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Abstracts



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2020

“Climate Smart Agriculture for Smallholder Farmers”
15th July, 2020

Faculty of Agriculture
Eastern University, Sri Lanka
Chenkalady 30350

NSA 2020



**Proceedings of the
3rd National Symposium on Agriculture**

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Chenkalady**

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NATIONAL SYMPOSIUM ON AGRICULTURE - 2020
Climate Smart Agriculture for Smallholder Farmers**

ABSTRACTS

3rd National Symposium on Agriculture – 2020 (NSA 2020)

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MESSAGE FROM THE VICE CHANCELLOR

Eastern University, Sri Lanka



I am delighted to spell-out my message for the 3rd National Symposium on Agriculture (NSA-2020) conducted by Faculty of Agriculture, Eastern University, Sri Lanka (EUSL). As we experience, 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- 2020, which is organized by Faculty of Agriculture of EUSL under the theme “Climate Smart Agriculture for Smallholder Farmers” 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 adopted to withstand Climate Smart Agriculture.

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 is great honor and privilege for me to write this message for the 3rd National Symposium on Agriculture -2020 organized by Faculty of Agriculture, Eastern University, Sri Lanka. Faculty of Agriculture is the oldest faculty of Eastern University, Sri Lanka which was established in 1986. It offers valuable learning experiences to the students and stimulate richer and sustainable quality of life for farming society in regional, national and global level. On the other hand, it fosters the research and capacity building in the field of Agriculture thereby ensure the healthy agricultural practices for the future.

The theme of the 3rd NSA 2020 is “Climate smart agriculture for smallholder farmers”. As we aware, the demand for food is expected to upsurge over 60% by 2050 due to changing climate. Since, the agriculture is largely relying on climate, frequent changes in the climate and severity of floods and droughts could pose challenges for farmers and smallholders and threaten food security. Especially smallholder farmers are the vulnerable groups on climate change, however efforts to support farmer adaptation to climate change are impeded by the absence of relevant information and techniques.

In this context, this Symposium will be a valuable platform for disseminating and sharing the latest research findings among the student, scholars, scientists and relevant government policy makers in the agriculture sector in Sri Lanka.

I wish to extend my sincere appreciation to the Organizing Committee of the NSA 2020 for the constant effort in bringing this event possible and success during this prevailing pandemic situation. I believe that you enjoy the virtual symposium and relate these proceedings for your academic career advancements and the future projects.

Dr M. Pagthinathan
Dean/ Faculty of Agriculture
Eastern University, Sri Lanka.

MESSAGE FROM THE COORDINATOR

3rd National Symposium on Agriculture 2020



On behalf of the organizing committee of the 3rd National Symposium on Agriculture – 2020 (3rd NSA -2020), I am honored and delighted to welcome you to the virtual NSA - 2020.

In recent years the changes in climate cause tremendous negative impact on Agricultural production. Which may potentially lead to food insecurity. Therefore, to build the capacity of the farming community and stake holders to mitigate this impact the organizing committee concentrated on the theme “climate smart Agriculture for small holder farmers” and also set under 4 tracks to provide platform for different discipline researchers to disseminate their findings to agriculture sector.

Due to the prevailing situation we have urged to postpone the symposium which was already decided to be held on the 8th of April 2020. Besides our organizing committee worked cooperatively and decided to have the symposium on virtual mode. I am very happy to conduct the 1st virtual symposium by the Faculty of Agriculture Eastern University, Sri Lanka.

I take this opportunity to thank our keynote speaker Dr. W.M.W. Weerakoon, Director General of Agriculture for accepting our request with his tight schedule during this special crisis in agriculture sector. Also, I have the honor to extend our sincere gratitude to our Vice-Chancellor Prof. F. C. Ragel and Administrative body for their fullest support to conduct the symposium successfully.

I wish to thank the Organizing committee, Editorial committee, Reviewers and Panel members for their diligent work to conduct the virtual symposium in a short period. I also extend my sincere thanks to our secretary for her tremendous support to succeed the symposium

I like to thank network manager and audio-visual technician for their fullest support to conduct this symposium in virtual mode. I also thank the academic, administrative and nonacademic staff agriculture for their corporation. I also thank our researchers who have submitted their research findings to enrich our symposium.

I hope that this symposium will contribute sustainable improvement in the Agricultural sector. I wish all the presenters and participants for a successful and productive experience.

Prof. (Mrs.) P. Premanandarajah
Coordinator/ NSA- 2020

MESSAGE FROM THE SECRETARY
3rd National Symposium on Agriculture 2020



I am so exhilarated as I pen the message to this proceeding of the 3rd National Symposium on Agriculture 2020, as we know, Sri Lanka has endowed with abundant human and natural resources meanwhile Agriculture sector leads to be the mainstay of the rural economy.

The Agriculture sector of the country encounters massive challenges due to the adverse climate changes, shrinking arable lands, rapid urbanization, continuous natural disasters, pest and disease outbreaks and post-harvest losses due to the less modernized value added techniques meantime it destructs the Agricultural value chain and cause to be fully affected the biodiversity in nature.

Climate smart Agriculture for small holder farmers is the novel concept not only ensures the agricultural development and food security, but, also provide protection to the environment and health of the living beings. As we are university, researchers; are so much committed to produce, analyze and disseminate new inventions for farming communities meantime to agricultural entrepreneurs by adhering to the aforesaid principal to estimate and ensure the sustainable development goals.

On having this concept, this publication possesses scientific articles in various categories to set the concept of Climate Smart Agriculture and it is the valuable resource to the professionals, researchers, farming community who indeed satisfy their unquenchable thirst for scientific knowledge and practices.

I express my gratitude and wishes for this timely opportune effort of publication.

Ms. N. Sivasubramaniam
Secretary/ NSA 2020

MESSAGE FROM KEY NOTE SPEAKER

3rd National Symposium on Agriculture 2020



The challenge we face today is to feed the nation with nutritious and healthy food. We must fulfill this need with small holder farmers as majority of the annual crop extent in Sri Lanka are cultivated by them. Further this need should be fulfilled with depleting natural resources and with increasing threats from biotic and other abiotic stresses. Furthermore, these targets should also be achieved while conserving and managing the stability of the food production ecosystems for the future.

As the world population is expected to increase from 7.4 billion at present to 9.2 billion in 2050, which demands 70 % more food than what is consumed today, food dependency on imports is also challenged with huge competition on international trade for basic foods. With the increase in the per capita income in Sri Lanka to over 4000 US\$ at present, the consumption patterns and food needs are also changing. Majority of these new food needs also should be produced locally incurring a heavy burden on the already-depleted small holder food production systems.

Many of the small holder farmers in Sri Lanka who are facing poverty, and food insecurity are also forced to invest on managing their food production system, which are already depleted, to face the challenges of achieving national food security and at the same time responding to climate change. In this context, Climate Smart Agriculture (CSA) was to guide the actions needed to transform and reorient agriculture systems to effectively support development and ensure food security in a changing climate via sustainable increase in agriculture productivity and income; building resilience to climate change and reducing greenhouse gas emission, where possible.

To feed the nation, annually we need a minimum of 240,000 tons of rice, 30,000, 25,000, 20,000, 28,000, 14,000, 12,000, 290,000, 250,000, 70,000 and 50,000 tons of Groundnut, Black gram, Cowpea, Green gram, Finger millet, Gingerly, Big onion, Potato, green Chilli and dry Chilli respectively. Further, about 500,000 and 250,000 tons of maize and soybean meal is needed as animal feed. Requirement of vegetables and tropical fruits are largely produced within the country. With the change in economies, food habits of average Sri Lankan is also changed leading to an increased demand for processed and non-processed food. We have achieved self-sufficiency in rice and some other food crops mainly due to adoption of innovations by the small holder farmers since independence. Although, a sizable quantity of the

above food commodities is produced in Sri Lanka, in the recent past, the requirement was satisfied mostly with imports due to various reasons. It was estimated that with the present productivity, an extent of over 550,000 ha of cultivable land are needed to be self-sufficient in other field crops. Therefore, the only option available is to increase productivity by bridging the yield gap while cultivating every possible land with increased efficiency.

