UNDERGRADUATE RESEARCH FORUM-2019

FACULTY OF AGRICULTURE

ABSTRACTS

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Foreword

I feel so fortunate to serve as the Coordinator of the Undergraduate Research Forum 2019 organized by the Faculty of Agriculture, Eastern University, Sri Lanka. It was an event that was intended to provide an avenue for the students of Fourth year second semester of the degree programme to present their research findings. These research findings have been published in the form of abstracts to disseminate research knowledge to the community.

I express my heartfelt gratitude to the Dean / Faculty of Dr. P. Sivarajah, Faculty of Agriculture for his support in publishing this book, and his commitment. To the staff, the Faculty of Agriculture, I extend my gratitude for their generous contribution and commitment in this task.

Finally, I would like to thank our 2013/2014 batch students who have made this event a success through their valuable presentations and contributions to the publication of articles.

Ms. Nishanthi Sivasubramaniam
Coordinator/ Undergraduate Research Forum – 2019
Faculty of Agriculture
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Message of Dean/ Agriculture

It is with great pleasure that I write this message on the publication of the Undergraduate Research Forum (URF) Abstracts -2019 booklet. The URF is an annual event of the Faculty of Agriculture, Eastern University; where Final Year undergraduate students make a presentation to showcase and disseminate their Final Year Research Project work. This URF booklet contains Abstracts of the research project work completed by the students, which have been evaluated by staff.

The students have toiled for six months on their research project work and presented their findings in a professional manner with guidance of their Supervisor. The research findings would be valuable to academics, researchers, policy makers and for future research work of students in the Faculty.

I congratulate the students for their achievements and also appreciate and thank their Supervisors for the guidance they had provided to the students on their project work.

I wish all the students a wonderful and bright future.

Dr. P. Sivarajah
Dean / Faculty of Agriculture
Eastern University of Sri Lanka

18th February 2020

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AGRICULTURAL BIOLOGY

STRATEGIES FOR THE IMPROVEMENT OF CONTROL MEASURES AGAINST COCKCHAFER GRUB (*Melolontha melolontha* L.) INFESTATION IN RUBBER PLANTATION

B. N. Gurusinghe

ABSTRACT

Cockchafer grub attack on the root system of young rubber clearings was reported occasionally since the establishment of the rubber plantation industry in Sri Lanka. However, grub infestation reached epidemic proportions during the year 2002 in Awissawella region and destroying young rubber clearings. Presently, this problem has spreaded to Rathnapura, Kegalle and Kalutara districts threatening the establishment of new clearings in certain locations. With the spread of the attacks, various pesticides were tested as soil drenching chemicals and Chlophyrifos was identified as an effective insecticide. As this chemical was banned in Sri Lanka the Rubber Research Institute introduced Imidacloprid as a substitute. Once Imidacloprid will be banned there is a need to Rubber Research Institute to identify an alternative to control the pest attacks. With this background the present investigation was carried out to develop control methods against cockchafer grub.

Screening of new insecticides against cockchafer grubs were carried out at Raigam estate Ingiriya under field conditions. This experiment was laid out in the Randomized Complete Block Design with 11 treatments and 30 replicates. Five different insecticides were applied in two concentrations as a soil drench. Among the treatments tested Imidacloprid 2.5 ml in 1.5 L of water/plant was the most effective treatment followed by Imidacloprid 2 ml in 1.5 L of water/plant and Diazinon 2.5 ml in 1.5 L of water/plant in controlling the cockchafer grubs.

As the chemical insecticides have many disadvantages there is an urgent need to develop alternative eco-friendly treatments with the help of natural pesticides and biological control agents. Because of that efficacy of entomopathogenic fungus *Beauveria bassiana* was investigated in in-vitro conditions as second experiment at Plant Pathology and Microbiology Department of Rubber Research Institute, Sri Lanka. *B. bassiana* fungus solutions were prepared with four concentrations and cockchafer grubs were treated with these different concentrations. The experiment was laid out in the

Completely Randomized Design with 10 replications. The resultsrevealed that the fungus solutions with 15 spores/ml and 20 spores/ml had the most efficacy with 100% mortality in cockchafer grubs in 14 days.

Compatibility study of *B. bassiana* with different insecticides was investigated as third experiment in in-vitro conditions. The experiment was laid out in Completely Randomized Design with 11 treatments and 3 replicates. The findings evidenced that the lower concentration of Chlorantraniliprole + Thiamethoxam mixture was safer to *B. bassiana* and allowed the development of fungus on PDA media followed by Imidocloprid and Carbosulfan. As the Imidacloprid had less detrimental effect on environment and low inhibition *to B. bassiana* it is possible to develop a control measure with Imidacloprid and *B. bassiana* against cockchafer grubs.

Supervised by:

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Senior Lecturer Gr.1

RELATIVE EFFICIENCY OF VARIOUS CONTROL STRATEGIES ON CHILLI (*Capsicum annuum* L.) ROOT KNOT NEMATODES (*Meloidogyne incognita*)

M. R. Fathima Nifflah

ABSTRACT

Chilli is one of the major cash crops grown in Sri Lanka. There are number of pests and diseases identified on chilli crop. Thus, there is a need to suggest efficient way to control these pests and diseases. Chilli leaf curl complex is the major disease on chilli caused by virus and transmitted by various vector insect pests. Other than leaf curl complex, chilli root knot disease caused by root knot nematodes (*Meloidogyne incognita*) is one of the diseases, which affect chilli plant. Farmers in the Batticaloa district are mainly engaged in rice and chilli cultivation. In the past few years, chilli cultivation in the Batticaloa area was affected by the root knot nematodes and caused root knot disease. Few acres of cultivatable chilli lands were abandoned in Kaluthawalai area due to root knot disease, which is the main area cultivating chilli in the Batticaloa district. This experiment was conducted in three different locations of the Batticaloa district, namely (1) Crop Farm of the Eastern University, Sri Lanka (2) Kaluthawalai chilli cultivation fields and (3) Agricultural Training Centre at Chathurukondan. Studies were carried out to find out the relative efficiency of various control strategies on chilli root knot nematodes. PC-1 chilli variety was selected for the experiment as farmers in this area mainly cultivate this variety. Treatments were started after two weeks of transplanting of chilli seedlings. This experiment was laid out in the Randomized Complete Block Design with seven treatments and four blocks. Treatments were imposed for the selected chilli cultivar 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 number of wilted plants were observed in the plots treated with compost (0±0 plants at 4th week after transplanting, 0±0 plants at 6th week after transplanting, 0.25±0 plants at 8th week after transplanting, 0.75±0.09 plants at 10th week after transplanting and 0.5±0.11 plants at 12th week after transplanting) and bio fertilizer (0±0 plants at 4th week after transplanting, 0.25±0.09 plants at 6th week after transplanting, 0.5±0.09 plants at 8th week after transplanting, 0.75±0.09 plants at 10th week after transplanting and 0.75±0.11 plants at 12th week after transplanting). The highest number of wilted plants was observed in the plots treated with citronella oil (2±0 plants at 4th week after transplanting, 1.5±0.11 plants at 6th week after transplanting, 1.75±0.11 plants

at 8th week after transplanting, 1.75±0.09 plants at 10th week after transplanting and 2±0 plants at 12th week after transplanting) and chicken litter (1.25±0.09 plants at 4th week after transplanting, 1.0±0 plants at 6th week after transplanting, 1.5±0 plants at 8th week after transplanting, 1.0±0 plants at 10th week after transplanting and 2±0 plants at 12th week after transplanting).

The study showed that there were no significant ($p>0.05$) differences among treatments in the numbers of pest-infested plants. The treatments failed in controlling insect pests fed on shoots of chilli crop. The number of pest-infested plants in treated plots was similar to that of untreated control treatment.

There were significant ($p<0.05$) differences between treatments in the yield of chilli plants in each treatment of each block. The highest yield was obtained from plots with nematicide/ Diazenol 5% (309±12.1g at 6th week after transplanting, 335.3±14.2g at 8th week after transplanting and 248.7±15.6g at 10th week after transplanting) followed by the plots treated with 10ml of bio fertilizer, compost 5kg/10m^2 and neem seed extract 50 l per acre. The lowest yield was obtained from the plots treated with essential oil/ citronella (72.8±6.1g at 6th week after transplanting, 93.1±8.7g at 8th week after transplanting and 55.1±5.09g at 10th week after transplanting) and from the untreated control plots (66.8±3.1g at 6th week after transplanting, 78.8±3.8g at 8th week after transplanting and 53.4±3.8g at 10th week after transplanting).

Though the bio-fertilizer, compost and neem seed extract gave second higher yield in chilli cultivation by comparing to the side effect to environment these can be recommended to chilli plants. Bio-fertilizers are easily affordable nowadays and small quantity is quite enough to treat large number of seedlings.

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A SURVEY ON THE INFESTATION LEVEL OF FALL ARMYWORM (*Spodoptera frugiperda*) IN MAIZE IN CERTAIN AGRICULTURAL INSTRUCTOR DIVISIONS OF THE BATTICALOA DISTRICT

S. A. Prabath

ABSTRACT

Fall armyworm is one of the major threats to maize cultivation at present. The fall armyworm threat looms large in Sri Lanka. The larvae stage of fall armyworm moth has the ability to destroy hundreds of acres of cultivation overnight and could affect over 180 species of crops. Maize is the major crop affected by fall armyworm. Maize is the most important coarse grain for which around 30,000 ha of land areas are devoted annually. The study was carried out to find out the impact of Fall Armyworm on maize in Batticaloa District. As well as to find out the farmer's knowledge about this threat and to determine pest control methods use for control this pest in the Batticaloa district. The study was mainly based on primary data obtained from a sample survey in six AI divisions in Batticaloa district. Data were collected using a structured questionnaire for 120 farmers. And also, secondary data were used. Data were analyzed using SPSS software and descriptive statistics was employed to study the socio-economic data of farmers.

According to this study, there are two major crops cultivated in Batticaloa district. They are rice and maize. But rice is most cultivated crop. Farmers have practiced crop rotation by cultivating rice and maize in the same field time to time. Farmers have obtained the information about this fall armyworm attack from newspapers (10%), television (11), radio (8%), neighboring farmers (28%) and from agriculture instructors (43%). There was incurred loss to farmers due to this fall armyworm attack. Most of the farmers had to faced Rs.50, 000-75, 000 loss as a result of this problem. This fall armyworm was controlled successfully by destroying all the cultivation.

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EFFECTS OF SALT STRESS ON THE PHYSIOLOGICAL AND GROWTH ATTRIBUTES OF SELECTED GROUNDNUT (*Arachis hypogaea* L.) CULTIVARS

M. M. Sahry

ABSTRACT

Salinity is one of the most deleterious environmental dilemmas that severely limit plant growth and productivity in the dry zone areas of Sri Lanka. Groundnut is grown in the Batticaloa district to a limited extent; the yield is highly susceptible to salt stress especially in the water scarce areas. This experiment was conducted at the Agronomy farm of the Eastern University, Sri Lanka in the '*Yala*' 2019. Studies were made to evaluate salt stress tolerance of selected groundnut cultivars; 'Tissa', 'Indi' and 'Lanka Jumbo' when salt stress was imposed during the vegetative stage and to determine the most salt tolerant groundnut cultivar which can resist salinity and produce substantial yield. The groundnut plants were grown in polyethylene bags and the experiment was laid out in the Randomized Complete Block Design with six treatments and four replications and the treatments were arranged in 3 × 2 factor factorial manner. Salt stress was imposed for the selected groundnut cultivars from 32 days of sowing during the vegetative stage.

A concentration of 100 mM Nacl solution was applied as the salt stress treatment and the control plants were watered at 2 days interval to Field Capacity. There were significant ($p<0.05$) differences between treatments in the measured physiological and growth attributes. Salt stress significantly ($p<0.05$) reduced the Relative Water Contents (RWC) of all the tested groundnut cultivars. The highest RWC (69.6%) was observed in 'Indi' groundnut cultivar and the lowest was found in 'Tissa'. The highest amounts of Chlorophylls a (1.8 mgg^{-1}), b (0.6 mgg^{-1}) and total Chlorophyll (1.7 mgg^{-1}) contents were observed in 'Indi' groundnut cultivar and the lowest Chlorophylls a (0.7 mgg^{-1}), b (0.2 mgg^{-1}) and total chlorophyll (0.7 mgg^{-1}) were recorded in 'Tissa' groundnut cultivar.

Salt stress significantly ($p<0.05$) reduced the plant shoot length of all the tested groundnut cultivars. The highest plant shoot length (30.5 cm) was observed in 'Indi' groundnut cultivar and the lowest (16.7 cm) was found in 'Tissa'. Salt stress significantly ($p<0.05$) reduced the Leaf Area Index (LAI) of all the tested groundnut cultivars. The highest LAI (0.73) was observed in 'Indi' groundnut cultivar and the lowest (0.42) was found in 'Tissa'. Salt stress significantly ($p<0.05$) reduced the plant dry weights of all the tested groundnut cultivars. The highest

plant dry weight (168.5 g) was observed in 'Indi' cultivar and the lowest (108.7 g) was found in 'Tissa'. Moisture stress significantly ($p<0.05$) reduced the yield of all the tested groundnut cultivars. The highest yield (1.4 tha^{-1}) was obtained in 'Indi' groundnut cultivar and the lowest (0.5 tha^{-1}) was found in 'Tissa'. Moisture stress significantly ($p<0.05$) reduced the number of pods per plant of all the tested groundnut cultivars. The highest number of pods per plant (18) was observed in 'Indi' groundnut cultivar and the lowest (9) was found in 'Tissa'. There were significant ($p<0.05$) differences between treatments in the 100 seed weight and shelling percentage of selected groundnut cultivars. The highest 100 seed weight (39.8 g) was obtained in 'Indi' cultivar and the lowest (15.6 g) was found in 'Tissa'. 'Indi' cultivar showed the highest shelling percentage (66.4%) and the lowest (45.2%) was found in 'Tissa'.

There were also significant ($p<0.05$) interactions between cultivars and moisture stress treatments on the RWC, Chlorophylls a and b, plant shoot length, LAI, plant dry weight, 100 seed weight and shelling percentage of the tested groundnut cultivars. However, no significant ($p>0.05$) interaction was observed on between cultivars and salt stress treatments the total Chlorophyll content.

The highest yield obtained in 'Indi' groundnut cultivar under salt stress condition would have been due to its inherent characteristic feature. Based on the measured physiological and growth attributes, 'Indi' was identified as the most salt tolerant groundnut cultivars which could be suggested for cultivation in the saline areas of the Batticaloa district.

