eggs/female). Further, the paddy husk ash minimized the production of new progenies (13.6 ± 0.37), grains weight loss (0.03%) and germination loss (0 %) in 90 days after treatment thus, it could be the best protectant on stored cowpea.

Keywords: Cowpea weevil, mortality, paddy husk ash, *Vigna unguiculata*

EFFECT OF DIFFERENT TRELLIS SYSTEMS AND TRAINING METHODS ON CUCUMBER (*Cucumis sativus* L.) PRODUCTION

Y. Abishajini, S. Sivachandiran and G. Asharp*
Department of Agronomy, Faculty of Agriculture
University of Jaffna, Ariviyal Nagar, Kilinochchi, Sri Lanka

*Corresponding Author: *asharpsharmec9@gmail.com*

ABSTRACT

A field experiment was conducted at Integrated Farm and Training Center, Faculty of Agriculture, University of Jaffna, Kanagarayankulam, from February to July 2020 to develop suitable combinations of training methods, trellising systems and its appropriate height for cucumber cultivation. Local white cucumber variety was chosen for the trial. The treatments consisted of three training types (drape system, pinch system and control), two trellis systems (vertical and inverted “V” trellis system) and trellis treatment was erected at two different heights (120 cm and 180 cm). The three-factor factorial experiment was carried out in Randomized Complete Block Design (RCBD) with three replicates. Data collected on internodal length, number of male and female flowers per plant, fruit length and circumference, number of fruits per plant and total yield were subjected to analysis of variance (ANOVA) to determine the difference between treatments and their interactions using SAS 9.1. Mean separation was done by using the Duncan method. Interaction effects between two different factors are insignificant to all parameters. However, the interaction between three factors (trellis treatment × training types × trellis height treatment) has a significant ($p < 0.05$) influence on internodal length, number of fruits per plant and total yield. The lowest internodal length (4.38 cm) was recorded in treatment combination of drape system in inverted V shape trellis at 180 cm height. Even though the single factors yielded less productivity, the combination of drape system in vertical shape with 180 cm height was recorded significantly ($p < 0.05$) higher values for the number of fruits per plant (6.67) and yield per hectare (33.02 t/ha). Trellis height treatments have shown significant ($p < 0.05$) effect on the number of male and female flowers. According to these results, cucumber could be successfully cultivated by providing combination of drape training along with vertical trellis at a height of 180 cm.

Keywords: *Cucumber, training, trellis systems*

INTEGRATED NUTRIENT MANAGEMENT FOR SUSTAINABLE PRODUCTION OF BRINJAL (*Solanum melongina* L.) IN SANDY REGOSOL

K. A. A. L. Weerasingha, D.S.M.M.S. Samiraja and B. Karunaratna*
Department of Crop Science, Faculty of Agriculture
Eastern University, Sri Lanka

*Corresponding Author: *brinthak@esn.ac.lk*

ABSTRACT

A pot experiment was conducted at the crop farm of Eastern University, Sri Lanka in 2020 to evaluate the effect of compost along with different levels of recommended inorganic fertilizers on the growth and yield of Brinjal (*Solanum melongina* L). The experiment was carried out in a Completely Randomized Design with five treatments having ten replicates. The treatments were recommended inorganic fertilizers (T1), 10 tons/ha of compost + ½ rate of top dressings (T2), with 75% (T3), 50% (T4), and 25% (T5) basal fertilizer. The results revealed that there were significant differences ($P < 0.05$) in plant height, greenness content, girth of fruit and number of fruits per plant and it was high in T4 compared with T1. Further, T4 gave approximately 9% additional yield compared with T1. However, number of leaves per plant and fruit length were not significantly varied ($P > 0.05$) among the tested treatments. The present study concluded that the application of 10 tons/ ha of compost + 50% of basal fertilizer with ½ of top dressings would be more suitable for brinjal production in sandy regosol.

Keywords: *Brinjal, compost, inorganic fertilizers, yield*

**DISTRIBUTION OF WEEDY RICE (*Oryza spontaneus*) SEEDS
AMONG DIFFERENT SOIL DEPTHS OF PADDY FIELDS IN
BATTICALOA DISTRICT**

R.F. Mufliha, M.Kalaimathy* and T.Geretharan
Department of Crop Science
Eastern University, Vantharumoolai, Sri Lanka

**Corresponding author: kalaimathym256@gmail.com*

ABSTRACT

Rice (*Oryza sativa*) is an important cereal and cultivated 34% of the total cultivated area in Sri Lanka. Rice production is hindered by weed infestation, and yield losses caused by weeds range between 40 and 70%. Among rice weeds, weedy rice has become a significant problem in the Batticaloa district. The paddy fields in Batticaloa district are infested by weedy rice rapidly and require effective control measures. Information on weedy rice seed distribution at different soil depths is vital for weedy rice management. This study was conducted to find distribution of weedy rice seeds among different soil depths. Eight heavily weedy rice infested paddy fields in Batticaloa district were randomly selected, and composite soil samples were collected from three plots in each location at depths of 0-5, 5-10, 10-15 and 15-20 cm. Soil samples were air-dried. Number of filled and unfilled weedy rice seeds in each sample was counted. Number of filled and un-filled weedy rice seeds were significantly ($P<0.05$) varied with soil depth in all the eight locations. The highest average number of weedy rice seeds was recorded at 0-5 cm soil depth with a range of 5.5–18.5/plot, and number of weedy rice seeds were lower at deeper soil layers. Similarly, unfilled weedy rice seeds were high in the topsoil layer compared to the bottom soil layer. This study clearly showed that the weedy rice seeds are concentrated in top layer of the soil and the deep ploughing may help to minimize weedy rice seeds in the topsoil layer.