Smaller average land holding size in Sri Lanka has impacted negatively on the possible adoption of new technology and reducing cost of production. The land holding size vary with the type of crop and the season. The average land holding size of paddy varies with the water availability, i.e. rain fed and irrigated systems. In general, 67% and 37% of the farmers in the rainfed system had lands of less than 1 acre while in the irrigated system, 59% and 47% of the farmers had paddy lands between of 1 – 2.5 acre during 2018 *Yala* and 2018/19 *Maha* respectively. These differences in the fragmentation of paddy land was mainly because of initial land allocation system in irrigated areas, especially in the Mahaweli system. In the other field crop sector, between 75-80% farmers cultivating maize, black gram, green gram had land extents between 1- 5 acres while, Finger millet, cowpea and onion farmers had smaller land extents which are lower than 1 acre.

With the increasing cost of production and scarcity of labour, mechanization and automation of farming land where possible, is very much in demand. Technology is needed to go beyond primary production. Value addition and strengthening the supply chain with market-oriented agriculture would not only increase profits but also attract youth to agriculture. However, small holder farmers often limit his role to only the primary produce without playing a major role in the value chain.

With the changing climate, crop varieties are faced with ever-changing abiotic as well as biotic environments making farming a difficult enterprise. Managing biotic stresses with agro-chemicals and other means are often challenged. Similarly, enormous gains in productivity on many crops are often achieved with negative impacts on natural resource base, if soil health issues are not adequately addressed. Mining the soil without proper replenishment of required nutrients will have a serious impact on sustainability. New innovations and CSA practices must be adopted at an accelerated pace. At present, adoption of these innovative new high yielding, biotic and abiotic stress-tolerant varieties and associated technologies etc. for precision farming is challenged by the greater number of farming families with small land holdings and with their poor investment capacity.

With the climate change, the variability of weather patterns has increased leading to difficulties in predicting. With limited access to production forecast systems, small

holder farmers with little knowledge on possible gluts and lean periods often face difficulties in marketing their produce. Therefore, requirement-based production forecast systems coupled with CSA practices for farming during off season should be implemented. Further, medium term storage and value adding systems to absorb gluts and stabilize prices are need for small holders farmers. A proper climate-based insurance for risk transfer is a need for the future.

All these should be done by clustering small holder farmers to production groups while uplifting their individual capacity.

Dr. W.M.W. Weerakoon
Director General,
Department of Agriculture, Sri Lanka

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AGRIBUSINESS MANAGEMENT AND FARM EXTENSION

PADDY PROCESSING EFFICIENCY AND OUTPUT LEVEL OF RICE MILLS IN AMPARA DISTRICT

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Sri Lanka

ABSTRACT

This study mainly aimed to analyze the daily output level and paddy processing efficiency of rice mills in Nintavur, Addalaichenai and Sammanthurai DS divisions of Ampara District. Primary data was collected from 40 randomly selected rice mill owners by administering a pre-tested questionnaire. Descriptive statistics, frequency, ANOVA were used to analyze the data. All the rice millers were male, married, educated with an average age of 53 years old. Rice milling is done as a full-time occupation and average years of experience of millers was 17 years. The initial investment was both their own money and a bank loan, whereas 67.5% of them invested lower than Rs.5 million. Most of them process “Red Raw” variety of paddy, while “Red Samba” in less quantity. An average of 11,300 kgs of paddy is purchased and 10,871 kgs of paddy is milled every day. Around 55% of rice mills were medium-scale and its milling capacity per day was between 5,000 to 10,000 kilograms of paddy. A kilogram of paddy processed produced roughly 62.5% of rice, 20.70% of paddy husk, 5.88% of rice bran and 3.72% of broken rice. The rice processing efficiency significantly differs with a daily milling capacity of rice mills but did not vary significantly with the amount of investment in rice mills. Processing efficiency of high milling capacity rice mills should be increased through the introduction of new processing technology.

Keywords: *Ampara, Investment, Paddy processing, Production efficiency, Rice mills*

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PROFITABILITY OF SMALL-SCALE ORNAMENTAL FLOWER PRODUCTION IN NUWARA ELIYA DISTRICT OF SRI LANKA

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ABSTRACT

Small-scale flower farming contributes largely in the flower market of Sri Lanka. Even though this small-scale flower farming found to be an emerging livelihood that linked to tourism industry and suits climatic condition of Nuwareliya District, its profitability was not studied. Therefore, this study looking into the profitability of this business by types of ornamental flowers (Rose, Anthurium, Daisy and Chrysanthemum) and the different input cost factors affecting on their Gross Return. The study was mainly based on primary data obtained from a sample of 100 small-scale farmers who cultivate less than 0.04 acres of land of flowers were included in the study using proportionate stratified simple random sampling technique among the four GN Divisions and interviewed using structured Questionnaire. Data were analyzed using SPSS software. Gross Margin (GM), Benefit-Cost Ratio, Breakeven and Regression analyses were done. Cost of production of ornamental flower was studied. According to this profitability analyses, the net profit for Rose, Anthurium, Daisies and Chrysanthemum were Rs 105,650, Rs 55,500, Rs 137,274 and Rs 74,357 per annum per 100 m². Breakeven prices were Rs 2.95, Rs 2.72, Rs 1.71 and Rs 1.31 and Benefit Cost Ratios were 5.07, 3.67, 6.98 and 4.56 respectively, for Rose, Anthurium, Daisies and Chrysanthemum which indicates that small scale ornamental flower farming was profitable. Gross Return of each of these flowers are significantly ($p < 0.05$) affected by different input costs of flower production. Small-scale flower producers who entering this livelihood firstly, could invest in Chrysanthemum since it has least variable cost of production among the four selected flowers. While in long-term, the producer could replace it by Daisies since it has the highest Gross Return as well as the highest Gross Margin.

Keywords: *Gross Margin, Gross Return, Ornamental flowers, Profitability*

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CLIMATE CHANGE, CROP PRODUCTION AND CROP PROTECTION

HOST PREFERENCE OF *Callosobruchus maculatus* (F.) ON GRAINS OF FOUR DIFFERENT LEGUMES UNDER IN VITRO CONDITIONS

S. Karunakaran* and R. F. Niranjana

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ABSTRACT

It is well known that the leguminous grains are the major component of human diet because of rich in protein content. However, its vulnerability to storage insect pests causes considerably high post-harvest losses. Further it is experienced that precarious techniques have been practiced in storing the grains, which are highly consumed by the people of Eastern Region of Sri Lanka. The references showed that the *Callosobruchus maculatus* would choose its preferred host under free choice condition where many grains are stored in same place. Thus, the present study has been undertaken to prioritize certain hosts of *C. maculatus*. The experiment was designed to investigate the host preference and storage losses of *C. maculatus* through no choice and free choice bioassays. Through which sexually unidentified randomly selected *C. maculatus* were allowed to select preferred host from the tested grains, red cowpea (*Vigna unguiculata* Var: Waruni), cowpea with black eye (*Vigna unguiculata* Var: Dhawala), green gram (*Vigna radiata*) and chickpea (*Cicer arietinum*) and certain biological parameters like, number of eggs deposited on the grains, percentage of new emergency developed in F1 generation and percentage damage grains were calculated. According to the results, the red cowpea was the most preferred host for egg laying followed by cowpea with black eye, whilst the chickpea was rejected to lay eggs by *C. maculatus* in both trials. As the green gram was not selected by *C. maculatus* to the level of red cowpea and cowpea with black eye under free choice bioassay, the grains damage was reduced by 16% when it was stored with some other desired host of *C. maculatus*. The emergence of F1 progeny was noted in green gram from 20th day onwards, which said that *C. maculatus* completed its development in shortest days than in red cowpea and cowpea with black eye.