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IMPACT OF SALT STRESS ON THE GROWTH, PHYSIOLOGY AND YIELD OF SELECTED BRINJAL (*Solanum melongena* L.) CULTIVARS

A. F. Nahila

ABSTRACT

Brinjal is grown in the Batticaloa district to limited extent; as it is highly susceptible to salt stress. This experiment was conducted at the Agronomy farm of the Eastern University, Sri Lanka. Studies were made to evaluate salt stress tolerance of selected brinjal cultivars; 'Thirunelvely Purple', 'Palugamum White' and 'Padagoda (BW11)' when the stress was imposed fourteen days after transplanting and to determine the most suitable brinjal cultivar which can resist salt stress and produce substantial yield. This experiment was laid out in the Randomized Complete Block Design with six treatments and four replications and the treatments were arranged in 3 × 2 factorial manner. Up to fourteen days after the transplanting regular watering was done by tap water. Then treatment plants were watered by salt water once in two days and the control plants were watered by tap water once in two days.

There were significant ($p<0.05$) differences between treatments in the measured physiological and growth attributes. Salt stress significantly ($p<0.05$) increased the proline content of all the tested brinjal cultivars.The highest amount of proline (6.94mgg^{-1}) was noticed in 'Thirunelvely Purple' brinjal cultivar and the lowest (2.42mgg-1) was found in the 'Palugamum White' brinjal cultivar.
Salt stress significantly reduced the amounts of chlorophylls. The highest amounts of chlorophylls (a 0.98 mgg^{-1}, b 0.8 mgg^{-1} and total chlorophyll 1.75 mgg^{-1}) contents were observed in 'Thirunelvely Purple' brinjal cultivar and the lowest amounts (Chlorophylls a 0.49mgg^{-1}, b 0.3mgg^{-1} and total chlorophyll 0.87mgg^{-1}) were recorded in 'Palugamum White' brinjal cultivar.

Salt stress significantly ($p<0.05$) reduced the Relative Water Contents (RWC) of all the tested brinjal cultivars. The highest RWC (72.3) was noticed in 'Thirunelvely Purple' brinjal cultivar where the lowest (29.7) was obtained in 'Palugamum White' brinjal cultivar. Salt stress significantly ($p<0.05$) reduced the shoot length of all the tested cultivars. The highest and the lowest shoot length were observed in 'Thirunelvely Purple' and 'Palugamum White', respectively.

Salt stress significantly ($p<0.05$) reduced the Leaf Area Index (LAI), plant dry weight and number of branches per plant. The highest LAI (0.56) was noticed in

'Thirunelvely Purple' brinjal cultivar where the lowest (0.15) was obtained in 'Palugamum White' brinjal cultivar. The highest plant dry weight (17.18g) was observed in 'Thirunelvely Purple' brinjal cultivar where the lowest (6.42g) was obtained in 'Palugamum White' brinjal cultivar. The highest numbers of branches were observed in 'Thirunelvely Purple' brinjal cultivar where the lowest were recorded in 'Palugamum White' brinjal cultivar.

Salt stress significantly ($p<0.05$) reduced the yield and yield components (fruit length and fruit girth). The highest fruit length (15.8cm) was obtained in 'Thirunelvely Purple' brinjal cultivars and the lowest (6.1cm) was recorded in 'Palugamum White' brinjal cultivars. The highest fruit girth (14.3cm) was obtained in 'Thirunelvely Purple' brinjal cultivars and the lowest (4.1cm) was recorded in 'Palugamum White' brinjal cultivars.The highest yield (22.11tonnesha^{-1}) was obtained in 'Thirunelvely Purple' brinjal cultivar and the lowest (10.15tonnesha^{-1}) was found in 'Palugamum White'.

There were also significant ($p<0.05$) interaction between cultivars and salt stress treatments in the 'proline content', 'total chlorophyll' 'shoot length' and fruit girth of the tested cultivars. However, no significant ($p>0.05$) interaction was observed in the 'chlorophyll a', 'chlorophyll b', 'RWC', 'plant height', 'LAI', 'plant dry weight, 'number of branches per plant', 'yield' and 'fruit length'.

The highest yield obtained in 'Thirunelvely Purple' brinjal cultivar under salt stress condition would have been due to its inherent characteristic feature. Hence, considering the measured physiological and growth attributes, 'Thirunelvely Purple' cultivar can resist salt better than the rest of the cultivars and could be suggested for cultivation in the salt prone soils of the Batticaloa district.

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PHYSIOLOGICAL AND GROWTH RESPONSES OF FIVE RICE (*Oryza sativa* L.) CULTIVARS TO SOIL MOISTURE STRESS

R. Dharshika

ABSTRACT

Scarcity of water for irrigation is an alarming issue limiting crop production worldwide and it is increasing severely in Sri Lanka. Rice production in the Batticaloa district is thus being adversely hampered by the shortage of water. The rice yield is highly susceptible to moisture stress especially during the '*Yala*' Season. This study therefore was made to evaluate moisture stress tolerance of selected rice cultivars viz; 'Bg 300','Bg 357','Bg 366','Bw 367' and 'Bg 370' and to determine the one which can produce substantial yield when moisture stress was imposed during the panicle initiation stage. This experiment was conducted at the Agronomy farm of the Eastern University, Sri Lanka and was laid out in the Randomized Complete Block Design with ten treatments and four replications and the treatments were arranged in 5 × 2 factor factorial manner. Moisture stress was imposed for the selected rice cultivars for a period of fourteen days during the panicle initiation stage. The control plants were watered once in two days.

There were significant ($p<0.05$) differences between treatments in the measured physiological and growth attributes. Moisture stress significantly ($p<0.05$) reduced the Relative Water Content (RWC) of all the tested rice cultivars. The highest RWC (59.2%) was observed in 'Bg 370' rice cultivar and the lowest (48.2%) was found in 'Bw 367' under moisture stress condition. Moisture stress significantly ($p<0.05$) reduced Chlorophylls a, b and total Chlorophyll contents of the tested rice cultivars. The highest amounts of Chlorophylls a (9.1mgg^{-1}) b (9.8mgg^{-1}) and total Chlorophyll (13.3 mgg^{-1}) were observed in 'Bg 370' rice cultivar and the lowest amounts (Chlorophylls a-4.5mgg^{-1}, b-4.5mgg^{-1} and total Chlorophyll-6.3mgg^{-1}) were recorded in 'Bw 367' rice cultivar.

Moisture stress significantly ($p<0.05$) reduced the Leaf Area Index (LAI) of all the tested rice cultivars. The highest LAI (0.9) was observed in 'Bg370' and the lowest was found in 'Bw367' under moisture stress condition. Moisture stress significantly ($p<0.05$) reduced the yield of all the tested rice cultivars. The highest yield (2.1tonnesha^{-1}) was observed in 'Bg370' rice cultivar and the lowest (0.5 tonnesha^{-1}) was found in 'Bw367' under moisture stress condition. Moisture stress significantly ($p<0.05$) reduced the 1000 grain weight of all the tested rice cultivars.

The highest 1000 grain weight (19.1g) was obtained in 'Bg370' and the lowest (10.1g) was found in 'Bw367'under moisture stress condition.

There were also significant ($p<0.05$) interactions between cultivars and moisture stress treatments in the RWC, 'Chlorophyll a', total Chlorophyll, , plant shoot length, 1000 grain weight and yield of the tested cultivars. However, no significant ($p>0.05$) interaction was observed in the plant dry weight and 'Chlorophyll b' content.

Cultivar 'Bg370' exhibited comparatively more tolerance to moisture stress with less reduction in various physiological and growth attributes and could be suggested for cultivation in the drought prone areas of the Batticaloa district.

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AGRICULTURAL CHEMISTRY

IMPACT OF ORGANIC AND INORGANIC FERTILIZERS ON SOIL PROPERTIES OF BLACK PEPPER GROWING SOIL IN INTERMEDIATE ZONE MID COUNTRY SRI LANKA

H. A. Sewwandi

ABSTRACT

Black pepper (*Piper nigrum* L) – 'King of spices' is an important spice crop grown in Matale district of Sri Lanka, Black pepper varieties of grown are, Sri Lankan local variety and 'Panniyur'. This experiment was carried out to study the effect of organic and inorganic fertilizers on soil properties of black pepper growing soil in intermediate zone wet country Sri Lanka. The treatment consist of T1: Present fertilizer recommendation (Urea as N source).T2:Half of recommended fertilizer mixture+10Kg of gliricidia;T3:Presentfertilizer recommendation $(NH_4)_2SO_4$ as N source;T4:Half of recommended fertilizer mixture [$(NH_4)_2SO_4$ as N source] +10 Kg of gliricidia green manure;T5:Half of recommended dose of N-[$(NH_4)_2SO_4$ as N source] ;T6:Control.These 6 treatments replicated three times in Randomized complete Block Design (RCBD).The data was analyzed using SAS and different between treatment means was compared using Duncan's Multiple Range Test (DMRT). Treatment with the application of ammonium sulfate showed increasing trend of Soil nitrogen, phosphorus, potassium, Electric Conductivity and Leaf tissue nitrogen, phosphorus, potassium, magnesium, manganese and Ferrous in Black pepper. Combination of 50% ammonium sulfate and gliricidia green manure can be recommended for Black pepper in intermediate zone mid country.

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IMPACT OF DIFFERENT SOIL TYPES ON THE GROWTH PARAMETERS OF SUGARCANE (*Saccharum officinarum*) GROWN IN HIGURANA GALOYA PLANTATION

S. P. Kumara

ABSTRACT

Soil physical, chemical and biological properties are the key factors affecting growth of sugarcane and its management. This study was conducted to study the impact of properties of different soil types: reddish brown earth (RBE), non-calcic brawn (NCB) and alluvial soil in Hingurana plantation and their impact on growth parameters of sugarcane. This soil samples were collected from Hingurana plantation and soil properties like density, color, moisture content, pH, organic matter content and microbial activities were rested. Plant growth parameters like germination percentage, number of internodes, length of internodes, number of leaves, length of leaves, plant height and girth diameter of stem were recorded from randomly selected plants from RBE, alluvial and NCB soil types in Hingurana. Statistical analysis was conducted by using analysis of variance (ANOVA) in SAS statistical software package and mean comparison of within treatment using Duncan Multiple Range Test (DMRT) at 5% significant level. He results of the study revealed that alluvial soil type represent mean values including lowest bulk density as 1.2g/cm3, and highest porosity, microbial activity and organic matter content as 52%, 43.76mg co2/1g soil, 1.6% respectively than RBE and NCB soil types with the high levels of plant germination percentage, number of internodes, length of internodes, number of leaves, length of leaves, plant height and girth diameter of stem. The study concluded that alluvial soil can be recommended as the most suitable soil type to get high growth efficiency of sugarcane and high production of sugar in the Gal- Oya plantation's cultivation areas and the second soil type is non-calcic brown soil types as a medium for sugarcane cultivation.

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QUESTIONNAIRE SURVEY TO STUDY THE IMPACT OF SOCIO-ECONOMIC CHARACTERS AND CULTIVATION PRACTICES ADAPTED IN THE KURUNAGALA DISTRICT

A. S. Sudeera

ABSTRACT

Soil physical, chemical and biological properties are the key factors affecting growth of sugarcane and its management. This study was conducted to study the impact of properties of different soil types: reddish brown earth (RBE), non-calcic brawn (NCB) and alluvial soil in Hingurana plantation and their impact on growth parameters of sugarcane. This soil samples were collected from Hingurana plantation and soil properties like density, color, moisture content, pH, organic matter content and microbial activities were rested Plant growth parameters like germination percentage, number of internodes, length of internodes, number of leaves, length of leaves, plant height and girth diameter of stem were recorded from randomly selected plants from RBE, alluvial and NCB soil types in Hingurana. Statistical analysis was conducted by using analysis of variance (ANOVA) in SAS statistical software package and mean comparison of within treatment using Duncan Multiple Range Test (DMRT) at 5% significant level. He results of the study revealed that alluvial soil type represents mean values including lowest bulk density as 1.2 g/cm^3,

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POTENTIAL OF BIO FERTILIZER FOR OKRA (*Abelmoschus esculentus*) AND AMARANTHUS (*Amaranthus viridis*) IN EASTERN REGION

C. P. Hettiarachchi

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). Therefore, this study was conducted to evaluate the effect of BFBF on growth, yield of okra and Amaranthus in eastern region, in comparison with fertilizer recommendation of the Department of Agriculture and farmer practice at eastern region. 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 Randomize Design. 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, pod formation in okra and plant biomass in Amaranthus, Combination of 50% recommended chemical fertilizers with BBs can be recommended for Okra & Amaranthus cultivation in eastern region.

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IMPACT OF DIFFERENT SOIL TYPES ON CHEMICAL PARAMETERS OF SUGARCANE GROWN IN HINGURANA PLANTATION

R. A. Janaka Siri

ABSTRCT

A sugar is a food additive that provides a sweet taste and ethanol fuel is ethyl alcohol, the same type of alcohol found in alcoholic beverages, used as fuel.it is most often used as energy resource for generating electricity. There are differences in nutrient contents in the different soil types and those nutrients are affects to the growth of crop finally plant productivity. Other than the nutrients, properties of the soil also influence to growth of the plant. Soil physical chemical and biological properties are the key factors affecting growth of sugarcane and its management. This study was conducted to study impact of soil type's properties of reddish-brown earth, non-calcic brown and alluvial soil types in Hingurana on chemical parameters of sugarcane at maturity stages at agronomy farm, Gal –oya sugar plantation in Ampara district during January to May, 2019. Three different soil types as mediums for sugarcane cultivation were practiced in randomized complete block design with three replications and nine plots were labelled. To find out the most suitable soil type for "SL 96-128" variety of sugarcane was selected and grown. period from 8th month to 12th month the chemical parameters such as brix value, POL value pH value, purity and recovery of cane sugar of sugarcane juice were observed and recorded and soil properties such as bulk density, particle density, porosity, soil pH, organic matter content and microbial activity were analyzed. All the experimental data were analyzed statistically with Duncan Multiple Rang Test (DMRT) at 5% significant level by using SAS 9.1 application statistical package.

Analyzed chemical parameters and soil physical and chemical properties were compared among those three different soil types. Alluvial soil type had improved in chemical parameters of sugarcane "SL 96-28' variety at maturity stages of plant ant physical and chemical; properties of soil compared to other two soil types. Alluvial soil type was showed the low level of bulk density(1.2433g/cm3) and particle density (2.4600g/cm3) and high level of porosity (52.43%),organic matter content (1.6366%) and microbial activity (43.76mgco2/1g soil).moreover, alluvial soil type was found to have better improvement than non-calcic brown soil type

and reddish brown earth soil type in above chemical parameters, physical and chemical properties of soil. this study also showed that the alluvial soil type improves the soil properties with minimum negative impact on the environment.

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PRODUCTION AND QUALITY EVALUATION OF BIOETHANOL FROM CORN (*Zea mays* L.)