Keywords: *Deep ploughing, seeds, weeds, weedy rice, weedy rice seeds bank*

FOOD NUTRITION AND VALUE ADDITION

**EFFECT OF LOCALLY AVAILABLE CARBON AND NITROGEN
SOURCES ON THE SIMULTANEOUS PRODUCTION OF α -AMYLASE
AND BIOETHANOL FROM *Saccharomyces cerevisiae***

M. R. F. Rafadha and A. Vengadaramana*
Department of Botany, Faculty of science
University of Jaffna, Sri Lanka

* Corresponding author: avengad19@yahoo.com

ABSTRACT

α -Amylases are commercially important in various starch processing industries and produced by several bacteria, yeasts and fungi. Most of the yeasts from nature are not harmful as compared to bacteria. The aim of this study was to increase the α -amylase production by the application of different locally available carbon and nitrogen sources and characterize the α -amylase produced by Baker's yeast (*Saccharomyces cerevisiae*). When the activated yeast strain was inoculated to the fermentation medium (1% of starch as carbon source and 1% yeast extract as nitrogen source at pH 6.0) the enzyme production started at 24h reached the maximum at 60h and at 100 rpm, room temperature ($30 \pm 2^\circ\text{C}$). The starch was replaced with powder of different locally available carbon sources such as powder of corn, cassava, potato, sago, barley rice, white rice, red rice and palmyrah tuber separately. The production of enzyme was highest when corn flour and barley rice were used as carbon source in the basal media and in the presence of corn medium produced highest amount of ethanol (0.6 % v/v). When the yeast extract was replaced with different locally available nitrogen sources such as powder of sesame oil seed cake, coconut oil seed cake, green pea, cowpea, horse gram and soy beans in the basal media separately, the cowpea containing medium showed higher amount of enzyme production compare to control and maximum ethanol content (0.3% v/v) was obtained when coconut oil seed cake was used as nitrogen source. In this study 0.6 % NaCl and 0.04 % of CaCl₂ containing α -amylase showed 70% and 53% of the activity compared to control respectively.

Keywords: *α -Amylase, enzyme activity, enzyme stability, soluble starch*

THE STUDY OF PHYSICOCHEMICAL PROPERTIES OF WATER LILY (*Nymphaea pubescens*) SEED FLOUR

N.N.G. Chiranthika^{1*}, K.D.P.P Gunathilake¹, and Ananda Chandrasekara²

¹Department of Food Science and Technology, Faculty of Livestock, Fisheries and Nutrition
Wayamba University of Sri Lanka, Makandura, Gonawila, (NWP), Sri Lanka

²Department of Applied Nutrition, Faculty of Livestock, Fisheries and Nutrition
Wayamba University of Sri Lanka, Makandura, Gonawila, (NWP), Sri Lanka

*Corresponding author: chiranthika.gnn@gmail.com

ABSTRACT

Water Lilly (*Nymphaea pubescens*) seeds are one of the underutilized cereal crops in Sri Lanka. The objective of this study was to evaluate physicochemical properties of locally available *N. pubescens* seeds and impress the potential of applying the *N. pubescens* seeds flour into functional food formulation. Total starch content, total dietary fiber content (TDF), soluble dietary fiber content (SDF), insoluble dietary fiber content (IDF) and amylose and amylopectin contents were determined under chemical composition of carbohydrate while water holding capacity, oil holding capacity, swelling power and water solubility were analyzed under physical parameters. Total starch, TDF, SDF and IDF were analyzed by enzymatic gravimetric method and amylose content was determined by spectrophotometric method. All experiments were conducted as triplicate and data were analyzed using SPSS 16 statistical software. Quantified amounts of total starch, TDF, SDF and IDF in *N. pubescens* seeds (g/100g dry basis) were 76.85±0.03%, 12.48±0.003%, 3.77±0.014 % and 8.51±0.004% respectively. Amylose content of the *N. pubescens* seeds was 27.30% and amylopectin content was 72.70% on average. *N. pubescens* seeds showed 6.34±0.004 g/g of water holding capacity and 1.35±0.001 mL/g of oil holding capacity. Swelling power and the water solubility were observed as 11.79±0.008 g/g and 1.01±0.005% respectively. *N. pubescens* seeds contain considerable amount of SDF and IDF that could lead to several health benefits and showed favorable levels of physical parameters that may preferred enough for food product processing.

Keywords: *Nymphaea pubescens*, physicochemical, underutilized, water Lilly

ANTIOXIDANT AND ANTI-INFLAMMATORY PROPERTIES OF SELECTED EDIBLE FLOWERS OF SOME MEDICINAL PLANTS

G. Janarny¹, K.D.P.P. Gunathilake² and K.K.D.S. Ranaweera¹

¹Department of Food Science and Technology, Faculty of Applied Sciences, University of Sri Jayewardenepura, Gangodawila, Nugegoda, Sri Lanka

²Department of Food Science & Technology, Faculty of Livestock, Fisheries & Nutrition, Wayamba University of Sri Lanka, Makandura, Gonawila, Sri Lanka

*Corresponding Author: gjanarny3@gmail.com

ABSTRACT

Edible flowers which were used to enhance the visual appeal of foods, are recently regaining popularity as natural sources of antioxidants which could combat oxidative stress. In Sri Lanka many flowers have been used since ancient times to treat diseases. However, there is no much scientific evidence regarding the potential health benefits of these flowers and only few flowers have been investigated so far. The present study reports the antioxidant and anti-inflammatory potential of eight different edible flowers. Additionally, the contents of total phenolics (TPC), flavonoids (TFC) and anthocyanins (TAC) also has been quantified. DPPH radical scavenging assay, inhibition of lipid peroxidation and assay for reducing power were used to determine the antioxidant activity and assay for inhibition of protein denaturation and heat induced hemolysis were used to determine the anti-inflammatory potential. The results show that the TPC of the flowers were within the range of 1.09 ± 0.01 to 39.23 ± 1.81 mg gallic acid equivalents per gram of dry weight. Considering the TFC, highest and lowest contents were noted in the extracts of *Hibiscus rosa-sinensis* and *Sesbania grandiflora* respectively. The highest percentage of DPPH radical scavenging activity and inhibition of lipid peroxidation was revealed in the extracts of *Madhuca longifolia* ($81.91 \pm 0.31\%$) and *Cassia auriculata* ($63.32 \pm 0.23\%$) respectively. Considering the anti-inflammatory property extracts of *Aegle marmelos* expressed the highest activity in both inhibition of egg albumin denaturation and inhibition of heat induced hemolysis. It can be concluded that the investigated edible flowers are good sources of bioactives with promising antioxidant and anti-inflammatory properties.