Key words: *Callosobruchus maculatus*, Free-choice bioassay, F1 progeny, Legumes, No-choice bioassay

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**IMPACT OF APPLICATION OF CATTLE AND POULTRY MANURES
ALONG WITH FOLIAR APPLICATION OF VERMIWASH ON YIELD OF
OKRA (*Abelmoschus esculentus*) cv. P – 11**

D. S. M. M. S. Samiraja*, K. D. Harris and A. M. K. D. M. Attanayake

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ABSTRACT

The indiscriminate usage of chemical fertilizers and pesticides destroy the fertility and texture of soil that led to harmful diseases to plants and humans. Vermiwash is a pale-yellow liquid extract collected during vermicomposting of organic wastes which can be used as a biofertilizer for many crops globally. The application of poultry manure and cattle manure as organic fertilizers improve soil productivity and overcome several soil problems that reduce yield. A pot experiment was carried out at the Crop Farm of Eastern University, Sri Lanka during the period January to April 2019 to study the impact of the application of cattle (CM) and poultry manures (PM) along with the foliar application of vermiwash on the yield of okra (*Abelmoschus esculentus*) cv. P- 11. This experiment was laid out in a Completely Randomized Design (CRD) with eight replications, and nine treatments. The treatments were; viz., T0 = Control (Recommended fertilizer), T1 = Poultry manure 10 t/ha with 25% vermiwash, T2 = Poultry manure 10 t/ha with 50% vermiwash, T3 = Poultry manure 10 t/ha with 75% vermiwash, T4 = Poultry manure 10 t/ha with 100% vermiwash, T5 = Cattle manure 10 t/ha with 25% vermiwash, T6 = Cattle manure 10 t/ha with 50% vermiwash, T7 = Cattle manure 10 t/ha with 75% vermiwash, T8 = Cattle manure 10 t/ha with 100% vermiwash with eight replicates. The results revealed that the foliar application of 100% vermiwash with 10 t/ha poultry manure increased girth of pods (23%), length of pods (25%), fresh weight of pods (14%), number of seeds/pods (39%), number of pods/plant (42%), total yield/plant (34%) than the recommended fertilizer. Hence, the experiment suggests that poultry manure 10 t/ha + vermiwash @ 100% is one of the eco-friendly ways of obtaining high yield in okra.

Keywords: *Cattle manure, Okra, Poultry manure, Vermiwash, Yield*

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**EFFECT OF FOLIAR APPLICATION OF WILD SUNFLOWER
(*Tithonia diversifolia*) LEAF EXTRACT ON GROWTH AND YIELD
OF VEGETABLE COWPEA cv. BS-1 IN SANDY REGOSOL**

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ABSTRACT

A field experiment was carried out at the Crop Farm, Faculty of Agriculture, Eastern University of Sri Lanka, during the period of January to April 2019 to study the effect of different concentrations and foliar application frequencies of Wild sunflower (*Tithonia diversifolia*) Leaf Extract (TLE) on growth and yield of vegetable cowpea Cv. BS-1. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three (3) replicates and 7 treatments. TLE concentrations of 10%, 20% and 30% were used. Foliar application of TLE was started at two weeks after germination and each plant is sprayed with 25 ml of TLE up to pod formation. Sampling was done at 4, 6, and 7 weeks after planting (WAP). The results showed that the foliar application of TLE 30% at 2 weeks interval had significantly ($p < 0.05$) influenced the plant height, leaf area index (LAI), dry weight of leaves/ha, dry weight of stems/ha, dry weight of roots/ha, dry weight of total plants/ha, and dry weight of pods/ha. The results suggest that foliar application of TLE 30% at 2 weeks interval increased the yield by 45%. *Tithonia* is a potential foliar nutrient that could provide adequate nutrients to the plants and can be substituted for inorganic fertilizer. Therefore, this technology is more profitable with high-value crops such as vegetables.

Keywords - Cowpea, Foliar application, TLE, Vegetable, yield

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BADULLA DISTRICT IS INCLINED TO CLIMATE CHANGE: A REVIEW

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ABSTRACT

Climate change related vulnerabilities occurred in different fields are the forefront leading research intentions worldwide today. Island nations are more susceptible to the climate change impacts. Sri Lanka as an island inclined with climate change impacts. Badulla District is an administrative region located in central highlands of Sri Lanka. According to literature there were considerable changes in temperature and rainfall patterns and frequencies in the Badulla region. Present paper attempted to review the climate variation in Badulla District reviewing the published research works, statistical abstracts and relevant district performance reports. According to many analyses done by different scientists on temperature and rainfall data belongs to more than 100 years or at least 50 years provided indications that Badulla District has progressively reaching to significant and systematic climate change. Furthermore, the warming trend in Badulla area during the past century has exceeded the global average rates of warming (0.0074°C/year) and noticeable clear downward trend in precipitation and occurrence of frequent extreme weather events indicate that the possibility of climate changes in the Badulla area. However, to confirm the climate change, it is essentially needed to analyze long term climate data in several meteorological stations which belongs to the study region as well prevalence and strength of other factors that stimulate the climate change.

Keywords: *Climate change, Temperature, Rainfall*

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EFFECT OF FOLIAR APPLICATION OF MORINGA LEAF EXTRACT ON GROWTH AND FRUIT YIELD OF CHILLI (*Capsicum annuum* L.) cv. MIPC-1

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ABSTRACT

This study was carried out in the Crop Farm of Eastern University, Sri Lanka during the period from January to May 2019 to ascertain the effect of foliar application of moringa leaf extract (MLE) on growth and fruit yield of chilli (*Capsicum annuum* L.) cv. MIPC-1. This investigation was followed in a pot experiment with Completely Randomized Design (CRD) with seven treatments and seven replicates. The concentrations of Moringa leaf extract were 10%, 20%, 30% in addition to 0% (distilled water) as control. The treatments included were; T₀ - control (Distilled water), T₁ - 10% MLE at once a week interval, T₂ - 10% MLE at once in two weeks interval, T₃ - 20% MLE at once a week interval, T₄ - 20% MLE at once in two weeks interval, T₅ - 30% MLE at once a week interval and T₆ - 30% MLE at once in two weeks interval. The *Moringa oleifera* leaf extract was sprayed on leaves and axial parts starting from two weeks after transplanting and it was continued until pod formation. 25 ml of MLE was sprayed per plant. The results of the experiment showed that the foliar application of MLE with 10% concentration at one week interval had significant ($p < 0.05$) effects on the plant height, number of branches/plant, dry weight of leaves/plant, stems/plant, roots/plant, fruit/plant and total dry weight of plant were statistically analysed using Statistically Analytical Software (SAS). The results indicated that the foliar application of moringa leaf extract stimulated the growth and fruit yield of chilli. Based on the results, it was concluded that MLE helps in improving the growth and fruit yield of Chilli and MLE with 10% concentration at one week interval is recommended for improved growth and fruit yield of Chilli (*Capsicum annuum* L.) cv. MIPC-1.

Key words: Chilli, moringa leaf extract, plant growth, yield

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GROWTH AND YIELD RESPONSE OF MAIZE (*Zea mays* L.) TO ORGANIC LIQUID MIXTURE (*PANCHAGAVYA*) APPLICATION

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ABSTRACT

Panchagavya is an organic liquid fertilizer having the potential to promote growth and immunity in plants. A field experiment was conducted in natural farming area in crop farm, Eastern University, Sri Lanka, Vantharumoolai from June to September 2019 to find the effects of different frequency of organic liquid mixture (*Panchagavya*) application on growth and yield of maize. The experiment was laid out in the Randomized Complete Block Design (RCBD) with four treatments and four replicates. Treatments were defined based on the frequency application viz. T1- once in a week, T2- once in two weeks, T3- once in three weeks and T4 as control. Compost was applied at the rate of 10 kg/ha to all treatments as basal fertilizer. All the other management practices were carried out uniformly as per recommendation of Department of Agriculture, Sri Lanka. Measurements viz. plant height, leaf number per plant, leaf chlorophyll content and shoot and leaf biomass were carried out at two weeks interval. Yield components and grain yield were measured at the time of harvest. Collected data were analyzed statistically to determine the effects of treatments on measured parameters. Results revealed that *panchagavya* has the potential to increase growth viz. plant height, leaf number, biomass and yield of maize. It would have been due to presence of growth promoting substances in the *panchagavya*. It could be concluded that application of *panchagavya* once a week with the basal application of compost is a suitable combination to maximize the growth and yield of organic maize in the sandy regosol of Batticaloa district of Sri Lanka.