R. F. Rifna Banu

ABSTRACT

Industrialization and world population are continuously increasing and this demands high energy. As a result, the cost of fossil fuel such as crude oil, coal, and natural gas is increasing from time to time. Awareness of global climate change and the uncertainty of fossil fuel have thus led to the development of renewable energy. Biofuels are the renewable energy that gets attention these days. Bioethanol, biodiesel, and biogas are the dominant renewable energy among biofuels. Although a number of biofuels are available bioethanol is the most commonly used renewable fuel in the transportation sector. Bioethanol is the product of the sugar fermentation process from carbohydrate (sugar or starch) sources. Corn is the most important and economical source of starch, comprising about 68-72% of kernel weight, which is easily converted into glucose and fermented into ethanol. This present study was designed to produce bioethanol which is alternative, sustainable, renewable and oxygenated source of energy mainly from corn grains and to find out most suitable corn mash concentration for maximum ethanol production and the quality analysis of ethanol.

Bioethanol was made from corn mash in the different concentration of 10%, 20%, 30% and 40% in the treatments of T1, T2, T3 and T4. To obtain corn ethanol, Ground corn was slurried by addition of heated water and prepared mash was cooked well for two hours at 100^{o}C. Then the mash was subjected to hydrolysis and fermentation by the addition of amylase enzyme and yeast at the amounts of 2ml and 5ml respectively. Different concentration of fermented ethanol was separated from the sample by distillation. Distilled samples were subjected to several physico-chemical analysis to evaluate the suitability of corn mash for the peak production of ethanol. Physico-chemical qualities of distilled bioethanol such as ethanol concentration which is measured by specific gravity method and spectrophotometry method and rest of the parameters such as pH, electrical conductivity, total soluble solids, titratable acidity, reducing sugar and total sugar were analysed by recommended methods.

Determination of ethanol content by both specific gravity method and spectrophotometer technique revealed that at 30% of mash content peak ethanol

productivity was observed. Compared to specific gravity method, spectrophotometric process for ethanol determination was more trustworthy and the amount of ethanol produced was 13.6% and 13.8% by the both techniques respectively. Results of the physico-chemical analysis revealed that the titratable acidity was increased gradually up to treatment 3 and suddenly dropped at treatment 4. Treatment 1 had the least mean value which is 0.51% and treatment 3 had the highest mean value at 0.74%. Measurement of pH was taken during fermentation and after distillation. pH and electrical conductivity measurements had the least mean value for the treatment 3 and highest mean value was obtained from treatment 1. For the distilled samples the highest pH value 4.39 was obtained in the treatment 1 and treatment 3 had the least mean value which is 3.76. The electrical conductivity of the treatments decreased from 57.67µs/cm to 36.67µs/cm with the treatments until treatment 3 and it's increased again in treatment 4 at the amount of 43.67.

The amounts of total soluble solids, reducing sugar and total sugar were increased with the increase in mash concentration. The results of physico-chemical analysis for above parameters showed that, there were significant differences ($p<0.05$) between the treatments. Total soluble solids were measured before fermentation and after the distillation. Amount of total soluble solids were decreased for all treatments from the initial which was measured before fermentation to after the distillation. The results were obtained higher at 40% of mash content after fermentation which was 13.4^{o}Brix and the least mean value obtained from 10% of mash was 2.2^{o}Brix. Ethanol produced from 40% mash content had highest mean value 0.63% and ethanol from 10% mash content had least mean value 0.39%. Measurements of total sugar also revealed the similar trend as reducing sugar and from T1 to T4 total sugar increased from 4.24% to 13.23%.

The results indicated that, the ethanol obtained from the 30% mash, contained 13.8% of ethanol and within the distilled ethanol sample; 0.74% of acidity (as acetic acid), pH of 3.76, 36.67µs/cm electrical conductivity, 10.17^{o}Brix total soluble solids, 0.54% reducing sugar and 8.89% of total sugar were observed.

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PREPARATION OF RICE FLOUR BISCUITS USING SELECTED RED RICE VARIETIES

A. R. Wijerathna

ABSTRACT

This study was conducted to analysis the nutritional and sensory qualities of biscuit supplemented with brown and white rice flour of selected rice varieties. This experiment was conducted in the Grain Quality Division, Rice Research and Development Institute, Bathalagoda, Sri Lanka during January to May of 2019. Rice brain has better nutritional value, therefore, rice biscuits were prepared with five varieties of rice with 1:2 proportion of brown rice and white rice flour. Analysis were conducted with five rice varieties of T1- Suwandel, T2- At 309, T3- Bg 94/1, T4- At 311 and T5- MA2. Each variety were tested for their physical and physiochemical characteristics. Each treatment was subjected to organoleptic analysis and more preferred three varieties of biscuits were selected for nutritional and microbial analysis and storage studies. Results of the nutritional and organoleptic qualities were analyzed statistically by ANOVA using SAS statistical analysis package to evaluate the significance at $P < 0.05$. According to physical quality analysis Suwandel variety has higher percentage of brown rice (80.09%). At 311 variety has higher percentage of head grain (74.73%). By physiochemical analysis of grains, At 311 and Bg 94/1 varieties have high gelatinization temperature. In sensory evaluation rice biscuit with Suwandel variety get most preference on texture (5.38), flavour (5.11), taste (5.45), colour (5.62) and overall acceptance (5.52) like attributes than other varieties. The results of the proximate analysis revealed that the T3 treatment with Bg 94/1 variety was richer in fat content (12.28%) and T1 treatment with Suwandel rice variety was richer in fiber (1.83%), moisture (2.82%) and ash (1.40%) content. T2 treatment with At 309 variety contained highest amount of protein content (6.28%). Products were not affected by any microbial activities. Process such as roasting and baking at high temperature destroy large number of microorganisms. Based on all the analysis, biscuit prepared from three verities such as Suwandel, At 309 and Bg 94/1 were given overall nutritional quality and acceptability out of five varieties.

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EXTRACTION, ENCAPSULATION OF RED COLOUR FROM ROSELLE (*Hibiscus subdarifla*) AND UTILIZATION IN TO ICE CREAM

K. T. Bandara

ABSTRACT

There is a trend of increasing usage of natural colours due to the nutritional, pharmaceutical and antioxidant properties and adverse effect of synthetic colours. Roselle calyces is a rich source of red colour and can be formulated with ice cream as a substitution to synthetic colour. Therefore, the aim of this present study was to investigate the physico-chemical properties and storage of ice cream incorporated with Roselle red colour extract with the concentration percentage range from 0.1% to 0.25% and control sample with 0.015% of synthetic colour. Ice cream samples were analyzed for physico-chemical and sensory properties during freezing storage at -12^{o}C. The physic-chemical (pH, titrable acidity, total soluble solid, colour parameters, melting rate, fat, ascorbic acid, ash) and sensory characteristics (colour, taste, texture, flavor and overall acceptability) were analyzed at day 1 and week 2, week 4, week 6 and week 8 of storage.

The pH, titrable acidity, total soluble solid, colour parameters, melting rate, fat content, ascorbic acid and ash content were significantly difference ($p<0.05$) among the treatments at day one. The results of this study revealed that, the pH was significantly decreased with the increasing of Roselle colour concentration. Titrable acidity, total soluble solid, colour parameters, melting rate, fat content, ascorbic acid and ash content is increased significantly ($p<0.05$). According to sensory analysis the best three treatments were selected and they were T1 (control sample with 0.015% synthetic colour), T2 (ice cream formulated with 0.1% Roselle colour) and T3 (ice cream formulated with 0.15% Roselle colour). The treatments of T1 and T2 has insignificant scores according to the sensorial properties namely, colour, taste, texture, flavor and overall acceptability.

During storage the pH, ascorbic acid content of stored samples (T1, T2 and T3) had a significant decrease while titrable acid and ash content had

increased significantly. The value of total soluble solid, colour parameters and melting rate had insignificantly changed during two months storage.

According to the sensory analysis and physico-chemical analysis finally, it could be concluded that the 0.10% of Roselle red colour concentration can be used as a substitute to synthetic colour while preventing adverse effect of synthetic colour and increasing nutritional value in ice cream.

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PRODUCTION AND QUALITY EVALUATION OF WATERMELON (*Citrullus lanatus*) JAM USING PECTIN EXTRACTED FROM LEMON (*Citrus limon* L.) PEELS

S. Dhushane

ABSTRACT

One of the major problems challenging the food industry throughout the world, is how to make full utilization of the waste material. Huge amount of solid fruit wastes which have been an increasingly cause environmental health hazards. During processing, citrus peels contribute almost 15-20% of the total fruit. Citrus fruits peels are very rich in pectin and can be used as source of pectins for its commercial production. Moreover, the citrus fruit peels contain several bioactive compounds including carotenoids, essential oils, antioxidants and flavors are widely incorporated into food products in order to enhance their sensory properties and to develop their nutritional and health benefits. This study aimed to make use of lemon peels, as a source of pectin and its utilization in the watermelon jam production with different combinations of sugar and pectin levels. Based on the extraction, the pectin content in the lemon peel was found to be 20.4% with 1.56% methoxyl content therefore the extracted lemon peel pectin is considered as low methoxyl pectin. The physico-chemical, sensory and microbiological properties of the formulated jam were assessed using standard methods. The nutritional analysis of freshly made watermelon jam revealed that an increasing trend in titratable acidity from 0.27% to 0.61% (as citric acid), moisture from 52.9% to 63.1% and decreasing trend in pH from 3.95 to 3.31, total soluble solids from 68.04°Brix to 66.11°Brix and total sugar from 50.4 to 16.5% when the pectin levels increased from 1.8 to 3.3g for 500g watermelon pulp. According to Turkey's test, the mean scores of the sensory qualities in terms of colour, taste, texture, aroma and overall acceptability varied significantly ($p<0.05$) in the freshly formulated jam. There were no significant ($p>0.05$) differences observed in total plate count in the all treatments. This may due to heating of jam eliminated a large number of microorganisms. The counts were below the standard limits and for safe consumption. The results of this study revealed that the watermelon jam formulated with 65g sugar and 2.8g pectin was found to be the best combination and could be stored at 30±1°C and 70-75% RH for 12 weeks

without any significant changes in the quality characteristics. Therefore, the lemon peel is a good source of pectin and could be used for the production of watermelon jam that has as no deleterious effect on consumer acceptability.

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PRODUCTION AND EVALUATION OF PHYSICO-CHEMICAL PARAMETERS OF PEANUT MILK YOGHURT FORTIFIED WITH SKIMMED MILK POWDER

A. K. Nayanathara

ABSTRACT

Peanut is used as an oil crop, as a snack and in confectionaries in Sri Lanka. There is more value addition and novel products from peanut but most of them are not commercially available in Sri Lankan market. Peanut milk and its products have nutritional benefits for young and old people because of richness in protein, minerals and essential fatty acids such as linoleic and oleic acids. The production of non-dairy based yoghurts has been pointed out as a novel trend in the creation of functional foods. A growing number of consumers opt to plant based milk substitutes for medical reasons or as a lifestyle choice. Therefore, this research study was conducted with an aim to produce peanut milk based yoghurt by utilizing the functional properties of peanut milk to evaluate physicochemical and organoleptic characteristics of peanut milk based yoghurt. Yoghurt samples were produced from blends of peanuts milk and skimmed milk powder together with the starter culture of Lactobacillus bulgaricus, and Streptococcus thermophilus. The skimmed milk powder was added to peanuts milk at the concentration of 0% (T1), 5% (T2), 10 % (T3), and 15% (T4). The physico-chemical (moisture, ash, fat, pH, titratable acidity, protein, total soluble solids, and total solids) and sensory characteristics (colour, taste, texture, aroma and overall acceptability) of freshly made yoghurts were analyzed according to AOAC (2002) Methods.

Moisture, ash, fat, pH, titratable acidity, protein, total soluble solids, and total solids were significantly difference ($p<0.05$) among the treatments at day one. The results of this study revealed that with increased of skimmed milk powder concentration; the moisture content was ranged from 83.29 to 62.87%, total solid varied from 16.71 to 37.13%, ash content was increased from 1.06 to 2.16%, pH value decreased from 4.76 to 4.39, while titratable acidity was increased from 0.73 to 1.74%. And TSS in peanut yoghurt was increased from 14.53 to 18.80% while fat content varied from 5.44 to 7.36% and Protein content ranged from 11.52 to 20.64% with increased of skimmed milk powder concentration of peanut milk yoghurt. Organoleptic properties were evaluated though the panel of 20 members. Results of organoleptic characteristics revealed that, among all types of peanut yoghurts, peanuts milk-based yoghurt fortified with 10% skimmed milk powder

represented highest (P≤0.05) mean score of overall acceptability
The above four treatments were kept in a refrigerator at 4 ℃ for two weeks in order to assess their shelf life. Physico-chemical characteristics were analyzed at one-week intervals and sensory characteristics were analyzed at the end of 2nd week during refrigerated storage. During storage periods, the moisture content was significantly ($p<0.05$) increased and total solids, ash content, total soluble solids, fat content, protein content were significantly ($p<0.05$) decreased with increased of skimmed milk powder concentration. pH content was significantly ($p<0.05$) decreased while titratable acidity was increasing with increased of skimmed milk powder concentration of peanut yoghurt. Peanuts milk based yoghurt fortified with 10% skimmed milk powder (T3) represented highest (P≤0.05) mean score of overall acceptability for stored peanut yoghurt at the end of 2 weeks period. Finally, it could be concluded that the peanut yoghurt fortified with 10% skimmed milk powder (T3) can be kept in refrigerator for 2 weeks without spoilage and with good nutrient composition.

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STUDY ON THE PHYSICO – CHEMICAL PROPERTIES, SENSORY ATTRIBUTES AND SHELF LIFE OF BREADFRUIT FLOUR INCORPORATED COOKIES WITH LOW FAT CONTENT

I. L. Rajinie

ABSTRACT

The bakery industry is growing very fast and the products are becoming increasingly popular among consumers world-wide. Biscuits possess several attractive features including wider consumption base, relatively long shelf-life and preferred eating quality. Breadfruit constitute important natural and valuable material in producing functional foods due to the presence of high mineral and fiber content. But the breadfruit production faced several problems, which are production cost and wastage due to short shelf life. Therefore, a research study was conducted to improve utilization of breadfruit and reduce the production cost by reducing wastage through the development of value added products such as breadfruit flour, bread fruit flour incorporated cookies and to assess the quality of cookies during storage. The good quality breadfruits were washed, peeled and cut into thin slices, dried in oven at 105℃ for 3 hours, milled, sieved, and packed in air tight container and store refrigeration condition until further use.