Keywords: Antioxidants, anti-inflammation, bioactives, edible flowers

COMPARISON OF ANTIOXIDANT ACTIVITY AND PHENOLIC CONTENT OF SEED EXTRACTS OF *Phyllanthus emblica* AND *Phyllanthus acidus*

H.A.C.O. Hettiarachchi*, K.D.P.P. Gunathilake, S. Jayatilake
Department of Food Science & Technology, Faculty of Livestock, Fisheries & Nutrition,
Wayamba University of Sri Lanka, Makandura, Gonawila, Sri Lanka

*Corresponding Author: osh0626@gmail.com

ABSTRACT

The concentration of bioactive compounds varies among the different parts of fruits and often discarded parts are reported having bioactive compounds in significantly higher concentrations than in edible parts. Thus, the study aimed of investigating the availability of bioactive compounds in seed extracts of *Phyllanthus emblica* and *Phyllanthus acidus*. The seeds of selected fruits were analyzed for antioxidant properties using Posphomolybdenum assay and reducing power assay, phenolic content using Folin Ciocalteu assay and flavonoid content. Hydro-methanolic extracts were prepared from lyophilized, ground seed samples before the chemical analysis. Among studied two varieties, *P. emblica* seed extract showed higher contents of flavonoids (5.81 ± 0.06 mg Rutin Equivalents/g dry weight), higher DPPH radical scavenging ability (95.43 %), total antioxidant capacity (3.00 mg Ascorbic Acid Equivalents/g dry weight) and higher reducing power (23.78 mg AAE/g dw). However, the highest phenolic content (481.63 ± 31.40 µg Gallic Acid Equivalents/g dry weight) was reported by the seed extract of *P. acidus* fruit and *P. emblica* seed extract had lower content of phenols (12.64 µg GAE/g dw). It is evident that *P. emblica* seed is a significant source of Polyphenols, flavonoids, Ascorbic acid and other phytochemicals carrying high antioxidant potential. The phytochemical compounds in seed extracts of both varieties should be further investigated using novel techniques prior to utilization for product development.

Keywords- Antioxidant activity, flavonoids, *Phyllanthus*, reducing power, underutilized

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A STUDY ON THE BIODEGRADABLE EDIBLE COATING USING *Hibiscus Rosa-sinensis* LEAF MUCILAGE WITH GELATIN TO INCREASE THE SHELF LIFE OF GUAVA FRUITS

S. Deviahayshini* and T. Mahendran
Department of Agricultural Chemistry, Faculty of Agriculture
Eastern University, Sri Lanka

*Corresponding author: hayshini@gmail.com

ABSTRACT

Guava is a common tropical fruit and it is perishable. Two varieties of guava fruit are commercially cultivated in Sri Lanka. They are Bangkok giant and Malaysian variety. Guava fruit is rich in nutrients and consisting 2883 mg/kg vitamin C). Genetics, harvest maturity, postharvest handlings are the three main causes for the reduction of fruit quality. Application of biodegradable coating is a cost-effective and eco-friendly. Biodegradable films can be produced from edible biopolymers such as protein, polysaccharides and lipids. The study was conducted to investigate the effect of gelatin and leaf mucilage from *Hibiscus rosa-sinensis* as biodegradable coating on the storage quality and shelf life of matured guava fruits. Freshly harvested, uniformly sized and undamaged mature guava fruits were selected to dip into *Hibiscus rosa-sinensis* leaf mucilage and different concentrations of 1, 3, 5 and 7% (w/v) gelatin solutions for 20 minutes and stored at 30°C and 15°C. Physico-chemical parameters such as pH, titratable acidity and total soluble solids were tested at three days interval during storage. The fruits were assessed for sensory characteristics such as colour, firmness, flavor and overall acceptability, using a seven-point hedonic scale. Guava fruits coated with 5% of gelatin showed highest retention of titratable acidity, pH and total soluble solids having the values of 5.36, 0.16% and 11.56°Brix, respectively. The results of the quality analysis revealed that the guava fruits coated with 5% of gelatin could be stored for 4 weeks at 15°C without any significant losses in nutritional quality.

Keywords: *Gelatin, guava fruit, mucilage, perishability, shelf life.*

PHYSICO-CHEMICAL AND ORGANOLEPTIC QUALITIES OF CEREAL BAR COMBINED WITH *Kurakkkan* FLAKE AND POPPED CORN

W.A.N.Pavithra Weerasinghe and S.Amuthenie*
Department of Agricultural Chemistry, Faculty of Agriculture
Eastern University, Sri Lanka

*Corresponding Author: amuthenie@yahoo.co.uk

ABSTRACT

Intake of balanced diet is the correct way to prevent nutritional related health problems, such as obesity, diabetes, malnutrition and cardiovascular diseases. Production of cereal bar using *Kurakkkan* flakes and popped corn with different recipes including kithul treacle, milk powder and ghee provides nutritional rich food product. This study was carried out to produce high quality nutritional cereal bar using different combination of *Kurakkkan* flakes and popped corn with constant amount of other ingredients. The prepared formulations were subjected to physico-chemical analysis such as moisture, fiber, ash, protein, reducing sugar and total sugar content using AOAC method while Minerals (Ca, Fe, Mg, F, Na and K) were analyzed using atomic absorption spectrometry (AAS) and the organoleptic evaluation of developed cereal bar was carried out by using 7 point hedonic scale with 35 semi-trained judges with respect to different quality attributes such as color, taste, flavor, texture and overall acceptability. The results were analyzed by using SPSS statistical package. Treatment 3; The cereal bar formulated with 70% of *kurakkkan* flakes and 30% of popped corn were most preferred formulation based on the physico-chemical point of view, followed by Treatment 2(80% *kurakkkan* flakes and 20% popped corn) and Treatment 1 (90% *kurakkkan* flakes and 10% popped corn). In organoleptic analysis, there were significant ($p < 0.05$) differences in organoleptic characteristics between the formulations. According to DMRT test, the highest overall acceptability was observed in Treatment 3. This formulation can be used for commercial food production in future.