Keywords: Leaf chlorophyll content, Organic liquid mixture, Panchagavya, Regosol, Yield components

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EVALUATION OF DIFFERENT CASING MIXTURES FOR “MAKANDURA WHITE” MUSHROOM PRODUCTION IN SRI LANKA

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ABSTRACT

Makandura-White (MK-White) mushroom cultivation requires a special practice, casing. At present, the recommended casing mixture is termite clay, sand, dry cattle manure (3:1:1). However, the availability of termite clay in large quantity is limited. On this background, a study was conducted during June to September 2018 at the Regional Agriculture Research Centre in Makandura, Sri Lanka to find out locally available material that can be easily found and is cost effective for the cultivation of MK-White mushroom. The experiment was arranged in a completely randomized design with seven treatments and three replications. Different combinations of casing mixtures; termite clay, dry cattle manure, dry canal basin soil, compost and half burnt paddy husk were evaluated for their physico-chemical properties. Further, the effects of casing materials on mycelial growth and pin head formation of MK-White mushroom were determined. There were significant differences ($p < 0.05$) in mycelial growth and pin head formation among the different casing mixtures. The fastest pin head formation and the highest yield of pin heads were recorded in the casing mixture of dry canal basin soil and compost with a ratio of 3:2. Further, this casing mixture was found to have the optimum level of physico-chemical properties, such as moisture content (44.7%), pH (7.41) and C:N ratio (15:1) to grow MK-White mushroom. Therefore, the casing mixture of termite clay, sand and dry cattle manure which is presently adopted, could be replaced with the readily available dry canal basin soil: compost (3:2) casing mixture for MK-White mushroom cultivation.

Keywords: *Casing mixture, Makandura White mushroom, Physico-chemical properties, Pin head formation*

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INFLUENCE OF SEED SOURCES ON YIELD PERFORMANCE OF SELECTED VARIETIES OF RICE CULTIVATED IN KARACHCHI DIVISION, KILINOCCHI

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ABSTRACT

The utilization of quality seed paddy is an important aspect to increase the yield of rice with providing optimum management. An experiment was conducted at the Integrated Farm, Faculty of Agriculture, Killinochchi during November 2018 to March 2019 to assess the use of quality seed paddy on yield performances of selected rice varieties. Two factor factorial experiment was conducted in Randomized Complete Block Design (RCBD) with three replications. Two seed sources (ADA and Farmer) and five varieties (Bg 300, Bg 358, Bg 360, At 308 and At 362) were used as treatments. All other management practices were performed based on the farmer practices adopted in Kilinochchi District. The seed verification, leaf area index and yield parameters (panicle numbers per plant, panicle length, number of grain per panicle, total yield) were recorded and data were analyzed in ANOVA using SAS 9.1 package. The means were compared by using Duncan Multiple Range test. All the varieties of the farmer's seed source contained higher levels of other distinguishable variety (ODV), weed seeds and insect damaged seeds than the ADA's seed source and the standards of the seed certification service. The ODV in ADA's seed was less than farmer's seed in harvested paddy of all varieties. There is no interaction effect between seed source and the varieties. There were significant different in all parameters within the same variety of difference seed sources and showed the significant difference between the varieties except panicle numbers per plant. The ADA's seed source, At 362 variety was performed better compared to other varieties and gave the highest yield of 9.02 mt/ha. The cost of production of ADA's seed source is less than Farmer's seed source. It can be concluded that the use of ADA's seed paddy can be recommended as the best seed paddy to increase the yield by 10 to 25 % and the most suitable rice variety was At 362 for cultivation in Kilinochchi District.

Key words: *Damaged seeds, Other distinguishable variety, Seed verification, Quality seed paddy, Vigorous*

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IMPACT OF DIFFERENT BORDER CROPS ON GROWTH AND YIELD PERFORMANCE OF CABBAGE (*Brassica oleracea*. L) VARIETIES

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ABSTRACT

A research was conducted to assess the impact of different border crops on growth and yield performances of cabbage varieties at Faculty of Agriculture, Kilinochchi during December 2018 to April 2019. Experiment was carried out in split plot design with four different borders such as sunflower (T₁), Lemongrass (T₂), Chrysanthemum (T₃) and No border (T₄) were selected as main plot treatments and two different cabbage varieties such as Green hot (V₁) and KY cross (V₂) were used as sub plot treatments. The cabbage varieties were planted at the spacing of 50 cm × 40 cm. All the agronomic practices were done according to the recommendations of the Department of Agriculture except plant protection methods. The growth, plant protection measures and yield parameters were recorded. ANOVA and Duncan's Multiple Range Test (DMRT) were performed to find out the significant differences among the treatment combinations. Growth parameters such as plant height, number of leaves showed non-significant effect among different border treatments and varieties. The yield parameters such as head weight, circumference, diameter and total yield were significantly different among the border crops. Highest yields were recorded in varieties Green hot (37.4 ton/ha) and KY cross (59 ton/ha) in chrysanthemum border (T₃) and in Lemongrass border (T₂) respectively. Marketable yield was significantly differed between different border crops and the highest was recorded in the lemongrass border (T₂) in both varieties (Green hot – 31.4 ton/ha and KY cross – 55.3 ton/ha). The plant protection parameters viz. number of damaged leaves per plant and number of damaged heads were significantly differed among the border crops and the highest measurement were recorded in control (T₄) treatment. There were no significant differences between varieties of cabbage on the plant protection parameters within same border and the highest was recorded in var. Green hot due to susceptibility to pest damage. It can be concluded that lemongrass border with KY cross variety can be recommended as best treatment combination for growing cabbage in Kilinochchi district during *Maha* season.

Key words: *Border crops, Cabbage, Growth and Yield, Plant protection parameters, Varieties*

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IN VITRO MORPHOGENIC RESPONSE OF ORCHID BY USING DIFFERENT EXPLANTS

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ABSTRACT

Orchid is an ornamental plant with high commercial value. Since, conventional propagation method is not competent to produce sufficient planting materials for commercial cultivation and also seed propagation results in unwanted heterozygous types, vegetative propagation by means of *in vitro* culture is an essential for rapid multiplication of orchids to meet the current market demand. This study was aimed to select the suitable type of explants for *in vitro* micropropagation of orchid. Young mother plants of Vanda orchid were collected from the net house subsequently nodal portion with auxiliary buds, leaves and stem were separated from these plants. Different types of 1 cm long explants namely single nodal segments, base and tip portions (0.5 cm width) of leaves and stem segments (entire and vertically cut into half) were excised from these plant parts and then surface sterilized with 20% of sodium hypochlorite (5.25% active ingredients) for 30 min. Subsequently they were cultured on the MS basal medium supplemented with 2.0 mg/l BAP and 0.2 mg/l NAA to evaluate *in vitro* morphogenesis. Result revealed that highest survival rate and *in vitro* response (88.8%) were significantly ($P < 0.05$) high in light green immature nodal segment explants. Within four weeks of culture, mature leaf segments failed to show any *in vitro* response. Immature leaf segments showed moderate *in vitro* response (33.3-44.4%) and survival rate (55.5%) was higher in immature leaf tip portions than base portions (44.4%). Meanwhile stem segment explants showed very low survival rate (22.2%) and *in vitro* response (11-22%). Within 4 weeks of culture, creamy white in colour swelling was observed in nodal explants. Subsequently, nodules like structures were formed to initiate shoot buds on nodal portions after 8 weeks of culture. The result indicated that nodal segments were found to be the best for *in vitro* plant regeneration as compared to leaf and stem segment explants.