The breadfruit flour was nutritionally analyzed that contains moisture content of 6.11%, protein 3.45%, rich in dietary fiber 3.67% and mineral content of 2.667% while total carbohydrate content 79.50%. Different composite blends of wheat flour and breadfruit flour were mixed in the ratios of 100:00, 80:20, 60:40, 40:60, 20:80 and 00:100, were then developed. These cookies were packed in sealed laminate aluminum foil and cookies were stored under ambient conditions of average temperature of 30°C and relative humidity 75 - 80 % for evaluation of the shelf life. Cookies were subjected to the physico – chemical analysis and sensory evaluation to know the acceptability and shelf life for the entire storage period of 12 weeks. The physical parameters of breadfruit flour cookies such as diameter, thickness, spread ratio, density and volume decreased from 7.07 to 6.64cm, 0.981 to 0.968cm, 7.24 to 6.86, 0.624 to 0.469gcm^{-3} and 42.01 to 32.66cm^{3} with increasing percentage of breadfruit flour. Breadfruit flour cookie were analyzed for nutritional composition which ranged in values with moisture from 3.37 to 4.34%, ash 2.73 to 3.76%, fiber 0.97 to 3.02% and total carbohydrate 59.92 to 64.93% increase respectively, while protein and fat content decreased from 12.46 to 9.04% and 20.41 to 14.71% with

increase in the proportion of breadfruit flour level from 0 to 100% for the freshly made wheat – breadfruit flour cookies. These were evaluated for sensory analysis. The results of sensory evaluation revealed that there was a significance difference among the treatments at 5% significant level.

Based on the quality and functional characters, the most preferred wheat – breadfruit cookies selected and subjected to storage studies. The 40% breadfruit flour contained cookie was analyzed for nutritional composition during the storage period. The ash, fiber, fat and protein content decreased from 3.04 to 2.62%, 1.71 to 1.51%, and 18.03 to 16.46% and 10.88 to 9.46% respectively with storage period, while moisture content increased from 3.66 to 4.97% with storage period. The finding of the study revealed that, the declining trend was observed in ash, fiber, protein and fat content with storage period, while an increasing trend was observed in moisture content with storage period for all the treatments.

According to quality characteristic of composite cookies, 40% breadfruit flour added cookies has the good score in organoleptic point of view and acceptable nutritional quality compare to other combinations. There is no remarkable changes in organoleptic characters were observed up to 12 weeks of storage in ambient condition of average temperature 30℃ and relative humidity of 75-80% breadfruit flour added cookie could be stored up to 12 months.

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DEVELOPMENT OF GELATIN FREE VALUE ADDED PRODUCT (YOGURT) FROM *Cyclea peltata*

P. S. Perera

ABSTRACT

Gelatin is a non-vegan compound derived from animal bones. So, vegetarians reluctant to eat gelatin used foods. By using *Cyclea peltata* leaves we can formulate a gel. So, this study was focused on developing a value-added product (yoghurt)using *Cyclea peltata* leaf gel as a gelatine substitute. The experiment was laid out with completely randomized design, with three replications. Various physical parameters (length, diameter, weight, colour of the gel, consistency of the gel) and chemical parameters (moisture, ash, protein, crude fibre, pH) of *C. peltata* leaf gel were determined to assess the quality characters. The gel was extracted by grinding the *Cyclea peltata* leaves. There were four recipes (four treatments) of yoghurts prepared incorporating different levels (0, 4, 6 and 8 g) of Cyclea peltata leaf gel per one litre of yoghurt mix. The other ingredients were used in similar proportions in all four treatments. The amount of gelatine in the control yoghurt was 6 gL-1with 0 gL-1Cyclea peltata leaf gel. The most effective two recipes were selected by undertaking a sensory evaluation. The selected two recipes were then analysed for nutrient content. Organoleptic properties were evaluated though the panel of 20 members. As a result of organoleptic characteristics revealed that, treatment with 6 gL-1 of leaf gel had the highest mean score of overall quality of all sensorial properties namely, appearance, taste, aroma and overall acceptability and the control had next best level. The treatment with 6 gL-1 of leaf gel was selected as the best recipe considering the sensory evaluation results. The nutrient content (pH, moisture, titratable acidity, fat, protein, total solid) was not different($p>0.05$) between treatment with 6 gL-1 of leaf gel and control except for crude fibre content. A slight decrease in pH and moisture but, slight increase in titratable acidity, fat, protein and total solid content, considerable increase in crude fibre was noticed in both 0gL-1and 6gL^{-1} of *C. peltata* leaf gel incorporated yoghurt products during storage period of 15 days. Thus, it can be concluded that *Cyclea peltata* leaf gel can be used tore place gelatine in yoghurt completely.

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NUTRITIONAL QUALITIES AND STORAGE STUDIES OF CEREAL BAR FUSED WITH KURRAKKAN FLAKE AND POPPED CORN

N. P. Weerasingha

ABSTRACT

Intake of balanced diet is the correct way to prevent or even remedy health problems, such as obesity, diabetes, malnutrition, cardiovascular and others, which largely originate from dietary mistakes. Production of Cereal bar using Kurakkan flakes and popped corn with different recipes including Kithul treacle, Milk powder and Ghee provide better nutritional and health value for the consumers, in developing country like Sri Lanka. Therefore, this research study was carried out to produce high nutritional cereal bar using different combination of Kurakkan flakes and popped corn with constant amount of other ingredients. The freshly made formulations were subjected to physico-chemical analysis such as moisture, fiber, ash, protein, reducing sugar and total sugar content were analyzed according to AOAC method while Minerals (Ca, Fe, Mg, F, Na and K) were analyzed using atomic absorption spectrometry (AAS) method. Microbial assessment including total plate count and yeast and molds count and sensory evaluation of developed cereal bar 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. Results of the Nutritional and Organoleptic qualities of freshly prepared cereal bars and most preferred three formulations (90% kurakkan flakes, 80%kurakkan flakes and 70% kurakkan flakes) were selected for storage studies. The results were analyzed statistically by using SPSS statistical package.

Based on the physico-chemical analysis and sensory evaluation, Treatment 3 (70% kurakkan flakes and 30% popped corn) was selected as the best formulation followed by Treatment 2(80% kurakkan flakes and 20% popped corn) and Treatment 1 (90% kurakkan flakes and 10% popped corn). Different temperature at Refrigerator and room temperature with different packaging materials (Polythene bag and Food wrapped aluminum foil) used for storage studies. The physico-chemical organoleptic characteristics and

microbial assessment were measured in one-month interval up to 3 months. The results showed there were no any significant difference ($P<0.05$) between different Temperature and different packaging materials. According DMRT, treatment 3 (70% Kurakkan flake with 30% popped corn) Showed highest value up to 90 days of stored and all samples in stored had not significantly different with time.

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AGRICULTURAL ECONOMICS

PROFITABILITY OF GROUNDNUT CULTIVATION IN ERAVUR PATTU DS DIVISION, BATTICALOA DISTRICT

C. S. Suraj

ABSTRACT

Groundnut is a major field crop cultivated in Eravur Pattu DS division, Batticaloa District. The main objectives of this study were, to analyze the socio-economic status of groundnut farmers, identify the problems in groundnut production, and marketing, and to determine the factors affecting the profit of groundnut production. Vantharumoolai ASC, and Karadiyanaru ASC were selected from Eravur Pattu, DS division, based on the highest number of groundnut farmers. The random sampling method was used for the primary data collection among the groundnut farmers. A structured questionnaire was designed for interviewing groundnut farmers. The collected data were analysed using the SPSS version 22. Descriptive statistics of the socio-economic status of groundnut farmers, problems in production and marketing of groundnuts were discussed. Linear Regression was used to identify the factors affecting profit of groundnut production. One-sample t-Test was done to test the hypotheses. Majority of the farmers cultivated during both Yala, and Maha seasons. Around 50% of farmers had obtained extension services, and all the farmers had not obtained crop insurance. Farmers were unable to obtain good quality planting materials, and faced a severe loss of yield in Maha season due to floods. There is lack of training programmes conducted by NGOs, and Department of Agriculture. Groundnut crops are destroyed by wild animals. In Yala season, net profits were affected by extent of land cultivated, participation in Training programmes, and type of marketing channel. While in Maha season only participation in Training programmes affected the net profits. There was no any significant difference between the extent of land cultivated in Maha, and Yala seasons. Mean net profit of groundnut production in Yala season was greater than in the Maha season.

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THE IMPACT OF TEA PACKAGING ON CONSUMER BUYING BEHAVIOR IN WALALLAWITA DS DIVISION, KALUTARA DISTRICT

D. G. Madushan

ABSTRACT

Tea is one of the most popular beverages consumed in Sri Lanka. The study was carried out to determine, impact of tea packaging on consumer buying behavior in Walallawita DS division, Kalutara district. The study was mainly based on primary data obtained from a sample survey in six GN division in Walallawita division. . Data were collected using a structured questionnaire for 100 consumers. Data were analyzed using a SPSS software and descriptive statistics was employed to study the socio-economics of consumers. About 66% consumer used super market and 34% used retail market. About 66% of consumers gained knowledge on tea through TV, radio, newspapers. About 44% consumer purchased tea per once a week. Consumer mostly preferred to buy 100gms and 200gms size tea pack. Average expenditure to buy tea on a month was Rs.652.00. Most of consumers used tea brand; Laogee tea (21%) and Watawala tea (19%). When consumer selecting the tea brand; packaging label, packaging type, SLS certification, packaging material, packaging color and packaging diagram were factors considered. Consumer's preference level of those factors were assessed using mean value of Likert scale.

The Likert scale was measured from 1 as most preferred to 5 as no preferred. Among those, packaging label (2.08) and packaging type (2.23) received high level preference by consumers. Most consumers (62%) examined the SLS certification when buying tea. Most of consumers (65%) preferred to buy tea packets as tea packaging type. The consumer preference on the basis of average mean for Likert scale which factors influencing to select packaging type can be indicated as: convenience features (1.56), cost (1.73), availability (1.87), aesthetic (2.17) and eco-friendly (2.77).About 54% consumer were considered about packaging color of tea package. 46% consumers were not considered about packaging color. Among those who considered the packaging color, 40.7% consumers were preferred dark color tea packaging, 33.4% consumers were preferred light color packaging and others (25.9%) were preferred transparent packaging. 67% of consumer were preferred the plastic packaging material while 20% of consumers were preferred the composite packaging material. According to the consumer preference on the basis of average mean value, factors influencing to select packaging material identified as

availability (1.67), cost (1.76), convenient features (1.82), aesthetic (2.43) and eco-friendly (2.62). 51% consumers were considered about diagram on tea pack when buying tea and 49% of consumer did not consider about tea package diagram. According to the consumer preference on mean Likert value for the diagram to select the tea pack identified as cup of tea (1.19), tea throat (1.60), a lady (1.81), tea sample (2.00) and tea estate (2.04). 84% consumer considered about the package label on tea package and others (16%) did not consider. According to the consumer preference on the basis of average Likert mean value for the labeling information, expiration date (1.32), manufacture date (2.44), package date (2.64), grading of tea (2.71), artificial ingredient (3.18) and nutrition value (3.21) were important to consumer to decide purchase of tea.

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STUDY ON PRODUCTION AND MARKETING OF PINEAPPLE IN ATTANAGALLA DS DIVISION, GAMPAHA DISTRICT

I. K. Madhushani

ABSTRACT

The study was carried out to determine production and marketing of pineapple in Attanagalla DS division, Gampaha district. The study was mainly based on primary data obtained from a sample survey in fourteen GN division in Attanagalla division. The simple random sampling method was used to select a sample of 100 farmers and data were collected through a pretested questionnaire. Also, secondary data were used from various sources. Data were analyzed using SPSS software and descriptive statistics, frequencies and linear regression were performed. Aspects of socio-economic status of the farmers, productivity parameters, credit use, marketing channel, cost of production and constraints in pineapple production were studied. 23% of farmers had owned land and majority of farmers had been used low land to pineapple farming. Most of them had bought planting materials, fertilizer, pesticides, agrochemicals, from village shops, fertilizer shops, town shops and agrarian service center Most of labors had involved at ploughing, harvesting, weeding, fertilizer application. Middleman, wholesaler, Village traders, out traders, export firms were involved in marketing activities. The total cost of production was labor cost, ploughing cost, planting material cost, fertilizer cost, agrochemical cost, pesticide application cost. Quantity of pineapples sold and prices varied between GN divisions. Most of farmers (84%) had used loan as a source of investment. Majority of farmers (72%) had not obtained to take crop insurance and 100% of farmers had contacts with AI. It was found that severe pest and disease attack, no stable price at the market, high cost of agrochemicals, low harvest, not enough water source, finding enough inputs, theft stolen pineapples were major problems faced by farmers.

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PROFITABILITY AND EFFICIENCY ANALYSIS OF RICE PROCESSING AND MARKETING IN NINTAVUR, ADDALAICHENAI AND SAMMANTHURAI DS DIVISIONS, AMPARA DISTRICT

A. Asmiya

ABSTRACT

A study was done in Nintavur, Addalaichenai and Sammanthurai DS divisions of Ampara District to analyze the structure and costs of rice processing, determine the profitability of rice production, estimate the efficiency of processing and marketing and identify the constraints in rice production and supply to the market. Primary data was collected from 40 randomly selected rice mill owners by administrating a pre-tested questionnaire to rice millers comprising both par-boilers and millers. Descriptive statistics, frequency, ANOVA and regression analysis were used to analyze the data. The findings indicated that Net Profit per day was Rs 26,062 for only raw rice producers and Rs. 49,515 for the raw and parboiled rice producers while Value Added per kg of paddy was Rs.31.50, Processing Cost Efficiency was 58.71%, Gross Marginal Revenue was Rs. 55,706 per mill per day. It revealed that the productivity of the rice milling industry was significantly affected by the amount of paddy fed into machines, quantity loss in milling and total rice sales. According to the amount of investment and daily paddy milling capacity, Gross Marginal Revenue of rice mills significantly differed. As well as according to the daily milling capacity, Rice Processing Cost Efficiency, daily operating expenditure and Gross Revenue differed. The major limitations faced by the rice millers were the severe competition in purchasing paddy and marketing rice and selling the rice entirely for credit became a risk factor for the millers. Highly competitive market, high moisture and low-quality paddy were the main constraints in operating the rice mills. Technology improvement is highly recommended to increase the profit and efficiency of rice processing.