Keywords: *Cereal bar, kurakkkan flakes, nutritional qualities, physico-chemical analysis, popped corn*

POTENTIAL OF MANUFACTURING JAM USING TAMARIND PULP

V.K.A Janith Saranga¹, K. Premakumar^{1*}, S. Sahana²

¹Department of Agricultural Chemistry, Faculty of Agriculture
Eastern University, Chenkalady 30350 Sri Lanka

²Department of Biosystems Technology, Faculty of Technology
Eastern University, Chenkalady 30350 Sri Lanka

*Corresponding Author: premakumar.k2016@gmail.com

ABSTRACT

In Sri Lanka, *Tamarindus indica* L. (Tamarind) is known as a multi-purpose tropical fruit tree primarily for its fruits, which may be eaten fresh or used as a seasoning or spice. This study was conducted to investigate the nutritional and sensory qualities jam prepared using tamarind (*Tamarindus indica* L.) pulp. Four jam formulations (T1, T2, T3, and T4) were prepared using tamarind pulp with varying sugar concentrations (50%, 55%, 58%, and 59% respectively) as treatments. Physicochemical analysis viz- pH, titratable acidity, total soluble solids (TSS) inverted and reducing sugar content, ascorbic acid content, and sensory analysis were conducted for five replicates in each treatment. The pH, titratable acidity, TSS, inverted and reducing sugar content, ascorbic acid content were increased significantly ($p < 0.05$) among the treatments. The results of this study revealed that the pH was significantly decreased with the decreasing with added sugar content. The results of sensory evaluation reveal T2 was the best treatment in respect to colour, taste, texture, aroma, and overall acceptability using a nine-point hedonic scale. T2 which has a higher amount of acidic content 22.45% can be used for the commercial production which has pH of 2.82, TSS value of 10.20, inverted sugar content of 25.17 which has satisfied the standards of FAO. Therefore, T2 jam formulation having 45% sweet tamarind pulp and 55 % sugar concentration is can be used for commercial production of sweet tamarind jam.

Keywords: *Ascorbic acid content, Tamarindus indica* L., *tamarind pulp, sweet jam*

EFFECTS OF SALT CONCENTRATION ON QUALITY OF SAUERKRAUT DURING STORAGE

M. A. S. F. Sabrana¹, K. Premakumar^{1*}, S. Sahana²

¹Department of Agricultural Chemistry, Faculty of Agriculture
Eastern University, Chenkalady 30350 Sri Lanka

²Department of Biosystems Technology, Faculty of Technology
Eastern University, Chenkalady 30350 Sri Lanka

*Corresponding Author: premakumar.k2016@gmail.com

ABSTRACT

Sauerkraut is probably the most well-known lacto-fermented vegetable which is traditionally made with thinly sliced *Brassica oleracea* L. (cabbage) and salt. This work was undertaken to evaluate the effect of NaCl concentration on the storage stability of fermented cabbage. Five different concentrations of NaCl (1.0%, 2% a, 3%, 4%, 5% (w/w)) were prepared as T1, T2, T3, T4, and T5 respectively. Cabbage was shredded, salted and packed into glass jars and kept under anaerobic conditions for fermentation at room temperature (29 ± 2 °C) for 7 days. After initial fermentation, the samples were analyzed for physicochemical properties such as pH, titratable acidity, total soluble solids (TSS), total sugars (TS), ascorbic acid, moisture, ash content, and sensory qualities using five-hedonic scale. Based on the results of sensory evaluation, three formulations (T2, T3, and T4) were selected for storage study at ambient conditions for four weeks and evaluated for physicochemical properties and sensory attributes. The stored samples revealed an increasing trend in titratable acidity (0.21-0.7%) and TSS (18.94-110.51 mg/kg) and decreasing trend in pH (5.72-3.94), moisture (90.84-83.86%), ash (3.51-2.94%) and vitamin C content (0.41-0.08 mg/kg). TS of the samples increased during the first week and then showed a decreasing trend (45.21-37.85 mg/kg). There is a significant increase in overall acceptability of the sample treated with 3% salt solution in colour, aroma, and taste during storage. Based on the results of the study, sauerkraut prepared with 3% NaCl was selected as the suitable percentage desirable nutritive values up to 21 days at ambient storage.

Keywords: *Brassica oleracea* L., NaCl, storage, physico-chemical analysis

PROXIMATE, MINERAL AND PHYTOCHEMICAL ANALYSIS OF SELECTED WILD EDIBLE GREEN WEEDS OF COMMELINACEAE FAMILY

N.C.I. De Silva* and U. Mathiventhan
Department of Botany, Faculty of Science, Eastern University, Sri Lanka

*Corresponding Author: ishuudesilva@gmail.com

ABSTRACT

Wild Edible Plants (WEP) have essential nutrients and phytochemicals which are necessary for a healthy life. The present study aimed to determine the proximate, mineral and phytochemical constituents of two wild edible green weeds (WEGW) of Commelinaceae family. *Commelina benghalensis* (Diya Meneriya-S) and *Commelina diffusa* (Gira pala-S) were collected from three different localities in Matara District where these weeds are consumed as leafy vegetables. The dried powdered leaf samples were used for proximate, mineral and qualitative phytochemical analysis using standard methods. The nutritional content of *C. benghalensis* and *C. diffusa* obtained from different locations were shown as follows respectively; Moisture 87.39±1.75% to 90.37±0.62%; 83.40±1.82% to 87.96±1.94%, Ash 15.48±1.62% to 17.77±1.26%; 12.89±1.33% to 16.17±3.23%, Fat 6.39±0.93% to 17.17±1.28%; 1.36±0.19% to 2.97±1.10, Fiber 10.02±2.10% to 13.02±1.73%; 3.23±0.88% to 5.63±2.08%. Mineral content of *C. benghalensis* was ranged as follows; Na, K, Mg and Fe were 123.98±7.25-162.44±12.14mg/100g, 82.91±4.84-89.48±1.96mg/100g, 176.6±19-187.94±5.33mg/10. 0g and 51.15±8.20-114.40±3.14mg/100g respectively. Mineral content of *C. diffusa*: Na, K, Mg and Fe were 48.90±3.37-99.96±5.54mg/100g, 79.93±3.79-94.75±2.04 mg/100g, 180.97±5.56-182.16±0.79mg/100g and 26.89±4.56-77.02±3.91mg/100g respectively. Nutritional and mineral content of both plants varied in different locations (P<0.05%). This may due to changes of soil content in three different locations. The qualitative screening of the tap water, distilled water, ethanol and acetone extracts revealed that the presence wide range of phytoconstituents such as alkaloids, flavonoids, steroids, glycosides, terpenoids, quinones, phenolic compounds, saponins and tannins but both water extract shown high number of different phytochemicals compared to the other extracts. The results indicate that the consumption of these WEGWs could provide essential nutrients and comparatively, *C. benghalensis* was the richest (P<0.05) source of essential nutrients and mineral elements.