Key words: *Explants, In vitro culture, Morphogenic response, Multiplication, Orchid*

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RELATIVE EFFICIENCY OF VARIOUS CONTROL STRATEGIES ON PESTS OF CHILLI (*Capsicum annuum* L.)

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ABSTRACT

Chilli is one of the major cash crops grown in Sri Lanka. In the past few years, chilli cultivation in the Batticaloa area was affected by various pests, *i.e.* aphids, thrips, whiteflies, root - knot nematodes, spider mites etc. Studies were carried out to find out the relative efficiency of various control strategies on pests of chilli. This experiment was conducted in two different locations of the Batticaloa district. And this experiment was laid out in the Randomized Complete Block Design with seven treatments and four blocks. Treatments were started after two weeks of transplanting of chilli seedlings, cultivar PC 1. Treatments were imposed for the chilli at fortnight intervals. The control plants were left as conventional chilli cultivation (no treatments were applied). There were significant ($p < 0.05$) differences between treatments in the number of wilted plants in each plot and block. The lowest numbers of wilted plants were observed in the plots treated with compost (0.4 ± 0.04) and bio fertilizer (0.45 ± 0.08). The highest number of wilted plants was observed in the plots treated with citronella oil (1.8 ± 0.02) and chicken litter (1.35 ± 0.02). The highest yield was obtained from plots treated with pesticide/ Abamectin and the lowest yield was obtained from the plots treated with citronella oil (73.66 ± 6.63) and from the untreated control plots (66.33 ± 3.57). Though the bio-fertilizer, compost and neem seed extract gave second higher yield in chilli cultivation by comparing to the side effect to the environment these can be recommended to chilli plants.

Keywords: *Bio-fertilizer, Pesticide, Root-knot nematodes, Wilted plants, Yield*

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**FOOD NUTRITION, VALUE ADDITION,
LIVESTOCK, FISHERIES AND AQUACULTURE**

HOUSING AND FEEDING STRATEGIES OF GOAT FARMING IN THE KILINCHCHI DISTRICT

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ABSTRACT

A survey was carried out in four veterinary divisions of the Kilinochchi district viz. Karachchi, Kandawalai, Poonakary and Pachchilaippalli to study the feeding and housing strategies adopted by the goat farmers. A total of 291 farmers were interviewed with structured questionnaires to collect information on housing and feeding practices adopted by the goat farmers. Results showed, earthen housing (60.82%) was predominant in all four veterinary divisions while least farmers constructed elevated (wooden) housing (2.75%) for goats. Percentages of farmers allowing goats for grazing in the dry and rainy seasons were 80 and 20, respectively. Majority of the farmers adopted a grazing period of 4-8 hours and 1-4 hours in the dry and rainy season, respectively. Goats were either tied or untied in non-cropped lands or abandoned spaces during grazing. Less than 28% of the goat farmers grew fodder grass and fodder legumes. Average extend of fodder cultivation was around 0.16 acres except in Pachilaipalai veterinary division where the average extend was around 3 acres. Farmers reported that CO3 seems to be less palatable to goats. In the semi intensive system of management goats were mainly fed with diverse plants and leaves, in addition kitchen wastes and human leftovers also was fed. Comparatively higher percentage of concentrates were given to lactating does and bucks than other stages of goats and the main concentrates fed were rice bran, coconut poonac, commercially available compound feed and gingelly poonac. It could be concluded that since farmers have been adopting the basic aspects of housing and feeding, they could be educated on appropriate housing and feeding strategies to improve the productive and reproductive efficiencies of goats in the Kilinochchi district.

Keywords: *Dry zone, Feeding, Goat rearing, Grazing, Kilinochchi*

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EFFECT OF NUTRITIONAL, MICROBIAL, ANTIOXIDANT ACTIVITY AND SENSORY QUALITIES OF CHICKEN MEAT SAUSAGES USING MORINGA, TEA AND CINNAMON LEAF

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ABSTRACT

The present study was conducted to develop preparation of chicken sausage with adding 0.5% concentration of each Moringa, Tea and Cinnamon leaf powder. Sausages sample was analyzed for nutritional, microbial sensory properties during 4 weeks of frozen storage at -10°C. Moisture content, ash content and fat content of sausage samples were analyzed by using AOAC methods. Texture, colour and pH were measured using food rheology tester, colour analyzer probe and digital pH meter respectively. Antioxidant activity was measured according to Ferrous Reducing Antioxidant Power method. Incorporation of leaf powder increased the dry matter content, ash content, fat content and antioxidant activity. Dry matter and ash content were higher with the moringa leaf powder added chicken sausage, whereas lower in the sausage sample without adding leaf powder. Higher fat content and antioxidant activity observed in the cinnamon leaf powder added sausages while lowest in the sausage sample without leaf powder. Considering the microbial activity, lowest Total Bacterial Count and *Staphylococcus aureus* observed in the cinnamon leaf powder incorporated chicken sausages and Moringa leaf powder incorporated chicken sausages respectively. Also, incorporation of different leaf powder, affect the textural properties of chicken sausages. During storage, dry matter and ash content were significantly ($p < 0.05$) increased. Moisture content, Fat content, pH values and Antioxidant activity were significantly ($p < 0.05$) decreased with the storage period. Organoleptic properties were evaluated through the panel of 30 members. As a result of organoleptic characteristics revealed that, 0.5% of cinnamon leaf powder incorporated chicken sausage had highest mean score of overall quality of all sensorial properties.

Key words: *Antioxidant, Cinnamon, Microbial, Moringa, Sausages, Tea*

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DEVELOPMENT OF READY TO SERVE (RTS) BEVERAGE BASED ON COCONUT SKIM MILK

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ABSTRACT

Coconut milk has been used as an important aspect of numerous Asian foods. The current study was based upon the potential development of a beverage from coconut skim milk in the market because of growing health concerns. The objective of this study was to develop skim coconut milk beverage and comparison of its quality. The study was carried out at the Coconut Processing Research Division, Coconut Research Institute, Lunuwila, Sri Lanka using 4*4 factorial complete randomized experimental design with different treatments. Three different kind of treatments using different concentrations of preservative, stabilizer and flavouring agent vz Sodium Metabisulphate and Carboxy Methyl Cellulose (CMC) and one flavouring agent were used for the preparation of a ready-to-serve beverage Treatment (T₃) - developed by using 1% CMC stabilizer, 0.035% preservatives & 0.5% of flavoring agents was selected for the successful formulation of ready to serve beverage. A major Nutrient constituent were observed as 1.01% of protein, 0.84% of fat, 18.70% of sugar and 79.25% of water in Treatment (T₃). Treatment (T₃) showed a minimal microbial count of fewer than 1.00*10¹ Colonies/g and Storage stability of the minimum 4 months at the room temperature of 30±2°C with minimal change in nutritional composition. Results indicate that Coconut skim milk could be utilized as a successful substitute for the production of ready to drink beverages.