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EFFECT OF SUBSIDIES ON COCONUT CULTIVATION IN BATTICALOA DISTRICT

T. J. Mohamed

ABSTRACT

The study on effect of subsidies on coconut cultivation in Battialoa district was carried out during the months of January and February, 2019. Using random sampling procedure, sample of 80 coconut cultivators were selected and a structured questionnaire was used to collect the information through personal interview. Data were analyzed using the SPSS package with the help of Excel software. Personal and socio-economic characteristics of coconut cultivators revealed that majority of respondents (77.5%) were male and 22.5% females involved in coconut cultivation. The motivation of females in coconut cultivation is increasing because of the subsidy schemes. The minimum age of the respondents is 20 years and the maximum age of the respondents is 65 years. According to that the involvement of youngsters in coconut cultivation is lower than other age groups. But mostly the new comers are young people. The majority of respondents (98.8%) educated. These might be the reason that the most of the people get benefits from the subsidy schemes. The majority of respondents doing the coconut cultivation as subsidiary occupation and only 15% of the respondents doing the coconut cultivation as main occupation only who are getting benefits from the under-cropping subsidy scheme. The majority of respondents doing the coconut cultivation as subsidiary occupation. Only the 6.3% of the farmers have 6-10 acres of cultivation land. Because of the increasing population the cultivation lands are decreasing day by day. Before 20 years, the involvement of people in coconut cultivation was low compare with current details. The majority of the respondents (81.3%) cultivated typica variety. Some of new cultivators are involving in the cultivation of king coconut because of the current market demand. All of the respondents have own land for coconut cultivation in all CDO ranges. 100% of the respondents received subsidies from the Government sectors. This is the reason to motive the youngsters to do coconut cultivation successfully. But no one received any kind of subsidy from private sectors. Respondents received new planting subsidies; irrigation subsidies; maintenance amount as subsidies; under cropping subsidies (Inter cropping); rehabilitation subsidies; fertilizer subsidies; North-East special program subsidies; subsidies for mites control; subsidies for cattle range; and subsidies for replanting. According to the kinds of the subsidies the supplied period also differs from each. There were 18.8% of the respondents make membership in agricultural association and 2.5% of the respondents make membership in Kapruka association.

The youngsters want to encourage towards the coconut cultivation therefor CDOs should explain the future scarcity of coconut and future demand. In future we will face the land scarcity who will be with cultivation land they will be rich.

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STUDY ON PRODUCTION AND MARKETING OF VEGETABLES IN GALEWELA DS DIVISION, MATALE DISTRICT

M. H. Madhuwanti De Silva

ABSTRACT

The study was carried out to determine production and marketing of vegetables in Galewela DS division, Matale district, mainly based on primary data obtained from a sample survey in twelve GN division. The random sampling method was used to select a sample of 150 farmers and data were collected through a pretested questionnaire. Also, secondary data were used from various sources. Data were analyzed using SPSS software and descriptive statistics, frequencies, one-way ANOVA test and linear regression. About 53% of farmers had owned land and 67.35% of farmers had used low land for vegetable farming. Brinjal, big onions, capsicum and okra were popular vegetable crops in the area during Yala season. Most of them had bought seeds from ASC and used their own seeds. Most of labors was used for harvesting. Middleman, wholesaler, village traders were major marketing outlets. Most of the farmers had obtained high yield from big onions. Quantity of vegetables sold and prices varied between GN divisions. Most of farmers (70%) had used loans for investment. Majority of farmers (52%) had not obtained crop insurance but had contacts with extension services. It was found that severe pest and disease attack, no stable price at the market, high cost of agrochemicals, low price of vegetables, post-harvest losses were major problems faced by farmers. Amount of credit had an impact on net profits of vegetables. There was a significant difference in production of big onions and capsicum among GN divisions, while there were significant differences in net profit of brinjal, big onions, capsicum and okra among GN divisions. And also, there was a significant difference in amount of credit between GN divisions.

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AGRICULTURAL ENGINEERING

EFFECT OF DIFFERENT IRRIGATION INTERVAL ON THE GROWTH AND YIELD OF CHILLI IN SANDY SOIL

S. F. Shahana

ABSTRACT

A study was carried out to evaluate the effect of different irrigation intervals on growth and yield of chilli at the crop farm of Eastern University, Sri Lanka, Vantharumoolai, Batticaloa district. The experimental setup was a Randomized Complete Block Design of four treatments and five replicates. The crop coefficient for this treatment for initial, development and mid- season stage was found to be 1.05, 1.05 and 0.9 respectively. The purpose of this research was to examine the suitable irrigation interval for chilli grown on a sandy soil in dry weather conditions. In order to study the effects of irrigation intervals on crop growth and yield, measurements on plant growth characteristics (plant height, leaf area, number of leaves, branches) and yield attributes (Number of flowers, pods) were carried out. Simultaneously fresh and dry weight of plant shoots, roots, and fruits were recorded periodically. High irrigation had higher growth rate on crop characteristics, such as plant height (64.3 cm), leaf area (28.48 cm^2), shoot fresh weight (112.09 g), shoot dry weight (28.01 g), root fresh weight (12.58 g), root dry weight (3.85 g) etc. Daily irrigation produced the highest yield of 11623.9kg/ha. And statistical analysis confirmed that there were significant differences between the daily irrigation plots with other treatments at 0.05 probability level. The daily irrigation significantly increased the yield attributes of chilli, whereas irrigation at 3 days and 5 days did not influence significantly. The growth, yield and WUE were significantly lower for treatment with 7 days irrigation interval. The yield reduction was by 45.4% for 7 days irrigation interval from daily irrigated plots which was significantly higher. According to the results it could be concluded that, though the irrigation at the crop requirement serves water with high water use efficiency, daily irrigation is produced high yield and most suitable at dry conditions.

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

D. U. Wathsala

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.

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TIME SCALE VARIATION OF WATER QUALITY IN BATTICALOA LAGOON, SRI LANKA

M. Azaam

ABSTRACT

The present study was undertaken to find the time scale variation of some water quality parameters of the Batticaloa Lagoon in Sri Lanka during January 2019 to March 2019. Ten sampling locations in the middle part of the lagoon were identified. Water quality parameters like temperature, electrical conductivity (EC), total dissolved solids (TDS), pH, dissolved oxygen (DO) and turbidity were measured at 15-30 cm below the water surface. The study revealed that the water temperature of the lagoon varied between 22.9oc to 37.9oc, TDS 1372ppm to 4553ppm, EC 2.52mS/cm to 9.11mS/cm, pH 7.0 to 9.2, DO from 12.5g/l to 19.93g/l, turbidity 1.66(FTU) to 47.48 (FTU). High values of EC and TDS were observed in the lagoon water near the bar mouth. Distance from sea play a major role in the variation of EC and TDS of the lagoon. The temperature varied with time at every sampling location. Temperature of the lagoon in some area may depend on external surrounding factors such as concrete payment and discharge from urban wastages etc. There was no any significant variation of EC, TDS and turbidity was observed with time during the day. As far as the pH is concerned, the sampling locations which are far away from the bar mouth area showed lower pH values and location which are near to bar mouth area showed higher pH value during the sampling period. The pH and DO showed significant variation with sampling time throughout the sampling periods. The relationship of water quality parameters at ten locations in the Batticaloa lagoon also studied. The EC, TDS and turbidity showed positive correlation with temperature but no any significant differences while the temperature changes. The pH and DO has significant positive correlation with the temperature. The present study results are help to understand about the time scale water quality variation of the Batticaloa lagoon. It will provide valuable information for planning and development of fisheries and environmental sectors. This time series analysis will help for modelling process and forecasting the water quality parameter.

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EFFECT OF INDUCED FIRE ON SOIL WATER REPELLENCY IN THE PINUS (*Pinus sabiniana*) FOREST OF WELIHENA, MATARA

D. U. Weerasinghe

ABSTRACT

Soil water repellency is a reduction in the rate of wetting and retention of water in soil caused by the presence of hydrophobic coatings on soil particles. Numerous techniques have been developed to determine the water repellency of soil. The most common method is the water drop penetration time (WDPT) test and molarity of ethanol droplet (MED) test. The creation of water repellency in soils involves both physical and chemical processes. The main aim of this study was to determine the effect of induced fire on soil water repellency in *Welihena pinus* forest, Matara. The study area is located in the *Welihena pinus* forest, Matara. The region has a wet zone with a mean annual precipitation of 2500- 3000 mm and a mean annual temperature of 25 °C. The samples were taken within 1 ha which is representative for the whole area. Study area (1ha) was divided in to 100 grids (10m*10m) and 10 grids were used for collecting 120 soil samples for further analyze. Samples at different depth layers of 0-2cm, 2-4cm, 4-6cm, 6-8cm, 8-10cm, 10-13cm, 13-16cm, 16-19, 19-22cm, 22-25cm, 25-28cm and 28-31cm were collected at selected sampling points. According to the soil textural analysis, the type of the soil is confirmed as clay in a study site. The terrain characters such as soil pH, electric conductivity of soil, soil texture, vegetation type, soil moisture content (volumetric water content), bulk densities, particle densities, soil organic carbon were measured.

The pH of soil layers from 0-2cm to 22-25cm varies from 5.8-6.7 indicating slightly acidic in nature. Further, the EC, particle density, bulk density and volumetric moisture content varies in between 0.06 dS/m-0.14 dS/m, 1.9342 g/cm^3-2.8089 g/cm^3, 0.8681 g/cm^3-1.6199 g/cm^3 and 10.08%- 33.81%, respectively. The organic carbon ranges between 0.02% to 1.82%. The WDPT of soil layers from 0-2cm to 22-25cm at field condition varies from 3.05s to 1.48 s. The maximum WDPT (3.05s) was observed at the soil surface whereas the minimum (1.48s) at the deepest soil layer of 22-25cm. The WDPT of soil layers from 0-2cm to 22-25cm at air dried soils ranges from 5.14 s to 1.82 s and the WDPT of soil layers of oven dried soils ranges from 6.21 s to 2.87 s. Induced fire experiment was done to determine the effect of fire intensities on SWR. Different amounts (50g,100g and 200g) of pinus litters were added on the surface of the experimental plots and burnt., The time taken to complete the fire was 3.29, 5.43, 8.72 minutes of 1st, 2nd and 3rd fires, respectively.

The moisture content of soil layers from 0-2cm to 4-6cm for 1st, 2nd and 3rd fires varies in between 15.96%-17.06%, 15.07%-16.71%,14.36%-16.56% respectively. The moisture content decreases gradually from 0-2cm layer to 4-6cm layer when the intensity of fire increases from 3.29 to 8.72 minutes. The WDPT of surface soils were 43.86s, 162.5s and 415.2s for 1st, 2nd and 3rd fires, respectively. And the WDPT of the soil layers (0-2cm to 4-6cm) for 1st, 2nd and 3rd fires varies between 1.18s-5.89s, 1.14s- 7.57s, 1.2s-4.76s, respectively. According to the results of WDPT, the soil surface becomes severely water repellent from wettable/slightly water repellent when the intensity of fire increases from 0 to 8.72 minutes. In addition to this, the soil water repellency of soil layers of 0-2 cm, 2-4, 4-6 cm become slightly water repellent from wettable water repellent when the intensity of fire increases from 0 to 8.72 minutes.

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EFFECTS OF DRYING TEMPERATURE ON SOIL WATER REPELLENCY IN JAMBOLAN (*Syzygium cumini*) NATURAL FOREST IN VADDUVAAKAL, MULLAITIVU

B. Apourvanan

ABSTRACT

Soil water repellency (SWR) has become burning issue as best characteristics of soil is needed for retention of water. Soil water repellency is often recognized in surface layers of soil that dry out frequently. The persistence of water repellency of a soils can be measured by using the water drop penetration time (WDPT) test on field moist or dried soils, referred to as actual and potential water repellency, respectively. The aim of the study was to investigate the effects of different drying temperatures on the severity of soil water repellency in Vadduvaakal, Mullaitivu in Northern part of Sri Lanka. The study area was identified by using WDPT test and soils samples were collected, packed and transported immediately to the laboratory of Department of Agricultural Engineering. Further, actual water repellency was measured by WDPT test in field. Potential WDPT was determined at different temperature (at ambient temperature, 40 ℃, 50 ℃, 70 ℃, 90 ℃ and 105 ℃). Soil physical parameters such as bulk density and soil texture and chemical parameter such as pH, electrical conductivity and organic matter content (%) were measured in laboratory.

The results reveal that, the study area belongs to the textural class of sandy soil since it has 91.4% of sand. According to the WDPT classification, 80% of surface soil belongs to the class 3(severely water repellent). The SWR at field condition reduces rapidly when the depth increases from the surface to the layer of 2-4 cm, and then after SWR reduces slightly up to 4-6 cm of layer. No soil water repellency observed when the depth increases from the layer of 4-6cm to the depth of 25 cm. When the temperature increases from ambient to 40℃ the SWR increases suddenly in the layers of 0-2cm and 2-4cm. And slow increases of SWR was observed in the above layers when the temperature increases from 40 ℃ to 50 ℃, 50 ℃ to 70 ℃, 70 ℃ to 90 ℃ and 90 ℃ to 105 ℃. According to the results of WDPT, the SWR decreases suddenly in all drying temperatures when the depth increases from the layer of 0-2 cm

to 2-4 cm. Thereafter the SWR reduces slowly up to the layer of 4-6cm and then no SWR was observed up to the depth 25cm in all drying temperatures. There was a negative relationship between bulk density and SWR. The SWR decreases when the bulk density increases from the layer of 0-2 cm (1.04 gcm^{-3}) to 2-4 cm (1.18 gcm^{-3}). The organic matter content in the soil determines the severity of SWR. It was observed that the SWR reduces with organic matter content decreases from the surface soil to the layer of 22-25 cm. In conclusion, SWR increases with increasing temperatures of soils.

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EFFECTS OF MOISTURE CONTENT ON SOIL WATER REPELLENCY IN CASUARINA PLANTATION IN KALUWANCHIKUDY, BATTICALOA

S. Thirusan

ABSTRACT

Soil Water Repellency (SWR) of soils is a common problem in many countries. Soils Water repellency can, among other things, be caused by an organic coating of the particles produced by the growth of microorganisms. The objectives of the study were (i) to identify the occurrence of water repellent soils by WDPT test (ii) To determine the physical characteristics of water repellent soils and (iii) to study the impact of different moisture contents on soil water repellency. The study area was selected by using WDPT test. Soil texture of the study area was analyzed by hydrometer method. The SWR (soil water repellency) was determined by water drop penetration time (WDPT) method. The SWR test (WDPT) was performed on a field soils and dry soil samples. SWR was analyzed with different soil moisture content (MC). Different moisture content conditions were maintained by using oven. pH and EC were measured by using the portable pH meter. Soil organic matter was determined by Walkley and Black titration method. Casuarina plantation soils in Kaluwanchikkudy was identified as water repellent by WDPT tests. The region has an intermediate zone with a mean annual precipitation of 900- 1750 mm and a mean annual temperature of 25-30 °C. According to the soil textural analysis, the type of the soil is confirmed as sandy in study site since it has 94.84% of sand. The results reveal that the soil organic matter (SOM) decreases from 1.12(%) to 0.019(%) when depth increases from surface to the depth of 8-10cm. According to the WDPT test on surface soil, 13.33% of surface soils belong to class 2 (strongly water repellent), 83.33% belong to class 3 (severely water repellent) and 3.33% belong to class 4 extremely water repellent The soil changes from strong water repellent (0-2cm layer) to wettable (from 8-10cm to the depth of 25cm) conditions when depth of soil increases. It is observed that there is no relationship between SWR, pH, SWR and EC. This soil develops repellent properties when drying and the SWR increases as soil moisture contents decrease from air-dried to oven-dried. Content of the soil tested shows that the organic matter (1.12%) is higher in the layer of 0-2cm

while lower 0.019% in the layer of 8-10cm. It is observed that 0-2cm soil layer has strong water repellency. The reason could be the higher OM and lower MC. The MC decreases when the drying temperature increases. According to the WDPT test, the SWR increases in all soil layers when the MC decreases. The results reveal that the highest SWR (WDPT is 403.47s) is observed in oven dried soils.