Keywords: Edible weeds, minerals, phytochemicals, proximate

LIVESTOCK, FISHERIES AND AQUACULTURE

INSTRUMENTAL TEXTURE AND SYNERESIS ANALYSIS OF YOGHURT PREPARED FROM GOAT AND COW MILK

W.K.D.H.D. Madhuwanthi and M. Pagthinathan*
Department of Animal Science, Faculty of Agriculture
Eastern University, Vantharamoolai, Sri Lanka

**Corresponding Author: pagthymp@gmail.com*

ABSTRACT

This study was aimed to compare the texture, syneresis and chemical properties of yoghurt processed from goat milk and cow milk and to investigate the effect of refrigerated storage of the manufactured yoghurts. Textural properties of fresh yoghurts were determined by using food rheology tester and syneresis was measured by drainage method. Yoghurt samples were analysed for nutritional attributes during refrigerated storage. Significant differences were observed in fat, ash and acidity of the yoghurts in first day and higher dry matter and ash content were observed in goat milk yoghurt and also acidity, fat, and lactose were found significant differences ($P<0.05$) in yoghurts during storage. Yoghurts prepared from different types of milk showed highly significant differences ($P<0.05$) in textural properties. Higher the hardness, gumminess, chewiness and springiness were found in cow milk yoghurt. During the storage, goat milk yoghurt showed higher cohesiveness and adhesiveness than cow milk yoghurt. Goat milk yoghurt is greater susceptibility to syneresis than cow milk yoghurt. In this study observed higher syneresis in yoghurt prepared by goat milk. However, goat milk yogurt shows lower hardness and higher syneresis but it is recommended to encourage the manufacture of milk products derived from goat milk. Research needs to be strengthened in the production, processing and implementation of new biotechnologies for goat milk due to its known therapeutic value.

Keywords: *Cow milk, goat milk, hardness, instrumental texture, syneresis*

EFFECT OF EDIBLE SEAWEED (*Gracilaria edulis*) ON QUALITY PARAMETERS OF SET YOGHURT

M. Pagthinathan and M.P.R. Sudara*
Department of Animal Science, Faculty of Agriculture
Eastern University, Vantharumoolai, Sri Lanka

*Corresponding Author: rivindus@gmail.com

ABSTRACT

Edible seaweeds constitute valuable natural antioxidants as bioactive compounds and therefore yoghurt can be fortified with edible seaweeds. The present study was aimed to investigate the nutritional and physiochemical properties and shelf life of yoghurts incorporated with edible seaweed *Gracilaria edulis* at 0.5% (w/w), 1.0% (w/w), and 1.5% (w/w) concentrations. Quality seaweeds were collected and they were cleaned to remove the unwanted particles. Seaweeds were soaked and washed several times in tap water to remove the salt in surface layers. And then soaked in 1000 ml of 05% lemon juice for 2 hours. Then washed again to remove extra lemon juice from it and dried in room temperature. Seaweed powder prepared by dried seaweed flakes crushed to smaller particles and the powder was added to the Yoghurt in relevant quantities. Yoghurt samples were analyzed for physiochemical (ash, dry matter, moisture, fat, titratable acidity, pH) and sensory (color, taste, smell, texture, appearance and overall acceptability) properties during refrigerated storage at 4oC at weekly interval. Best results came with 1.0% (w/w) seaweed incorporated yoghurt, which given the highest antioxidant activity which was measured at 593 nm absorbance by FRAP method using spectrophotometer, consumer preference from sensory evaluation and specially reduced milk fat levels. Overall results indicated possible antimicrobial and stabilizing properties with seaweed incorporation.

Keywords: *Antioxidants, ceylon moss, Gracilaria edulis, seaweed, sensory evaluation, yoghurt*

STATUS OF GOAT PRODUCTION IN SRI LANKA - A REVIEW

M.M. Mahusoon^{1*} and J.P.H. N. Karunathilaka²

¹Department of Animal science. Faculty of Agriculture
Eastern University, Sri Lanka.

²Quality Control officer Alex Sea Food Private Limited, Yakkala

*Corresponding Author: mahusoonmm@gmail.com

ABSTRACT

Goat farming plays an important role in the livelihood of a large proportion of small-scale farmers and landless laborers. It has a vast potential to increase economy of the country and people. Different factors affect the productivity of goat sector such as goat breed, breeding type, socio-economic status of goat farmers, management system, feeding, nutrition, diseases etc. Therefore, a review study was carried out to understand the present status of goat production, limitations and ways to overcome these problems in Sri Lanka. Data were collected from previously published sources and categorized and summarized to get the conclusions. It has been revealed that more than 75% of goat farming was practiced in dry and intermediate zones of the country. Main ethnic groups that reared goats were Hindu and Muslim community. Majority of goats were indigenous breed followed by Jamunapari and their crosses. Farmers reared goats mainly for meat production while very few goats were maintained for milk production. Jamunapari, Saanen, Kottukachchiya, Boer and indigenous breeds were available in most areas. Cross breeds exhibited higher production performance than indigenous breeds. Majority of farmers practiced natural breeding and Artificial Insemination (AI) was limited extent. Goats were reared predominantly under extensive management system. Tree fodders like *Gliricidia sepium*, *Erythrina variegata* and *Lencaena leucocephala* and agro-industrial by-products such as rice and coconut poonac play important ruminant feed resources. It was found that the shortage of feeds during dry monsoon seasons. The marketing system in Sri Lanka involved intermediaries called brokers. This system was unsatisfactory because of price manipulations by the brokers. Foot and mouth disease, pneumonia, parasitic worm and bloat have been identified the prevailing diseases in the goats in Sri Lanka. Limitations in goat farming were presence of diseases, lack of feed, lack of knowledge in farmers about the quality feeding practices, lack of land, lack of extension services, lack of proper breeding policy and breeding stock. In conclusion goat production in Sri Lanka was still recognized as a traditional form of livestock production among rural farmers and exhibited poor performance, but fulfill the cash and household protein requirement of poor people.

Keywords: Feeding practices, livestock farming, management systems

SOIL, WATER AND ENVIRONMENT

EVALUATION OF AN INNOVATIVE ORGANIC FERTILIZER ON GROWTH AND YIELD OF CURRY CHILLI (*Capsicum frutescens* L.)