Keywords: Beverage, Coconut Milk, Coconut Skim Milk, Food processing, Ready-to-drink

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ENHANCEMENT OF NUTRITIONAL VALUES OF LABNEH BY ADDING (*Moringa oleifera*) FRESH LEAF EXTRACT

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ABSTRACT

Moringa is a natural, whole-food source for vitamins, minerals, protein, antioxidants, and other important compounds that your body relies on to stay healthy. Therefore, the aim of this study was to investigate the nutritional and physical properties and shelf life of Labneh incorporated with different amounts of fresh Moringa leaf extract, at the rate of concentrations 0.2% (w/v), 0.4% (w/v), 0.6% (w/v). Labneh samples were analyzed for physico - chemical and sensory properties during refrigerated storage at 4 °C. The physico-chemical (ash, dry matter, free fatty acids (FFA), protein, titratable acidity, pH, lactose) were analyzed at day 1, day 7, day 14, day 21 and day 28 of storage. The sensory characteristics (colour, taste, texture, flavor and overall acceptability) were analyzed at day 1, day 7 of storage period. Ash, dry matter, FFA, pH, titratable acidity and lactose content were significantly difference ($p < 0.05$) among the treatments at day one. The results of this study revealed that, ash ($0.28 \pm 0.01\%$) and dry matter ($57.62 \pm 0.06\%$) contents were significantly ($p < 0.05$) higher in Labneh incorporated with 0.6% fresh Moringa leaf extract. The FFA content was significantly ($p < 0.05$) higher ($7.13 \pm 0.15\%$) in Labneh incorporated with 0.6% fresh Moringa leaf extract. pH was significantly ($p < 0.05$) higher ($4.87 \pm 0.01\%$) and titratable acidity was significantly ($p < 0.05$) lower ($1.32 \pm 0.01\%$) in without leaf extract added Labneh. During storage, the ash and dry matter contents were significantly ($p < 0.05$) increased. FFA content was significantly ($p < 0.05$) increased. pH and lactose content were significantly ($p < 0.05$) decreased and titratable acidity was increased with the storage period. Microbial content (E-coli, yeast, moulds, coliform, total plate counts) of Labneh with, different amounts of fresh Moringa leaf extract were analyzed. Higher value of yeast and total plate count were constituted without leaf extract added Labneh, and the lower value of Total plate count and yeast amount were constituted in 0.6% fresh Moringa leaf extract added Labneh. E-coli, moulds and coliform were not detected in the Labneh. Organoleptic properties were evaluated through the panel of 20 members. It revealed that, 0.2% of fresh Moringa leaf extract added Labneh had the highest mean score for overall quality. Sensorial properties namely, colour, taste, texture, flavor, and overall acceptability. Results revealed that most of the panelist accepted 0.2% of fresh Moringa leaf extract incorporated Labneh had the highest overall quality during the storage period compared to other treatments. The 0.6% of fresh Moringa leaf extract incorporated Labneh had the highest overall quality during the storage period compared to other treatments.

Keywords: Free Fatty Acid, Fresh Moringa leaf extract, Labneh, Storage

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DETERMINATION OF KINETIC PARAMETERS OF α -AMYLASE FROM BAKER'S YEAST (*Saccharomyces cerevisiae*)

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ABSTRACT

α -Amylase is an extra cellular hydrolytic enzyme present in plants and produced by several bacteria, yeasts and fungi. Most of the yeasts from nature are not harmful as compared to bacteria, interest in yeasts with potential use in biotechnological processes has increased in recent years. This study was conducted to characterize α -amylase produced by Baker's yeast (*Saccharomyces cerevisiae*). The optimum time for first order kinetics was optimized as 5 min at 65°C and pH 7.0. The optimum pH for the activity of the enzyme at 65°C was 7.0. The activity was measured at different temperatures ranging from 35 to 85°C and optimum temperature for the activity of the enzyme was 65°C when soluble starch was used as the substrate at pH 7.0. The V_{\max} (maximum reaction velocity) and K_m (Michaelis constant) values of the produced amylase were 0.71 U mL⁻¹ and 1.85 mg mL⁻¹, respectively, for hydrolysis of soluble starch in a reaction mixture of pH 7.0 at 65°C for 5 min. When the enzyme was pre-incubated at 65°C and at pH 7.0, it lost 21% of its initial activity at 60 min. Further studies are in progress to increase the stability of the enzyme by applying different metal ions and to purify the enzyme.

Key words: α -Amylase, Enzyme activity, Enzyme stability, Soluble starch

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PHYSICO-CHEMICAL AND MICROBIOLOGICAL PROPERTIES OF PROBIOTIC FERMENTED LOW-FAT YOGURT ENRICHED WITH OAT β-GLUCAN DURING COLD STORAGE

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ABSTRACT

Present study aimed to investigate the quality attributes of probiotic-fermented low-fat yogurt enriched with Oat β-glucan (OβG) during cold storage (5⁰C) for 21 days. Low-fat yogurt formulation was based on substitution with OβG (0.75%, w/v). There were five treatments viz. yoghurt made without the addition of OβG prepared from full cream cow milk fermented by yogurt starter (YS) (control), low fat milk without OβG fermented by YS, low fat milk with the addition of OβG fermented by YS (YSOβG), low fat milk without OβG and fermented by *Bifidobacterium lactis* and *Lactobacillus acidophilus* (PYS) and low fat milk with the addition of 0.75% OβG and fermented by *Bifidobacterium lactis*, and *L. acidophilus* (PYSOβG), respectively. Physicochemical composition, microbiological properties and sensory quality attributes of all the samples during storage period was determined. The results indicated an increase (p<0.05) in total solids, ash, total titratable acidity, total soluble solids of yoghurt and a reduction (p<0.05) in moisture, pH and lactose of yoghurt during refrigerated storage. Addition of OβG improved the survival of probiotic bacteria and yogurt starter culture during storage period where the OβG-enriched yogurt had high viable count. The substitution of OβG significantly enhanced sensory attributes of yogurt, wherein OβG-enriched samples recorded high score and acceptability. It could be concluded that substitution of OβG is a sufficient delivery truck of probiotic culture and OβG could be used safely in functional dairy products.

Keywords: Chemical composition, Dairy products, Microbiological properties, Oat β-glucan, Sensory evaluation

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EXTRACTION OF LECITHIN (PHOSPHATIDE) FROM UNREFINED SOY-BEAN OIL FOR INDUSTRIAL APPLICATIONS

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ABSTRACT

Generally vegetable oil is obtained by physical or solvent extraction and requires a series of operation called 'Degumming'. Degumming is the simplest form of phosphatide reduction in unrefined vegetable oil, which remove substantial amount of 'Lecithin'. The presence of lecithin in the unrefined vegetable oil causes darkening of the oil and poor storage stability. A package of processing operations is undertaken to eliminate these substances to make oil edible called 'Refining', which remove the Free Fatty Acids and need to achieve the level of Lecithin below 10 ppm to enable the physical refining. This study was carried out to quantify the quantity of Lecithin in parts per million (ppm), which was present in the different commercially available unrefined edible oils like Soybean, Sun flower, Rice bran and Palm oil. Analysis was carried out to quantify Lecithin by the absorption value of spectrophotometer. In this study initially, unrefined vegetable oils were used to investigate the level of a Lecithin concentration, which consist varies level of concentration start from 250-800 ppm. Soybean oil was yield very high Lecithin content 700-800 ppm. Palm and sunflower oil used in this study was very low Lecithin content 200-300 ppm. Water alone use as a degumming agent in initial stage of Lecithin removal with stirrer mixing operation. However, only water soluble (hydratable) Lecithin could be removed by this method. During this water degumming process, 3% water level, at 40°C, for 30 minutes of mixing duration at 1000 rpm efficiently reduced the level of Lecithin 150 ppm, afterwards Lecithin content in degummed oil was constant. In further process of un-hydratable Lecithin removal was done by Caustic reagent (3% v/v) use to investigate the Lecithin removal in the later part. Chemical degumming in which a citric acid and caustic soda (NaOH) mixture were used to remove gum simultaneously to an accelerated rate while in the remaining processes lecithin level was reduced to the required level less than 10 ppm. Soybean oil contained the highest amount of Soy-Lecithin, which was highly preferable in the cosmetic and pharmaceutical industries.