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REVIEW REPORT ON THE IMPACT OF TILLAGE SYSTEM ON SOIL MOISTURE

H. M. Aruna Jaya Prasad

ABSTRACT

Water penetration in soil and the increase of the water storage on soil profile are influenced by hydro-physical properties, soil texture and compaction which are closely interdependent and influenced by the tillage system. Tillage exerts adverse effects on soil when it is performed under inadequate moisture conditions or when inadequate tillage implements are used. Therefore, a literature review study was carried out with the objectives of studying and summarizing the findings on the effect of soil tillage on soil moisture content and to find out research gaps in soil tillage.

Of the several soil tillage systems reviewed, it has been found out that zero tillage/no tillage facilitates better infiltration, protect soil moisture and less evaporation. The adoption of zero-tillage allows more intensive cropping sequences, because zero-tillage results in increased rainwater infiltration and retains more water in the potential root compared to conventional-till. However, the soil under conventional tillage had significantly higher moisture content than tested reduced till, mulch till and zero-till treatments. Sub soiling improves root penetration and infiltration rate, which can be helpful for soils with drainage problems as well as those with moisture deficits. Minimum tillage application reduces the soil mobilization and due to this, soil is compacted in the first years of application. Soil moisture is higher in no tillage and minimum tillage at the time of sowing and at the early stages of vegetation, then the differences diminished over time. Mulch tillage ensures a maximum retention of crop residues (30% or more) on the soil surface. Less evaporation with increased soil cover allows greater water absorption and transpiration under the mulch tillage.

Future researches and new experiments needs to be evaluated the effect of soil types, crops and farming systems on soil moisture under no tillage system. However, studies on conservation tillage with respect to soil moisture are needed at different environmental conditions. Further, studies on water use efficiency and yield at different soil types under conservation tillage are strongly recommended for better management of soil moisture.

The findings obtained so far on minimum tillage reveal that studies related to different degree of soil disturbances have not been investigated extensively. Studies pertaining to mulch tillage together with mechanical tillage need to be evaluated to study about the moisture availability in soils.

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REVIEW ON THE NITROGEN TRANSPORT MODELS IN SOIL

M. L. Nisansala

ABSTRACT

This review of nitrogen transport models provided an efficient way to integrate knowledge on the behaviour of nitrogen in soil as it is an important tool when systematic reviews of primary studies are not adequate. Study of different models provided an understanding of biogeochemical processes and lead to the identification of research gaps and new experimentation on nitrogen transport.

Models discussed in this review are based on a mechanistic description of processes such as leaching, volatilization of ammonia, mineralization, immobilization, nitrification, denitrification and uptake by the roots. Such models studied are, DRAINMOD N, DRAINMOD-N-II, TOUGHTEACT-N, TRAMIN, HYDRUS 1-D, NLEAP, LEACH M , SHETRAN , NCSOIL ,NuCM, APEX, MIKESHED DNDC, REMM, SWATT, DRAINMOD FOREST, HYDRUS 2-D, NITROGEN 2D, FILTER, WHCNS, MODFLOW, WAVE, WANDA and CENTURY.

There are some modifications and further research experiments needed in future because each model has limitations to simulate N transformation processes. DRAINMOD-II needs further research to take the independent measurements. TOUGHREACT-N has to be tested for coupling with atmospheric forcing and plant growth model components. The model TRAMIN needs studies on simulation from site specific calibration. For HYDRUS-1D, further studies need for N transformation processes under various salinity conditions. CENTURY model needs a technique to measure the pool size. LEACHM needs further studies under different field conditions. SHETRAN needs multidimensional simulation. For NCSOIL need a devise experimental method in future for free simulation from calibration. APEX needs multiscale approaches. MIKESHE-DNDC needs to be incorporated with anaerobic soil process to better substantiate in

watersheds. DRAINMOD-FOREST and REMM need design for application at a large scale. SWATT needs forest growth component in future. WANDA needs experiment for simulate Nitrate fluxes and MODFLOW needs components to simulate runoff and unsaturated flows.

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SPATIO-TEMPORAL ANALYSIS OF RAINFALL DISTRIBUTION IN KURUNEGALA DISTRICT, SRI LANKA

A. P. Manike

ABSTRACT

Climate change affects every country in various ways. Impact of climate change on water resources may be positive or negative, depending on the geographical region. Agricultural sector especially in developing countries is likely to be the most vulnerable sector to climate change as it largely depends on rainfall distribution. Investigating the spatio-temporal dynamics of rainfall has become very crucial in managing water resources efficiently for sustainable development. Analysis of climate variables become vital to assess climate induced changes and to suggest feasible adaptation strategies, particularly in agricultural based countries and to mitigate the impacts of extreme weather hazards. Kurunegala is one of the major agricultural districts in Sri Lanka. Managing the water resources for sustainable development has become great challenge to the water managers due to erratic rainfall distribution in this area. In the above context, the present study was aimed to analyse the spatio-temporal variations in rainfall distribution in Kurunegala district. Historical rainfall data collected from four gauging stations were subjected to both mathematical and statistical analysis. In addition, annual and seasonal trends of rainfall, meteorological drought conditions and recent changes in rainfall distribution were studied. Rainfall distribution in the study area showed high spatio-temporal variations. Bathalagoda showed highest mean annual rainfall of 1843 mm. Mean annual rainfall of Wariyapola, Mediyawa and Siyambalagamuwa were 1629 mm, 1315 mm and 1222 mm, respectively. This district received higher rainfall in April, October and November. Compared to other regions, moderate distribution of rainfall was observed at Bathalagoda. In other regions, rainfall was concentrated only in certain months. Annual rainfall at both Wariyapola and Siyambalagamuwa showed significant decreasing trend at 5% significance level. Bathalagoda showed increasing trend while Mediyawa showed decreasing trend. Southwest monsoonal (SWM) and 2nd inter-monsoonal (IM2) rainfall showed decreasing trend in all regions in this district. Further, trend of SWM rainfall was significant at both Wariyapola and Siyambalagamuwa. Mediyawa and Bathalagoda showed increasing trend in both 1st inter-monsoonal (IM1) and northeast monsoonal (NEM) rainfalls. Further, all stations except Bathalagoda showed negative trend in number of rainy days and it was significant at Siyamabalagamuwa in Maha season. Number of rainy days at Wariyapola and Siyambalagamuwa showed decreasing trend while Mediyawa and Bathalagoda

showed increasing trend in Yala season. Severe drought conditions were experienced in the recent years at Wariyapola, Mediyawa and Siyambalagamuwa. At Mediyawa and Siyambalagamuwa rainfall highly deviated the long-term mean. Rainfall distribution showed cyclic pattern over the time in all regions. However, amount of rainfall received in the recent years was lower than immediate past decade in all regions except Bathalagoda. Taking proper management decisions based on rainfall distribution pattern is necessary for efficient management of water resources while ensuring sustainable crop production.

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PERFORMANCE ASSESSMENT OF IRRIGATED AGRICULTURAL SYSTEMS ACCORDING TO COMPARATIVE INDICATORS: A CASE STUDY OF MAPAKADA DIVISION IN MAHIYANGANA, SRI LANKA

M. T. Dilrukshi

ABSTRACT

There is an increasing concern about the performance of an irrigated agricultural system as pressure grows on water resources and as concerns increase regarding the food security and sustainability of irrigated agricultural systems. Proper management of land, water, and agricultural inputs along with efficient operation and maintenance of irrigation systems are prerequisites for achieving optimum yield. Performance assessment of irrigated agricultural systems helps to determine problems and identify ways and means of improving system performance. Performance of irrigated agricultural systems can be assessed using comparative indicators, include irrigation efficiency, adequacy of water supply, as well as land and water productivity. Mapakada irrigation division is one of the major irrigation schemes in Badulla district. Frequent crop failure, abandoning of cultivation and reduced crop yields are the common issues in this division. In the above context, present study was aimed to assess the performance of irrigated agricultural systems in Mapakada irrigation division using comparative indicators. In addition, water demand and supply deficit of different systems along with socio-economic status of farming community were studied. Farmers in Sorabora irrigation system show highest socio-economic status in Mapakada irrigation system. Annual income of the farmers varies from Rs.100, 000 to Rs.400, 000. Compared to other systems, Demodara and Nagadeepa systems have high young labour force. Farmers in all systems except Demodara have land extent less than 3.5 acres. More than 70% of the farmers in Mapakada and Sorabora systems get loan for cultivation. Corresponding figure for Demodara and Sorabora systems is 50%. Total water demand of Mapakada system is about 15.95 MCM in Maha season. Corresponding figures for Demodara, Sorabora and Nagadeepa are

4.78 MCM, 21.27 MCM and 40.66 MCM respectively. Water demand in Yala season are 19.29 MCM, 4.25 MCM, 25.72 MCM and 52.22 MCM in Mapakada, Demodara, Sorabora and Nagadeepa, respectively. Excess water supply was observed in some systems in Maha season whilst severe water shortage was observed in all systems in Yala season. Paddy yield varies from 4.37 t/ha to 6.39 t/ha in Maha season, which is above the national average. However, yield is slightly lower in Yala season (3.36 t/ha - 6.39 t/ha) mainly due to water stress. Sorabora system shows highest production per unit cropped area ($1693/ha in Maha and $1765/ha in Yala) while Demodara system showed lowest production ranges from $739/ha-$1354/ha in Maha from $339/ha-$1234/ha in Yala. Output per unit irrigation supply varies from $0.04/m3-$0.23/m3 in Maha and from $0.05/m3-$0.15/m3 in Yala season. Sorabora system shows better performance, followed by Mapakada system. In overall, irrigation systems in the study area are facing severe water shortage in Yala season. Sorabora system shows highest performance among other systems. Mapakada system also shows good performance which is followed by Nagadeepa system. However, Demodara system shows lowest performance in all aspects. Therefore, appropriate measures should be taken to improve the performance of irrigation systems particularly Demodara and Nagadeepa systems.

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CROP SCIENCE

COMPARISON OF ROOT AND SHOOT MORPHOLOGICAL DEVELOPMENT OF SELECTED RICE LINES (*Oryza sativa* L.) UNDER MOISTURE STRESS CONDITIONS

H. B. Hasini Wasana

ABSTRACT

An experiment was conducted at the Rice Research and Development Institute (RRDI), Batalagoda, Sri Lanka during January to March 2019 to compare morphological development of selected rice lines under moisture stress conditions. This experiment was laid out in a Completely Randomized Design (CRD) and as 3×3 factorial experiment with five replicates. The two treatments were rice lines and moisture conditions. The drought tolerant lines IRDTN 07-11 and IRDTN 07-56 and the variety Bg 300 were selected as rice lines and three moisture conditions *viz.* irrigated moisture condition throughout the research, moisture stress from two weeks after planting to panicle initiation, followed by an irrigated condition in the reproductive stage, and irrigated condition from two weeks after planting to panicle initiation followed by moisture stress at the reproductive stage was maintained. At the flowering stage, shoot and root morphological parameters of plant height, number of tillers, shoot dry weight, maximum root length, root ball length and root dry weight in three different depths of each treatment plot were obtained. The detailed root study in three different root depths for the root parameters of total root length, surface area, project area, root volume and average root diameter, were carried out. Agronomic practices were carried out as per the recommendations of the Department of Agriculture, Sri Lanka.

The results showed that the moisture stress in the reproductive stage was severely affected the root and shoot development of rice lines rather than the moisture stress in the vegetative stage. Within the vegetative stage, Bg 300 withstands the water stress similar to the IRDTN 07-11 and IRDTN 07-56. With the water stress at the reproductive stage, the maximum length of roots, root ball length, dry weight of roots, the total length of roots and surface area of roots were higher in IRDTN 07-56 and IRDTN 07-11 were more prominent than that of Bg 300. The higher maximum root length even

under non moisture stressed condition revealed that there is a genetically adjustment in these two lines for the drought tolerance. There was a significant reduction in plant height and the shoot dry weight of these two lines compared to Bg 300. Increasing of root dry weight, total root length, root surface area and the project area in deeper soil layers, especially above the 40cm of these two lines are other morphological developments observed to tolerate the water stress. Therefore, the results suggest that among these three lines, IRDTN 07-56 was the most drought-tolerant rice line followed by the IRDTN 07-11.

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DIFFERENT LEVELS OF NITROGEN FERTLIZER AND JEEWMIRTHA APPLICATION ON GROWTH AND YIELD *Abelmoschus esculentus* L.

L. M. Fazeel

ABSTRACT

Okra is one of the important vegetables in the Eastern region of Sri Lanka. It can be response to the both organic and inorganic fertilizers to improve the growth and yield. Jeewamirta is an organic liquid fertilizer. The study investigated the "different levels of Nitrogen fertilizers and Jeewamirta application on growth and yield of Abelmoschus esculentus L. This experiment was carried out in the Crop Farm, Eastern university of Sri Lanka as a pot experiment during January to April 2019. The experiment was with six treatments and eight replicates in a Completely Randomised Design. The treatments are T1 (100% Urea), T2 (75% Urea + 25% Jeewamirta), T3 (50% Urea + 50% Jeewamirta), T4 (25% Urea + 75% Jeewamirta), T5 (100% Jeewamirta), T6 (Urea + TSP + MOP (control)) and tested their performance on the growth and yield. Growth parameters and yield parameters shown significant increase treated with 25% Urea + 75% Jeewamirta (T4) in comparison with other treatments. This might be due to the presence of macro and micronutrients as well as growth promoting substances like IAA, GA and Cytokinins in Jeewamirta. The treatment receiving organic liquid fertilizer resulted in highest fungal population meanwhile Jeewamirta had the highest bacterial and actinomycetes population. Which regulate the plant function including cell division, plant growth and enzymatic activities; Promote root growth (Mg) and root development (P); Stimulate the flowering (K) and ultimately enhance growth and yield of plant. The 25% Urea and 75% Jeewamirta (T4) increased plant height (20.89%), chlorophyll content (13.65%), number of leaves per plant (24.96%), number of pods per plant (21.09%), fresh and dry weight of roots (154.15%, 193.50%), fresh and dry weight of shoot (85.52%, 105.01%) fresh and dry weight of pods (32.53%, 134.63%), length and girth of pods

(27.72%, 39.19%), leaf area (37.72%), tap root length (21.02%), number of lateral roots (76.19%) and total yield per hectare (61.11%) in comparison to plants applied with Department of Agriculture recommended inorganic fertilizers (Control - T6). Therefore, the 25% Urea and 75% Jeewamirta fertilizer could be recommended for the cultivation of *Abelmoschus esculentus* L. in order to enhance the growth and yield which is environmental friendly for Sustainable Agriculture.