K. Jeyakumar* and N.Gnanavelrajah

¹Department of Agricultural Chemistry, Faculty of Agriculture
University of Jaffna, Kilinochchi, Sri Lanka

*Corresponding Author: jeya.kasthuri@gmail.com

ABSTRACT

A study was conducted to formulate a low-cost organic fertilizer by using different nutrient sources and to assess the potential use of the formulated organic fertilizer (FOF) on growth and yield of Curry Chilli (*Capsicum frutescens* L.). The organic fertilizer was formulated based on nutrient content of dry powders *Spirulina* (Sp), *Azolla* (Az) Palmyrah leaf (Pl), Coconut leaf (Cl) and Banana pseudo-stem (Bp). A pot experiment was conducted to find the response of different fertilizer combinations 100% inorganic (T2-NPK-0.9,1.01,0.58 g/pot), 50% inorganic (T3), 100% organic (cattle manure-T4-135g/pot), 50% organic (cattle manure - T5), 50% inorganic + 67.5 g FOF (T6) and 50% organic + 67.5 g FOF (T7) and a control (no fertilizer - T1) on growth and yield of Curry Chilli in Complete Randomized Design with four replicates. Plant height, biomass yield, fruit yield at first picking and plant nutrient uptake were recorded. The recorded data were statistically analysed by using ANOVA and mean separation by DMRT. Nutrient content of organic sources namely, potassium (19.56ppm) phosphorous (6.17ppm), nitrogen (115.03ppm) and carbon (832.50ppm) were significantly higher in Bp, Bp, Sp and Pl respectively, than other sources. T7 (50% organic + FOF) recorded the highest values in height (51.63 cm), nitrogen (2.0 g/plant), phosphorous (1.77 g/plant), and potassium (44.5 g/plant) uptake, dry biomass yield (42.30 g/plant) and fruit yield at first picking (40 g/plant), however, significant differences were observed only in dry biomass yield and NPK uptake between T7 and T2. Considering height, biomass yield, fruit yield and nutrient uptake, substituting 50% of organic or inorganic fertilizer with FOF, the performance of Curry Chilli was either equal or higher than 100% organic or inorganic treatments. Results therefore indicate that FOF has potential as an organic fertilizer.

Keywords: *Azolla*, *curry chili*, *FOF*, *pot experiment*, *Spirulina*

NITRATE REMOVAL POTENTIAL OF NEWLY ISOLATED *Pseudomonas aeruginosa* STRAIN (A22) IN A SYNTHETIC MEDIUM

Abhiramy.K^{1*}, N.Gnanavelrajah¹ and R.R.Ratnayake²

¹Department of Agricultural Chemistry, Faculty of Agriculture
University of Jaffna, Kilinochchi, Sri Lanka

²National Institute of Fundamental Studies, Kandy

*Corresponding Author: abhiramyt@univ.jfn.ac.lk

ABSTRACT

Nitrate contamination of water bodies has become a serious issue worldwide. This study aimed to isolate and identify nitrate reducing bacteria and investigate their nitrate removal efficiency in synthetic medium as the initial step for bioremediation of nitrate contaminated water. The strain (A22) was isolated from poultry manure enriched soil sample. Primary screening was carried out on BTB agar plate supplemented with KNO₃. The efficiency of the bacterial strain on nitrate removal was investigated using mineral salt medium either with glucose or starch as carbon source at three levels (0.25 %, 0.5 %, and 1 %) with 500 mg l⁻¹ KNO₃. Strain A22 reduced 93 % of nitrate without nitrite accumulation in 60 hours of incubation with 0.5 % of glucose while 64.5 % and 52.3 % of nitrate reduction was observed with 0.25 % and 1 % of glucose, respectively. Moreover, strain A22 did not grow in the medium containing starch. Therefore, among two carbon sources in three levels (0.25, 0.5, and 1.0 %), glucose 0.5 % showed significantly highest nitrate reduction and found to be the best level of carbon source for efficient nitrate reduction. Strain A22 was identified as *Pseudomonas aeruginosa* by biochemical studies and 16s rRNA sequencing analysis. The results of this study suggest *Pseudomonas aeruginosa* is capable of reducing nitrate in nitrate rich medium. However, due to its opportunistic pathogenicity, application of the strain for drinking water treatment is not recommended. Further studies are required to decide the suitability of its application in waste water treatment.

Keywords: Carbon source, groundwater, nitrate contamination, *Pseudomonas aeruginosa*

IMPACT OF BIO-FERTILIZER AND UREA AS SOLE AND IN COMBINATION ON SOIL PROPERTIES AND GROWTH PERFORMANCE OF PADDY

V. Dishalini* and P. Premanadarajah
Department of Agricultural Chemistry, Faculty of Agriculture
Eastern University, Sri Lanka

**Corresponding Author: dishaliniweerasingam1995@gmail.com*

ABSTRACT

This study was conducted to evaluate the paddy growth performance and soil properties with urea and bio-fertilizers at clay loam soils in Kilinochchi. This objective was achieved using different fertilizers sources viz., two types of bio-fertilizer: azolla, azotobacter and chemical fertilizer: urea. The experiment was devised in a randomized complete block design with three replications. The treatments including recommended dose nitrogen applied in T₁ - 100% of bio-fertilizer (azolla), T₂ - 100% of bio-fertilizer (azotobacter), T₃ - 100% of urea, T₄ - 50% of bio-fertilizer (azolla) + 50% of bio-fertilizer (azotobacter), T₅ - 50% of bio-fertilizer (azolla) + 50% of urea, T₆ - 50% of bio-fertilizer (azotobacter) + 50% of urea and T₇ - control (No fertilizer). The results revealed that there were significant ($p < 0.05$) differences between treatments in the measured parameters. Therefore, combined application of 50% urea fertilizer and 50% bio-fertilizer showed the highest plant performance such as plant height (60.8 cm). The application of 100% bio-fertilizer and combined application of 50% urea fertilizer and 50% bio-fertilizer recorded significantly ($p < 0.05$) higher soil chemical properties such as soil available nitrogen (0.96%). It is concluded both bio-fertilizers combined with urea fertilizer could be used as an alternative source in improving the soil and plant growth in paddy cultivation.