Key words: Caustic, Phosphatide (Soy-Lecithin), Refining, Unrefined oil degumming

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**PREVALENCE IN EPIDEMIOLOGY OF SUBCLINICAL MASTITIS
IN MILKING COWS AT VANTHAROOMULAI, KOMMANTHURAI,
MAWADI-VEMBU AND KARADIYANARU VETERINARY
RANGES OF BATTICALOA DISTRICT**

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ABSTRACT

Subclinical mastitis is the most widespread type of the disease in milking cows in worldwide dairy farms. This study was carried out to investigate the prevalence of subclinical mastitis in dairy cows in Vantharamoolai, Kommanthurai, Mawadi-Vembu and Karadiyanaru veterinary ranges in Batticaloa district, Sri Lanka and in relation to the major pathogens, risk factors and economic losses about 3 months in the study period. A total of 100 lactating cows were randomly selected to identify SCM using California Mastitis Test (CMT) from Vantharamoolai, Kommanthurai, Mawadi-Vembu and Karadiyanaru Veterinary Ranges in Batticaloa District. Milk samples were collected aseptically from CMT positive cows and transferred to laboratory in the ice box. Microbiology and biochemical analysis were carried out to isolate pathogens in the milk sample by a standard procedure. Result showed that prevalence of SCM was associated with following factors such as farming system, age, breed, number of lactation, stage of lactation, housing, milking practices, isolated cows from infected cows, washing of hands and incidence of mastitis occurred in early. Furthermore, 22 lactating cows (22%) were positive to CMT, in which 39 (9.75%) quarters showed CMT positive. While 100% of CMT quarters showed a bacterial growth after the cultured. Major microorganisms were such as *Staphylococcus* spp. (90.5 %), *Escherichia coli* (6.0 %) and *Streptococcus* spp. (3.5 %) were isolated from milk sample. Finally studied most of factors were influenced to Subclinical Mastitis in these areas. Each were separately considered and discussed which were effect for the Subclinical Mastitis in these areas.

Keywords: *California Mastitis Test, Dairy Cows, Pathogens, Prevalence, Subclinical mastitis*

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NON-CONVENTIONAL FEEDS FOR RUMINANTS IN CHENKALADY VETERINARY REGION

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ABSTRACT

In this context, a study was undertaken for identification, categorization and proximate analysis of non-conventional feed resources in Chenkalady veterinary region from January to May 2019. One hundred and twenty ruminant farmers were selected in Chenkalady veterinary region using random sampling method. Respondents were randomly selected based on usage of non-conventional feeds for their ruminants. Randomly selected farmers were interviewed in each area by using structured questionnaires. Before commencement of data collection, the questionnaire was pretested, to know the possibility of the prepared questionnaires and changes were made to enable easy recording of responses from farmers and to include all necessary information involved in non-conventional feeds. The primary data such as socio-economic, educational level, family size, civil status, age of farmers, income level, likewise status of non-conventional feed information such as feed availability, types of non-conventional feeds were collected through personal interviews using questionnaires. Proximate composition of feeds were gathered from the proximate analysis of selected feed samples. The result of this study revealed there are main five categories of non-conventional feed resources were identified. Fruit and vegetable waste, paddy waste, other cereal waste, animal industry waste and tree leaves. In Chenkalady veterinary region 93.33%, 88.33%, 61.66%, 39.83% and 90.83% were fruit and vegetable waste, paddy waste, other cereal waste, livestock waste and tree leave respectively. Proximate analysis results revealed cassava leaves, ipil ipil leaves and fish meal are the best non-conventional feeds that contain all the nutrients in average amounts.

Key words: *Non-conventional feeds, Ruminants, Proximate composition*

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SOIL, WATER, ENVIRONMENT AND WASTE MANAGEMENT

SMALL SCALE BIODIESEL PRODUCTION FROM SARGASSUM AND OPTIMIZATION OF CONDITIONS FOR YIELD ENHANCEMENT

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ABSTRACT

Biodiesel production from natural resources has drawn global attention due to its cost effectiveness, eco friendliness and sustainability compared to the conventional fossil fuels. This work was aimed to select the best marine flora available in the Northern Sri Lankan sea to produce biodiesel and to optimize the conditions to enhance the yield. Five species of macro flora such as *Sargassum* sp, *Ulva fasciata*, *Turbinaria ornata*, *Gellidium* sp and *Thallasia* sp were collected from the coastal area of the Jaffna peninsula and washed thoroughly and dried under direct sun light. The organic solvents used to extract oil from marine plant species was n-Hexane and Di-ethyl Ether, while alkaline catalysts was used to convert the extracted oil into biodiesel via trans-esterification reaction. When the oil extraction was done separately from the five dried plant species using 200ml n-Hexane and Di-ethyl ether as solvents, significantly higher quantity of oil (11.6 ml /10 grams substrate) was obtained from *Sargassum* sp than the other marine macro floral species, hence *Sargassum* sp was selected for further studies. When the conditions for the extraction of oil from *Sargassum* sp such as *Sargassum* to solvent ratio (0:200), amount of algal biomass (100 g), longer contact time (24 hours), molar ratio (4:1), catalyst amount (0.6), temperature (60°C), reaction time (25 minutes) were optimized before the conversion of oil into biodiesel via trans-esterification reaction, there was a significant increase in the quantity of extracted oil by 11.7 times than the non-optimized conditions.

Key words: Biodiesel, Oil extract, Optimization, *Sargassum* sp, Trans-esterification

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EFFECT OF USING BIOFILM BIOFERTILIZER FOR AMARANTHUS (*Amaranthus viridis*) IN SANDY REGOSOL IN SRI LANKA

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ABSTRACT

Biofilms are aggregates of multiple microbial communities, attached to each other or to a surface. In vitro developed beneficial biofilms can be used as biofertilizers, which are then called biofilm biofertilizer (BFBF). This study was conducted to evaluate the effect of BFBF on growth of amaranthus and soil parameters in comparison with fertilizer recommendation of the Department of Agriculture and farmer practice at Eastern region of Sri Lanka. The pot culture experiment was conducted at Eastern University, Sri Lanka. Which is located in low country, dry zone. The experiment was carried out during the period from January April, 2019. Eight different treatments consisted of different levels of chemical fertilizers alone and their combination with BFBF and a control were replicated four times in Complete Randomized Design. The treatments are, T1-control, T2- 100% DOA Recommendation, T3-Farmer practice, T4-50% DOA Recommendation, T5-50% Farmer Practice, T6-50% DOA Recommendation + Biofilm, T7-50% farmer Practice + Biofilm, T8-Biofilm alone. Plant and soil parameters were recorded periodically and data were statistically analysed using SAS and difference between treatments means was compared using Duncan's Multiple Range Test (DMRT). Treatments with the application of BFBF showed increasing trend of soil organic matter content, and fresh weight of harvest in amaranthus. Combination of 50% recommended chemical fertilizers with biofilm biofertilizers BFBF). can be recommended for amaranthus cultivation in sandy regosol.

Key words: *Amaranthus yield, Biofilm, Sandy regosol, Soil organic carbon*

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EFFECT OF CONVENTIONAL, ORGANIC AND NATURAL FARMING SYSTEMS ON SOIL PROPERTIES AND PERFORMANCE OF COWPEA (*Vigna unguiculata*)

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ABSTRACT

Due to the increasing rate of a population the food availability is limited and farmers are adopting different farming systems to meet the demand. But sustainable and successful management of resources for agriculture to satisfy changing human needs, without degrading the environment or the natural resources is lacking. Therefore, this study was conducted at Agronomy farm, eastern university from October to December, 2017 to study the impact of organic, natural and conventional farming systems on soil properties and cowpea growth and yield. Organic, natural and conventional farming systems were practiced in a randomized complete block design with five replications to select best farming system for waruni variety of cowpea. Seeds were grown according to treatment and all required steps to grow the plant in each cropping system was followed. From 2nd week to 5th week the after planting leaf number and plant height were observed and recorded. The yield parameters such as pod number and pod weight were observed and recorded at harvest. Soil properties such as bulk density, porosity and organic matter content, were analyzed initially and at harvest. All the experimental data were analyzed statistically with the Duncan Multiple Range Test (DMRT) at a 5% significant level by using SAS 9.1 application statistical package. Analyzed growth parameters and soil physical and chemical properties were compared among those three farming systems. Natural farming had improved in growth performance and properties of soil compared to other two farming systems where the low level of bulk density was found as 1.1331 gcm⁻³ and high level of leaf number, pod number, pod weight per plot, porosity and organic matter content were found as 23, 261.4, 176.646 g and 54.1503% and 5.9871% respectively. Moreover, the natural farming system was regarding soil improvement and crop performances than organic and conventional farming systems in the above crop and soil parameters. This study also showed that the natural farming system improves the soil properties environmental friendly