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EFFECTS OF SEAWEED EXTRACTION, PANCHAGAVYA AND JEEWAMIRTHA ON GROWTH AND YIELD OF *Vigna unguiculate L.*

C. R. Samaraweera

ABSTRACT

The agricultural production needs to be increased to fulfill the food requirement of growing population. Therefore, the challenges faced by the agriculture sector are endless. Farmers are attracted to use excessive chemical fertilizer to increase the yield. These circumstances lead to heavy usage of chemical fertilizer to protect the crop from pests and other diseases. More than 300 million pounds of different chemical poison are currently produced in the form of fertilizers and pesticides under different brand names. Heavy use of agro chemicals forms environment and health problems. Furthermore, nutrient leaching from agricultural soil into ground water and surface water cause major environmental and health problem to all living beings. Nitrate and Phosphate concentrations found to be higher than the acceptable limits of World Health Organization standards due to leaching and surface runoff of chemical fertilizers from cultivated lands. Chemical fertilizers can slowly increase the acidity of the soil until it begins to impede plant growth. Therefore, people concern on their health and environmental aspects. For that, farmers are trend to use organic fertilizers and botanicals from natural resources to enhance the production of crops and sustain the environment. By applying organic manure, soil fertility and crop production has been increased by changing physical and chemical properties of soil including nutrient bio availability, soil structure, water holding capacity, soil pH, microbial community and its activity etc. In this regard, an experiment was conducted with jeewamitha, panchagvaya and seaweed with a control to investigate the Effect of sea weed extraction, Panchagavya & Jeewamirtha on growth & yield of *Vigna unguiculata* L. A Field experiment was carried out in Crop Farm, Eastern University Sri Lanka, from January to April 2019. Crop farm located in the latitude of 70 43′ and the longitude of 810 42′E. This area belongs to the agro ecological region of low country dry zone in Sri Lanka. The mean annual rainfall ranges from 1400 mm to 1680 mm and temperature varies from 30^0 C to 32^0 C. The soil type is sandy regosol. The experiment was arranged with six treatments in Completely Randomized Design with five replications. Treatments were defined as follows: T1: Control (distill water)- once a week application, T2: 20% Seaweed extraction- once a week application, T3: Jeewamirtha- once a week application, T4 - Panchagvya- once a week application, T5: Jeewamirtha & 20% sea weed extraction- once a week application, T6: Panchagvya

and 20% sea weed extract- once a week application. Further, The 20% seaweed liquid extract of Halimeda tuna combine with panchagvya increased plant height (21.78%), mean number of leaves per plant (12.5%), chlorophyll content of leaves (16.32%), leaf area (71.41%), fresh weight of shoot (65.74%), dry weight of shoot (71.67%), root length (32.25%), fresh weight of root (73.58%), dry weight of root (66.37%), total number of root nodules (%75.35), number of effective nodules (65.78%), mean number of flowers per plant (60%), average length of pods (47.51%), weight of a pod (38.97%), 100 seeds weight (51.71%) and total yield (77.33%) over the control plants. Therefore, it could be concluded that application of Panchagavya liquid organic mixture combine with 20% sea weed extraction of can be recommended to enhance the yield in sustainable and environmentally friendly manner for growth and yield of *Vigna unduiculata* L.

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APPLICATION OF *Hydrangea macrophylla* FLOWER EXTRACT ON GROWTH AND YIELD OF *Vigna unguiculata L.*

S. B. Dharmarathna

ABSTRACT

Sri Lanka is a developing country and the economy mostly depends on Agriculture sector. Over 25 percent of Sri Lankans are employed in the agricultural sector. Sri Lanka has the rich agricultural history dating back more than 2500 years. Indiscriminate use of agrochemicals leads to environmental degradation and hence challenging safe and healthy food for increasing population in the world. Efforts are underway for the sustainable way of crop production with organic fertilizers and botanicals from natural resources to enhance the production of crops. Now a day's approximately a billion of people are suffering from malnutrition, Chronic Kidney Diseases, Cancers and other health problems because of modern agriculture practices. Therefore, it is vigorous to grow environmental friendly agricultural practices for the production of quality and healthy food. Enhance the sustainable crop production with organic fertilizers and botanicals from natural resources to improve the crop production are very important. This decreases pesticide usage; it can increase species copiousness and richness. Sustainable agriculture is reduced the synthetic fertilizer and pesticide usage and also contributes to reserve the ecosystem. Synthetic fertilizer and pesticides are also dangerous not only for soil but also aerial environment. Most synthetic fertilizers and pesticides seep down below the root zone in to the ground water. It also pollutes ground water affecting diseases mainly "Methemoglobinemia".

A pot experiment was carried out at the crop farm of Eastern University, Sri Lanka during the period January 2019 to April 2019 to study the effects of different concentrations of Hydrangea macrophylla flower extract (HmFE) as a foliar application with recommended fertilizer on growth and yield of Cowpea (*Vigna unguiculata* L.), variety waruni. Now a day's foliar fertilization is the current trend of sustainable crop production. Mostly developed countries are using this system. Furthermore, it is mostly popular among developed countries. Therefore, it must be extended among developing countries.

The experiment was arranged with five treatments in Completely Randomized Design with five replications (T1: Distilled water (Control), T2: 10% HmFE, T3: 20% HmFE, T4: 50% HmFE, T5: 100% HmFE) and their performances on the growth and yield of Vigna unguiculata L. were investigated. It was found that the foliar

application of Hydrangea macrophylla Flower Extract significantly ($P<0.05$) increased the growth and yield of Vigna unguiculata L. when compared to control plants and the highest growth and yield performance was observed in plants applied with low concentration (20%) of Hydrangea macrophylla Flower Extract. In this investigation, the statistical analysis of data proved that application of low concentration (20%) of Hydrangea macrophylla flower extract increased the plant height (9.6%), chlorophyll content (23.02%), number of leaves (43.66%), leaf area (65%), root length (32.06%), fresh weight of stems (25.8%), fresh weight of leaves (16.5%), fresh weight of roots (32.5%), number of nodules (74.35%), number of effective nodules (90%), weight of the nodules (67.92%), number of seeds per pod (36.36%), weight of seeds per pod (30.14%), number of flowers per plant (71.4%), number of pods per plant (66.66%), 100 seeds weight (22.8%) and the Total yield (75.28%) compared to the control plant. Therefore, 20% HmFE is recommended to apply for *Vigna unguiculata* L. which is environmental friendly for sustainable manner.

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EFFECT OF PLANTING GEOMETRY AND APPLICATION OF JEEVAMIRTHA ON GROWTH AND YIELD OF *Abelmoschus esculntus* intercropped with *Vigna unguiculate*

S. I. Jayasinghe

ABSTRACT

Increasing world population demands higher agricultural crop production to fulfill the food requirement. Crop production can be reached by various ways such as expanding the cropping area, increasing the productivity per unit area, increasing the number of cultivating season per year. Although farming systems have succeeded in supplying enough food for more than half of the global population, it is well recognized that many of the systems based on sole cropping with substantial inputs of chemical fertilizers, pesticides, and antibiotics may have led to negative outcomes of agricultural ecosystem. Chemical fertilizers give quick results within short time period due to its compatible chemical composition which helps to absorb nutrients quickly through roots. Intercropping has gained interest in agriculture because it has greater advantages like over yielding; improved utilization of resources by the crops and minimizing weed attacks from season to season. Thus, intercropping combined with organic fertilizer will increase the quality of food. Choosing of the crop combination plays an important role in intercropping system. Therefore, intercropping is the best way to increase productivity in limited land area with organic inputs.

To enhance the positive attitudes towards intercropping and organic farming, this experiment was carried out at the Crop Farm of Eastern University, Sri Lanka during the period of January to April 2019 to study the effect of planting geometry with the application of Jeewamirta on the growth and yield of Abelmoschus esculentus L. intercropped with *Vigna unguiculata* L. Tested varieties were Haritha and Waruni. Crop farm located in the latitude of 70 43′ and the longitude of 810 42′E. This area belongs to the agro ecological region of low country dry zone in Sri Lanka. The mean annual rainfall ranges from 1400 mm to 1680 mm and temperature varies from 300 C to 320C. The soil type is sandy regosol. The experiment was laid out in a Randomized Complete Block Design (RCBD) with four replications. Each plot was 5 m × 2 m. Each treatment had four replicates. The total number of plots was 20. Spacing of 0.5 m separated the plot from each other and a space of 0.5m wide separated the blocks from each other. Treatments were okra as a sole crop with the spacing of 90cm×60cm (T1), cowpea as a sole crop with the spacing of 30cm×15cm (T2), okra in 60cm×60cm with one row of cowpea (T3),

okra in 90cm×60cm with 2 rows of cowpea (T4) and okra in 120cm×60cm with three rows of cowpea.

This investigation showed that there was a significant ($p<0.05$) effects in planting geometry with application of Jeewamirta in plant height, leaf area, fresh and dry shoot biomass, fresh and dry root biomass, days for 50% and 100% flowering, fruit length, number of fruits per plant, weight per fruit, 100 seed weight and yields than their monocroppings. In T4 treatment okra increased leaf area (48.17%), fresh shoot biomass (51.19%), dry shoot biomass (64.17%), fresh root biomass (75.58%), dry root biomass (74.34%), fruit length (43.35%), 100 seed weight (39.03%) and yield (51.16%) than its monocroppings. Also in treatment T4 plant height (22.13%), leaf area (57.59%), fresh shoot biomass (43.23%), dry shoot biomass (44.60%), fresh root biomass (45.71%), dry root biomass (70.86%), average pod length (26.09%), 100 seed weight (24.98%) and yield (51.13%) were increased in cowpea than its monocroppings. Furthermore, Land Equivalent Ratio (3.12) and Area – Time Equivalent Ratio (2.32) showed a significant ($p<0.05$) increased in T4 compared to other intercropping treatments. Based on economical aspect gross return (620,465.00), net profit (570,751.00) and benefit-cost ratio (11.48) were significantly ($p<0.05$) increased in T4 compare with the monocropping and in economic point of view okra intercropped with cowpea (T4) gave higher return. Therefore, it could be concluded that okra in 90 cm × 60 cm with two rows of cowpea can be recommended for okra cowpea intercropping to enhance the growth and yield.

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EFFECT OF INORGANIC AND BIO FERTILIZER APPLICATION ON GROWTH AND YIELD OF *Allium cepa* L.

A. H. Lahiru Bandara

ABSTRACT

Onion, is one of the most important commercial condiments grown –in the dry central region and dry zone of Sri Lanka that is especially used for food & medicinal purpose. It can be response to both organic and inorganic fertilizer to improve the growth and yield. Bio fertilizer application mean Inoculation of microorganisms, who are capable of converting the nutrient elements from non-usable form to usable form through biological process and those microorganisms are inexpensive form of plant nutrient & cost effective. They do not require Non-renewable source of energy during their production & provide or excrete plant growth promoting hormones (PGPR) which is finally result high & sustainable yield of crop. A pot experiment was conducted by using Eco Plus liquid & solid bio fertilizer & department recommended inorganic fertilizer in Pahalawewa Organic farm of Bio Foods (PVT) ltd, Sri Lanka, during January to April of 2019 to investigate the effect of inorganic and bio fertilizer on growth & yield of Allium cepa L. The experiment was conducted with four treatments in Completely Randomized Design with six replications. (T1: Eco Plus Liquid Bio Fertilizer, T2: Eco plus Solid Bio fertilizer, T3: Eco plus Liquid Bio fertilizer combined with Eco plus Solid Bio fertilizer, T4: Department Recommendation of the inorganic fertilizer) and also their performances on the growth and yield of *Allium cepa* L. were investigated. Eco plus liquid bio fertilizer was applied after 3days,1 month, 2 months after transplanting. The Eco plus Solid Bio fertilizer was applied at 3 days before transplanting to of Allium cepa L. Measurements were taken from the disruptive and non-disruptive sample while data analysis was done by SAS 9.4 (Dutch). The maximum growth and yields were observed in T3 and T2 where the parameters of plant height, plant width, number of leaves, average fresh weight and dry weight of the leaves, average fresh weight of bulb, average dry weight of the bulb, height of the bulb, diameter of the bulb and yield did not showed any statistical different. However, the economic analysis revealed that T3 provide highest net return (Rs. 1,209,548.00) than T2 (Rs. 815,803.00) per hectare.

Therefore, the treatment could be considered as best for the farmers to cultivate onion with the application of Eco Plus Liquid Bio fertilizer and Eco Plus Solid Bio fertilizer in combination.

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EFFECT OF FOLIAR APPLICATION OF WILD SUNFLOWER (*Tithonia diversifolia)* LEAF EXTRACT ON GROWTH AND YIELD ON VEGETABLE COWPEA cv BS1 IN SANDY REGOSOL

M. T. Abeyrathne

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 application frequencies of Wild sunflower (Tithonia diversifolia) Leaf Extract (TLE) as a foliar application on growth and yield of vegetable cowpea Cv. BS-1. The experiment was laid out in a Randomized Complete Block Design (RCBD) with 7 treatments and replicated three times. The treatments were; T0 - Control, T1 - 10% TLE at 1 week interval, T2 -10% TLE at 2 weeks interval, T3 - 20% TLE at 1 week interval, T4 - 20% TLE at 2 weeks interval , T5 - 30% TLE at 1 week interval , T6 - 30% TLE at 2 weeks interval. The foliar application was carried out from 2 weeks after planting upto pod formation. Sampling was done at 4, 6, and 7 weeks after planting. The results showed that the foliar application of TLE 30% at 2 weeks interval had a significant ($p<0.05$) effect on the plant height, number of leaves, number of branches, number of effective nodules, length of roots, leaf area, leaf area index, fresh weight of pods, dry weight of leaves, dry weight of stem, dry weight of root, dry weight of total of plant, dry weight of pods, chlorophyll content and yield at different stages of the growth. The results suggest that under the condition of this experiment yield could be increased by 22.22 % over the control treatment by the application of 30% at two weeks interval from 2 weeks after planting upto pod formation.

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EFFECT OF FOLIAR APPLICATION OF MORINGA (*Moringa oleifera*) LEAF EXTRACT ON GROWTH, YIELD AND FRUIT QUALITY OF CHILLI cv. MIPC-01 (*Capsicum annuum* L.)