Keywords: *Azolla, Azotobacter, bio-fertilizer, paddy, urea*

EFFECT OF DIFFERENT LEVELS OF TRIPLE SUPER PHOSPHATE ON VEGETATIVE GROWTH OF TURMERIC (*Curcuma longa* L.) IN INTERMEDIATE ZONE OF SRI LANKA

D.S.H. Dissanayake*, P. Premanadarajah¹ and T.E. Weerawardena²

¹Faculty of Agriculture, Eastern University, Sri Lanka

²Central Research Station, Department of export Agriculture Matale, Sri Lanka

*Corresponding Author: himashisenevirathna@gmail.com

ABSTRACT

Turmeric (*Curcuma longa* L Family Zingiberaceae) is a valuable spicy rhizome. There is a rapid increase of demand for turmeric powder as well as the cultivation of turmeric in Sri Lanka due to amended government policies since 2019 under Commercial Hub Regulation in the Finance Act. Though the recommendation of P source is 50g triple super phosphate as a basal fertilizer with 5kg organic manure for a bed by the Department of Export Agriculture, cow dung as organic source is inaccessible to farmers. Hence, this study was undertaken to investigate the effect of basal fertilizer levels of Triple Super Phosphate (TSP) levels and Di-Ammonium Phosphate (DAP) on vegetative growth of turmeric in Matale when Cow dung is inaccessible to farmers. Using 2 different TSP levels as, 100g/bed (T1) and 200g/bed (T2) 2 different DAP levels as 100g/bed (T3) and 200g /bed (T4), TSP 50g/bed as (T5) for a standard raised bed (4x 10 feet) in the absence of cow dung. And 5kg/bed of cow dung and 50g/bed TSP were combined in treatment (T6) for the same bed size. Field experiment was conducted in complete randomized blocked design with 3 replicates. Analysis of variance was performed to determine significant differences among treatments ($P < 0.05$).

The growth parameters such as shoot height, shoot and root fresh weights and shoot tissue P content were measured at 150 days after planting. Results indicated that shoot height, shoot, root fresh weights, significantly higher in T6. Application of cow dung is very effective on early turmeric growth by combining 50g/bed TSP. In the absence of cow dung (T4) DAP 200g per bed could be used to get higher growth and yield performances on vegetative growth of turmeric according to the results.

Keywords: Basal fertilizer, cow dung, DAP fertilizer, TSP fertilizer, turmeric

COMPARISON OF AMMONIUM ACETATE AND CALCIUM CHLORIDE EXTRACTED EXCHANGEABLE POTASSIUM CONCENTRATION IN PADDY SOILS IN SRI LANKA

N.D.R. Madushan¹, H.M.N.M. Herath¹, B.G.G. Wijesooriya¹, D.A.T. Samarasinghe¹
W.M.U.K. Rathnayake², D.N. Sirisena², M. Ariyaratne¹ and L.D.B. Suriyagoda^{1*}

¹Department of Crop Science, Faculty of Agriculture, University of Peradeniya,
Peradeniya, Sri Lanka

²Rice Research and Development Institute, Department of Agriculture,
Batalagoda, Sri Lanka

*Corresponding Author: lalith.suriyagoda@gmail.com

ABSTRACT

Ammonium acetate (AA) is the widely used extractant to determine the exchangeable potassium (K) concentration in soil. It is not used as an extractant to determine the concentration of other mineral elements in the soil. However, calcium chloride (CC) is used as a universal extractant of mineral elements from the soil. Therefore, the aim of this study was to examine the relationship between 1 M AA and 0.01 M CC as extractants for exchangeable K in the soil. A total of 250 soil samples were collected from lowland paddy fields in Sri Lanka representing three climatic zones and 19 districts widely used for paddy cultivation. Standard extraction and detection protocols were followed. Results revealed that the mean exchangeable K detected by the AA method was greater ($250 \pm 9.2 \text{ mg kg}^{-1}$) than the CC method ($136 \pm 6.2 \text{ mg kg}^{-1}$). The concentration of K determined by the AA method ranged from 34 mg kg^{-1} to 803 mg kg^{-1} while that by the CC method was 0 mg kg^{-1} to 545 mg kg^{-1} . The relationship between the AA and CC extracted exchangeable K was $K_{(AA)} = 1.146 \times K_{(CC)} + 92$ with a R^2 value of 0.63 ($p < 0.000$). Therefore, CC can be used as a reliable extractant to determine the exchangeable K in paddy soils in Sri Lanka.

Keywords: *Ammonium acetate, calcium chloride, exchangeable potassium, paddy soils, soil testing*

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SPATIAL VARIATION OF WATER QUALITY IN JAFFNA LAGOON

T. Piragasiny¹, T. Mikunthan¹, M. Prabhakaran¹ and K.S. Sivanesan²

¹Dept. of Agricultural Engineering, Faculty of Agriculture
University of Jaffna, Sri Lanka

²Central Environmental Authority, Northern Provincial Office, Kilinochchi, Sri Lanka

**Corresponding Author: tmikunthan@yahoo.co.in*

ABSTRACT

Jaffna Lagoon is a productive fishing ground and also a sink for many anthropogenic effluents draining from its surrounding urban area. Jaffna lagoon suffers due to the consequence of urban growth and land use from the surroundings and end up with diminishing water quality. Hence the objective of the study was to analyze the spatial variation of water quality characteristics and identifying the extent of the pollution in the Jaffna Lagoon of Sri Lanka to implement appropriate pollution prevention schemes to sustain the productivity and bio diversity of the lagoon. Twenty Sampling points were selected systematically and the distance between two sample points was around 500 m and covering the total length of 100 km. Water sample was collected from 10 cm below the water surface during heavy rainfall in December 2019. Physico chemical parameters; pH, Electrical Conductivity (EC), Total Dissolved Solids (TDS), Salinity, Total Suspended Solids (TSS), Dissolved Oxygen (DO), Turbidity, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Nitrate, Phosphate and oil and grease were measured by standard methods. The study revealed that the water pH of the lagoon varied between 7.8 - 8.3; EC 4.2 - 6.8 dS/m; TDS 1.45-4.75 ppt; Salinity 2.88 - 10.56 ppt; DO 3.9-6.5 mg/l; TSS 1.2-3.2 ppt; Turbidity 11.2-16.4 NTU; BOD 7.8-19.5 mg/l; COD 12.5-39.5 mg/l; Nitrate 2.03-3.01 mg/l; and Phosphate 0.15-0.45 mg/l and oil and grease less than one. High value of total dissolved solids, total suspended solids were the major problem in all locations. Higher number of solids come from the seasonal flooding. Phosphate and dissolved oxygen were also problem in certain locations. Water sample near to the Holy cross health centre significantly varied from other locations since there is an outlet drainage channel from the city. The results are important in understanding the pattern of variation of water quality parameters so as to assist relevant agencies to plan, protect and aid in the management of the lagoon water for different uses.