Key words: *Natural, Conventional, Organic Farming Systems, Cowpea*

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GROUNDWATER LEVEL AND QUALITY OF KAMMALAKKULAMA VILLAGE IN ANURADHAPURA

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ABSTRACT

Agro-wells are the most valuable resource for many farmers in dry zone of Sri Lanka, because it has a good potential to stabilize and sustain crop yield. A study was conducted to evaluate the suitability of groundwater for irrigation and drinking in Kammalaakkulama village. Important quality parameters such as pH, Electrical Conductivity (EC), Total Dissolved Solids (TDS), Phosphorus (P), Ammonia Nitrogen, Hardness and Alkalinity were tested in randomly selected 12 agro-wells located in the village from September 2010 to March 2011. Depth of agro-wells in the Kammalaakkulama village area were; 25% between 4 – 6 m, 33% between 6-8 m and 42% more than 8 m. 83% of wells had more than 2 m water depth at the end of dry period indicating high groundwater potential in the study area. Average pH value of the area ranged from 6.75 to 8.11 and this water is suitable for drinking and irrigation. Eight percent of the wells had EC values below 700 $\mu\text{S/cm}$ because of near the natural water stream and 92% of the wells had EC values between 700-3000 $\mu\text{S/cm}$ (ranged from 500 to 2200 $\mu\text{S/cm}$). Thirty three percent of wells had TDS values below 450 mg/l and 67% of wells had TDS between 450- 2000 mg/l (ranged from 254 – 1100 mg/l). All the wells had alkalinity values between 150-800 mg/l (ranged from 160-500 mg/l). Hence, most of the wells are slight to moderate for irrigation purpose. Fifty eight percent of the wells had available P above the critical level of 0.03 mg/l where eutrophication is likely to be triggered. Ammonia nitrogen content in all the wells were below the recommended level of 1.5 mg/l for drinking purpose with farmers. Considering total hardness value of wells 92% of the wells are not suitable for drinking but all the wells are suitable for irrigation.

Keywords: *Agro-well, Electrical conductivity, Groundwater, Hardness, pH, Water quality,*

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IRRIGATION WATER QUALITY OF PARAKRAMA SAMUDRAYA CANAL COMMAND AREA, POLONNARUWA DISTRICT, SRI LANKA

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ABSTRACT

The present study was conducted at the Parakrama Samudraya irrigation scheme in Polonnaruwa district from February to July 2019 to find the suitability of irrigation water of that command area. Water samples were collected at one km distance along the Right Bank canal using one litre plastic containers. Well-water samples also collected at a regular distance on both sides of the canal. Collected water samples were analyzed for their quality. The pH and electrical conductivity (EC) were analyzed at the field using portable pH/EC/TDS meter. Parameters such as Ca, Mg, Na, K, carbonate, bicarbonate, nitrate and phosphate were tested using standard procedures. Values of Residual Sodium Carbonate (RSC), Soluble Sodium Percentage (SSP) Ca:Mg ratio and Sodium Adsorption Ratio (SAR) were derived from cation and anion concentrations. Results revealed that the quality of RB canal water and the well water on both sides were varied with the distance. The pH of canal water varied from 8-8.4 showing slight alkaline condition. According to the RSC value, most of the canal and well water categorized as unsuitable for irrigation due to the bicarbonate hazards. According to the SSP and SAR, all the canal and well water samples categorized under suitable for irrigation. Magnesium hazard in well water in both sides also noticed during the study. The concentration of most of the quality parameters of the canal water significantly differs from the well water except bicarbonate and phosphate. Based on these studies, it is concluded that the Right Bank canal water of Parakrama-Samadrya is suitable for irrigation to crops. However, appropriate management is needed in some locations of the command area while using ground-water for irrigation purpose. At the same time, there should be a control mechanism against the over usage of fertilizer in these command areas to avoid pollution through nutrient accumulation to the canal as well as to the ground water sources.

Keywords: *Electrical conductivity, Sodium adsorption ratio*

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DIRECT AND RESIDUAL EFFECTS OF PHOSPHORUS AND SULPHUR FROM POULTRY MANURE AND SINGLE SUPER PHOSPHATE ON SOIL BIOLOGICAL PROPERTIES IN GROUNDNUT-SUNFLOWER CROPPING SYSTEM

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ABSTRACT

Phosphorus and Sulphur integration trial was conducted using poultry manure and single super phosphate for groundnut sunflower cropping system to improve organic carbon content and to maintain a better microbial population in groundnut and sunflower cropping system. Six treatments (100% RDF to groundnut crop through poultry manure, 75% RDF through poultry manure and 25% RDF through chemical fertilizers, 50% RDF through poultry manure and 50% RDF through chemical fertilizers, 25% RDF through poultry manure and 75% RDF through chemical fertilizers and 100% RDF through chemical fertilizers), all applied on equal P basis @ 34 kg P₂O₅ ha⁻¹ and on equal S basis @ 75 kg S ha⁻¹. The six treatments, including a no-P and no-S as control were replicated three times in a completely randomized design. Main crop of groundnut (*Arachis hypogaea*) was followed by a residual crop of sunflower (*Helianthus annuus*). Post-harvest soil analysis for organic carbon content, biomass carbon content and the microbial population was carried out after groundnut and sunflower. Sole poultry manure increased the soil organic carbon content, microbial population and biomass carbon content were higher in treatment combining 75% poultry manure and 25% chemical fertilizer in both main and residual soil. But the microbial biomass carbon content in the post-residual crop soil was lower than that in the post-harvest soil after the first crop of groundnut.

Key words: Biomass Carbon, Microbial Population Organic carbon, Organic manure

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ENVIRONMENTAL SUSTAINABILITY AWARENESS OF THE RESIDENTS IN GAMPAHA DISTRICT, SRI LANKA (A CASE STUDY)

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ABSTRACT

This paper aims to investigate the current scenario of environmental sustainability awareness of the residents in *Gampaha* administrative district in Sri Lanka. Importantly, *Gampaha* district is remarked as the densest populated area and one of the heavily industrialized areas in the country, risking the residents vulnerable to impacts of environmental degradation. Assessing the environmental sustainability awareness of residents may help to fill the gaps, towards sustainable development of the region. The present case study adopted a quantitative approach to assess the environmental awareness level between two student groups, and between the student groups and non-professional employees. Study variables included; awareness of environmental legislation, reactions, education, economy, energy, resources and issues. A structured questionnaire comprised of *Likert-type* and Analytical Hierarchy Process (*AHP*) based questions were used in a field survey, participating 104 residents (43 students of formal learning, 35 students of vocational training, and 27 of non-professional employees). Stratified random sampling method was used. Stratification was done according to the studentship and professional status. Environmental Sustainable Awareness Index (*ESAI*) was mathematically modelled. Parametric analysis, t-Test, and *AHP* method were performed. *SPSS* and *MS Excel* software were used in data analysis. Results revealed that the students of formal learning category show the highest awareness level compared to the students of vocational training and the non-professional employees. The *AHP* indicated that the students of formal learning exhibit more autonomous actions towards protecting the environment, whereas the students of vocational training tend to rely on governmental interventions. However, non-professional employees opt for governmental and autonomous intervention as equally as important.

Keywords: *AHP, Awareness, Environment, Gampaha, Sustainability*

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