Keywords: *Lagoon water, physico-chemical parameters, spatial variation, water quality*

ABILITY OF WATER HYACINTH (*Eichhornia crassipes*) IN PURIFYING POLLUTANTS FROM DAIRY INDUSTRIAL WASTEWATER

R.P.H.I. Weerasinghe* and R. Thivyatharsan
Department of Agricultural Engineering, Faculty of Agriculture,
Eastern University, Sri Lanka

*Corresponding Author: harshaniishara94@gmail.com

ABSTRACT

Water hyacinth (*Eichhornia crassipes*) has the potential for the removal of various pollutants from wastewater and especially it has the ability to grow even in severely polluted water. The aim of the study was to determine the ability of water hyacinth in purifying pollutants from dairy industrial wastewater. A laboratory scale experiment was conducted by sampling wastewater from highland dairy industry in Polonnaruwa and subjected to preliminary treatment and then transferred into the plastic buckets (20-liter capacity) which contains 500g of healthy and young water hyacinth with three replicates. The parameters such as pH, Electrical Conductivity (EC), Turbidity, Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Nitrate, Dissolved Oxygen (DO) were measured at initially, then 3rd, 6th, 9th, and 12th days with standard methods. At 12th day the treatment had reduced the EC, TSS and Nitrate by 71.68%, 58.82%, 80.57%, respectively while increased the DO by 16.63%. Dairy industrial wastewater treated by water hyacinth had shown the significant difference ($p < 0.05$) in the reduction of above-mentioned parameters and reached the values below the maximum permissible limit of CEA standards for the safe discharge of industrial wastewater on land for irrigation purpose. Therefore, it can be concluded that the treatment of dairy industrial wastewater using water hyacinth is effective in reducing some pollutants such as EC, TSS and Nitrate.

Keywords: *Pollutants, wastewater, water hyacinth*

DEVELOPMENT OF A HYDROMETRIC NETWORK FOR THE JAFFNA PENINSULA, SRI LANKA

M. Chandrasiva*, N. Piratheeparajah and L.D.Rajasooriyar
Department of Geography, University of Jaffna, Sri Lanka

**Corresponding Author: mchandrasiva@gmail.com*

ABSTRACT

Hydrometric networks are of a prime requirement for monitoring hydro-meteoric and water related parameters in regions for planning, real-time management and research and include monitoring centres relying on the meteoric and hydraulic data requirements. In the Jaffna Peninsula such networks have not become a reality in midst of enormous needs for data towards research, planning and management in sectors such as agriculture, groundwater and hazard management due to lack of national policies. The present study aimed at exploring the need for a hydrometric network and a conceptual plan for Jaffna, incorporating precipitation and evaporation networks. A questionnaire survey was carried out among 30 stakeholders related to agro and hydro-meteorology, disaster management, and sectors related to agriculture using proportional sampling to justify the need for a network design. Spatial analysis incorporating Arc GIS 10.4 was incorporated to analyse point sources, such as existing measuring centres and centres to be proposed against the available global standards by considering standard data requirements of crop planning, groundwater recharge and extraction, flood inundation, and land use planning. Results imply that the areal distribution of rain gauges in Jaffna as 1:114 km² and evaporation as 1:1025 km² whereas standard monitoring intervals and practises had not been maintained. The evaporation gauge fits the standards but rain gauge ratio fairly deviates with the international guidelines of 100 per 1000 km² for agricultural, hydrological and meteorological planning and forecasting. Five measuring locations for rain gauging and two locations for evaporation pan monitoring are recommended in addition to the existing 09 rain gauging and one pan evaporation centres considering the morphology of the Peninsula and the surrounding islands based on the need assessment.

Keywords: *Evaporation, hydrometric network, management, monitoring, precipitation*

EVALUATION OF SURFACE WATER QUALITY PARAMETERS IN WATER HYACINTH (*Eichhornia crassipes*) INFESTED WATER BODIES

A.M.M. Asmath¹, S.L.R. Begum^{1*} and L. F. Z. Shama²

¹Department of Biosystems Technology, Faculty of Technology
South Eastern University of Sri Lanka

²Department of Information and Communication Technology
Faculty of Technology, South Eastern University of Sri Lanka

*Corresponding author: imara@seu.ac.lk

ABSTRACT

Understanding about water quality is vital for planning and management of water for various purposes. Quality of the water either surface or ground got affected due to natural and man-made activities. The present study was aimed to study the changes in surface water quality parameters of water bodies such as lakes and ponds infested with water hyacinth which is a promising environmental issue in South Eastern regions of Sri Lanka. Surface water samples at a depth of less than 30 cm were collected from water hyacinth covered and uncovered sites and analyzed for water quality parameters such pH, TSS, DO, turbidity and EC. Water hyacinth plants were also collected using 1m² quadrat to investigate the relationship between water quality and weed morphological characters. Results revealed that, there were no significant difference in means of water quality parameters except TSS ($p < 0.05$) at water hyacinth covered and uncovered sites. Meanwhile, water samples collected from water hyacinth covered sites had lower mean values for pH (7.09 - 7.89), TSS (0.5 - 1.86), DO (4.15 - 6.08), turbidity (5.57 - 25.9) and EC (91 - 748) than water hyacinth uncovered sites. Moreover, morphological variables such as leaf length and width were significantly and positively ($r = 0.956$) correlated to each other. Meanwhile, turbidity and EC respectively showed positive and negative correlation to leaf length ($r = 0.219$, $r = -0.290$) and leaf width ($r = 0.194$, $r = -0.257$). However, the deduced water quality values were found to be within the tolerance limits for standard surface water. Therefore, the present study concluded that, changes in surface water quality parameters due to water hyacinth infestation was minimum and the surface water could be utilized for aquaculture, agriculture or recreational purposes.

Keywords: Surface water, water hyacinth, water quality

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