A. L. Weerasingha

ABSTRACT

This investigation was carried out at the Crop Farm of Eastern University, Sri Lanka during the period of January to May 2019 to study the effects of different concentrations and application frequencies of Moringa (Moringa oleifera) Leaf Extract (MLE) as a foliar application with recommended fertilizer on growth, yield and fruit quality of chilli cv. MIPC-1. This experiment was laid out in a Completely Randomized Design (CRD) with seven replicates with following treatments; 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. Foliar application of MLE was started at two weeks after transplanting and the performance was recorded at 6, 9 and 11 weeks after transplanting. All the required agronomic practices were carried out as per the recommendation by the Department of Agriculture, Sri Lanka. The results showed that the foliar application of MLE led to significant ($p<0.05$) effects on tested parameters over the control. MLE with 10% of foliar application at once a week interval increased plant height, number of branches/plant, number of leaves/plant, length of taproot, leaf area, leaf area index, number of flowers/plant, number of pods/plant, length of pod, girth of pod, number of seeds/pod, fresh weight of pods/plant, dry weight of pods/plant, total dry weight/plant, total yield/plant, 100 seed weight, chlorophyll content of leaves, total soluble solid and vitamin C content of pods. This suggests that the foliar application of MLE with 10% at once a week interval with the recommended fertilizer showed the best performance. This might be due to the presence of macro and micronutrients as well as growth promoting substances like gibberalin and cytokinins in moringa leaf extract which regulate number of plant functions including cell division and plant growth, promote root development (Phosphorus - P), root growth (Magnesium - Mg), stimulate flowering (Pottasium - K) and ultimately enhance the growth and yield of plant by initiating robust plant growth.

From this study, it was found that the foliar application of moringa leaf extract with 10% concentration at once a week interval significantly increased the growth, yield and quality of Capsicum annuum L. when compared to control plants. Therefore, it could be concluded that 10% moringa leaf extract with the DoA recommended inorganic fertilizer can be recommended to enhance the growth, yield and quality of Capsicum annuum L. as it is one of the eco-friendly ways to increase the growth, yield and quality in chilli.

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EFFECT OF DIFFERENT ORGANIC FERTILIZERS WITH VERMIWASH ON GROWTH AND YIELD OF OKRA (*Abelmoschus esculentus)* cv. P-11

S. Samiraja

ABSTRACT

The experiment was conducted at the Crop Farm of Eastern University, Sri Lanka during the period January to April 2019 to study the effects of organic manures with foliar application of vermiwash on growth and yield of okra (Abelmoschus esculentus) plants, with the variety of P-11. This experiment was laid out in a Completely Randomized Design (CRD) with eight replicates. The treatments were; viz., T1 = Control (Recommended fertilizer), T2 = Poultry manure 10 t/ha with 25% vermiwash, T3 = Poultry manure 10 t/ha with 50% vermiwash, T4 = Poultry manure 10 t/ha with 75% vermiwash, T5 = Poultry manure 10 t/ha with 100% vermiwash, T6 = Cattle manure 10 t/ha with 25% vermiwash, T7 = Cattle manure 10 t/ha with 50% vermiwash, T8 = Cattle manure 10 t/ha with 75% vermiwash, T9 = Cattle manure 10 t/ha with 100% vermiwash with eight replicates. Agronomic practices were carried out as per the recommendation by the Department of Agriculture, Sri Lanka. The results showed that foliar application of 100% vermiwash with 10 t/ha poultry manure had a significant ($p<0.05$) effect on tested parameters of okra over the control. Poultry manure 10 t/ha with 100% vermiwash increased plant height (29.71%), number of branches/plant (36%), number of leaves/plant (37.03%), length of tap root (32.41%), leaf area (44.52%), leaf area index (25.95%), number of flowers/plant (50%), total dry weight/plant (43.17%), number of pods/plant (42.1%), length of pod (25.06%), girth of pod (23.25%), number of seeds/pod (38.59%), fresh weight of pods/plant (14.20%), dry weight of pods/plant (31.60%), chlorophyll content (13.21%), total yield/plant (33.73%) than the recommended fertilizer. This result suggests that poultry manure 10 t/ha + vermiwash @ 100% is the potential source of plant nutrients for sustainable crop production. Because poultry manure and vermiwash are inexpensive and environmentally friendly organic sources which are easily available at our surrounding. It can

be successfully substitute for chemical fertilizers as an alternative for safe food production.

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EFFECTS OF DIFFERENT PRUNING HEIGHTS ON GROWTH AND CUT FLOWER PRODUCTION OF ROSE (*Rosa hybrida* L.) VAR. 'WHITE SUCCESS'

K. R. Shyamalee

ABSTRACT

An open field experiment was conducted to evaluate the effects of different pruning heights on growth and flower production of rose var. 'White Success' at the Regional Agricultural Research & Development Centre, Bandarawela, Sri Lanka from January to April 2019. One year old budded rose plants were hard pruned at 6 inches from the ground level before the commencement of experiment and allowed to grow for a period of one month and following treatments were imposed thereafter T1 (removal of terminal or flower buds), T2 (pruning of shoots 3 leaves above bud union), T3 (pruning of shoots 4 leaves above bud union), T4 (pruning of shoots 6 leaves above bud union), T5 (pruning of shoots 5cm from bud union), T6 (pruning of shoots 10cm from bud union), T7 (pruning of shoots 15cm from bud union) and T8 (No pruning - Control). Experiment was laid out in a Randomized Complete Block Design with four replicates. Measurements were taken from one month after pruning following non- destructive sampling method. Plant height was measured at weekly interval. Number of shoots per plant, number of leaves in a flower stem, bud length and diameter, dry weight of flower buds, number of flowers per plant and vase life of flowers were measured at seven weeks after pruning. Analysis of variance was performed to determine the effect of treatments on measured parameters and treatment means were separated by Duncan's Multiple Range test ($p<0.05$). Results revealed that mild pruning positively influenced on the growth and flowering of roses than hard pruning. Highest performances in measured parameters were observed in mild pruned treatments. Based on the results, it can be concluded that mild pruning increases growth and flowering of roses. Pruning of new stems at 15 cm above the bud union is the best method to get higher production of quality flowers from 'White success'.

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EFFECT OF DIFFERENT LEVELS OF POTASSIUM ON THE GROWTH AND DEVELOPMENT OF C*ordyline fruiticosa* var. 'PURPLE COMPACTA'

D. M. Udara Sampath

ABSTRACT

Cordyline fruticosa (Cordyline)is an ornamental shrub with attractive leaves and it is a popular foliage plant in the export markets. 'Purple compacta' is a striking variety of *Cordyline fruticosa*. Potassium plays important role in enhancing crop quality. A shade house (50%) experiment was conducted to find out the effects of graded potassium levels on vegetative growth of cordyline (*Cordyline fruticosa* var. 'purple compacta') plants in the Crop Farm, Eastern University, Sri Lanka from January to April 2019. The experiment was arranged in a completely randomized design with twenty replications. Six treatments were defined viz. 0.0 (T1- Control), 0.5 (T2), 1.0 (T3), 1.5 (T4),2.0 (T5) and 2.5 (T6) g potassium/plant/month (g/p/m). Muriate of potash (MOP) was used as a potassium source Nitrogen (Urea) and Phosphorous (TSP) were applied at the recommended and fixed rates (0.5 g/plant/month and 0.5g/plant/month respectively). Recommended agronomic practices were followed uniformly for all treatments. Growth parameters viz. plant height, leaf area, plant biomass and leaf nitrogen content (SPAD) were measured at monthly interval. Analysis of Variance was performed to determine significant difference among treatments ($p < 0.05$). Results revealed that plants belong to T2 showed significantly ($p < 0.05$) better performance in the measured growth parameters viz. plant height, leaf area, plant biomass and leaf nitrogen content, while the lowest performance was observed in T5 at 3 months after transplanting. From these findings, it could be stated that potassium level of 0.5 g/p/m could be optimum for maximum growth of cordyline plants (*Cordyline fruticosa* var. 'Purple compacta') at 50% shade level in Batticaloa district. A commercial scale evaluation is required to recommend these findings to floricultural industries.

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EFFECT OF CUTTINGS, MEDIA AND HORMONE (BAP) APPLICATION ON THE GROWTH AND DEVELOPMENT OF *Hydrocera trifloral* (L.)

N. R. Dhanushika

ABSTRACT

A study was carried out to determine the effects of different type of cuttings, different media and different concentrations of hormone (BAP) application on the growth and development of *Hydrocera triflora* L. from January to April 2019. The experiment one was arranged in a split plot design with completely randomized design (CRD) and there were two main factors and three sub factors with twelve replicates. Different media (S1-solid and S2-liquid) were arranged in the main plots while different types of cuttings (W1-softwood, W2-semi-hardwood and W3-hardwood) were distributed among the sub-plots. Agronomic practices were followed uniformly for all treatments. Growth parameters viz. plant height, number of new leaves, number of roots and root length were measured at one-week interval from two weeks after planting following destructive sampling method. Analysis of variance was performed to determine the effect of treatments on measured parameters and treatment means were separated by Duncan's Multiple Range Test ($p < 0.05$). Results revealed that softwood cuttings grown in liquid media performed better in the measured growth parameters. Their growth rate is also higher. Therefore, it could be stated that, softwood cuttings and liquid media are ideal for the propagation of *H. triflora*.

The experimental two was arranged in completely randomized design (CRD) with four treatments and twelve replicates. Following treatments were imposed: A1-Albert solution, A2- Pond water, A3- Chlorinated water, A4- Distilled water (control). Agronomic practices were followed uniformly for all treatments. Growth parameters viz. plant height, number of roots, fresh weight was measured at one-week interval from two weeks after planting following non-destructive sampling method. Analysis of variance was performed to determine the effect of treatments on measured parameters and treatment means were separated by Duncan's Multiple Range Test ($p < 0.05$). Results divulged that the plants grown in distilled water showed better performances in all measured parameter than other liquid media. Lowest performance was observed in chlorinated water. Therefore, it could be concluded that distilled water is suitable media for the propagation of *H. triflora*.

The experimental three was arranged in a completely randomized design (CRD)

with five treatment and ten replicates. Five treatments were defined viz. T1 (25 mg/l BAP), T2 (50 mg/l BAP), T3 (75 mg/l BAP), T4 (100 mg/l BAP), T5 (Control). Application of hormone was carried out twice as foliar spray while the control was sprayed with distilled water. First hormone application was practiced one month after the plant establishment. Second application was done seven days after the first application. Agronomic practices were followed uniformly for all treatments. Growth parameters viz. Plant height, number of leaves, number of shoots and chlorophyll content were measured at one-week interval from 1 week after 2nd hormone application following non-destructive sampling method. Analysis of variance was performed to determine the effect of treatments on measured parameters and treatment means were separated by Duncan's Multiple Range Test ($p < 0.05$). Results of the experiment disclosed that plants received lowest BAP (25 mg/l BAP) application showed better performances in measured parameters. Further plant growth performances decreased with increasing level of BAP concentration. Therefore, application of 25 mg/l BAP is optimum for *H. triflora* to increase the growth performances.

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ALLELOPATHIC EFFECTS OF SELECTED PLANT EXTRACTS ON GERMINATION, SEEDLING AND PLANT GROWTH OF SELECTED WEEDS

U. Januha Begam

ABSTRACT

The present study was undertaken to assess the allelopathic suppressive effects of Thevetia peruviana L. and Nerium oleander L. vinegar leaf extracts on Purple nutsedge (*Cyperus rotundus* L.) tuber germination and seedling growth, yellow nutsedge (*Cyperus esculentus* L.) plant growth and purple nutsedge (*Cyperus rotundusL*) plant growth at the Crop Science Laboratory, Faculty of Agriculture, Eastern University, Sri Lanka from January to April 2019. Following treatments were imposed: T1 (Control distilled water), T2 (100% coconut Vinegar) , T3 (100% Nerium oleander dry leaves extract) ,T4 (75% Nerium oleander dry leaves extract), T5 (50% Nerium oleander dry leaves extract), T6 (100% Nerium oleander fresh leaves extract), T7 (75% Nerium oleander fresh leaves extract), T8 (50% Nerium oleander fresh leaves extract), T9 (100% Thevetia peruvian dry leaves extract), T10 (75% Thevetia peruvian dry leaves extract), T11 (50% Thevetia peruvian dry leaves extract), T12 (100% Thevetia peruvian fresh leaves extract), T13 (75% Thevetia peruvian fresh leaves extract) and T14 (50%Thevetia peruvian fresh leaves extract). The first experiment was arranged in a completely randomized design with fourteen treatments and three replications. Uniform sized tubers were soaked in different plant extracts as per treatment structure for a period of two hours before planting. Then leaf extracts were applied to germinating tubers in pots at two days interval for three times. All the agronomic practices were followed uniformly. Germination percentage (%), Radical length (cm), Plumule length (cm), Seedling length(cm), Seedling dry weight(g) and Seed vigour index were measured at fourteen days after application of first treatments. Analysis of variance was performed to determine the effect of treatments on measured parameters and treatment means were compared by Duncan's Multiple Range Test ($p < 0.05$). Results revealed that germination and seedling growth parameters of purple nutsedge (*Cyperus rotundus* L.) were significantly affected by different concentrations and forms of Thevetia peruviana and Nerium oleander vinegar leaf extracts. The lowest performances were measured in treatment applied with 100 and 75% Nerium oleander dry leaves extracts and 100% Thevetia peruviana dry leaves extract. This study found that vinegar leaf extracts of T. peruviana and N. oleander has the allelopathic suppressive effects against purple nutsedge tuber germination and seedling growth.

The second experiment was arranged in a completely randomized design with fourteen treatments and three replications. Yellow nut sedge seedlings (two to three weeks old) were collected and were planted in prepared pots. They were allowed to grow for a period of 14 days. Leaf extracts were applied to foliage (2ml per plant) of the seedlings at two days interval as per treatment structure for four times. All the agronomic practices were followed uniformly. Number of plants died was measured at fourteen days after application of first treatments. Data were analyzed with Friedman's non-parametric analysis of variance. Results divulged that, yellow nutsedge (*Cyperus esculentus* L.) plant growth was significantly affected by vinegar leaf extracts of *Thevetia peruviana* and *Nerium oleander*. Significantly highest number of plants (100%) died in T. peruviana 100% dry leaf extract applied treatment. The inhibitory potential of vinegar leaf extracts of *T. peruviana* and *N. oleander* species were increased with increasing extract concentrations in wet and dry forms. It was observed the dry leaf extracts of N. oleander and *T. peruviana* have potent allelopathic activity than wet forms of respective leaf extract. It was also found that leaf extract of *T. peruviana* has higher allelopathic suppressive effect on yellow nutsedge than *N. oleander* on yellow nutsedge.

The third experiment was arranged in a completely randomized design with fourteen treatments and three replications. Uniform sized tubers of *Cyperus rotandus* were obtained before the commencement of the experiment. They were cleaned using distilled water and planted in prepared pots. *Cyperus rotandus* plants were allowed to grow for a period 14 days. Leaf extracts were applied to foliage (2 ml per plant) of the seedlings at two days interval as per treatment structure for four times. All the agronomic practices were followed uniformly for all the treatments. Number of plants died was measured at fourteen days after application of first treatments. Data were analyzed with Friedman's non-parametric analysis of variance. Results disclosed that purple nutsedge (*Cyperus rotundus* L.) plant growth was significantly affected by vinegar extracts of Thevetia peruviana and Nerium oleander. Significantly highest number of plants (100%) died in 100 and 75% Nerium oleander dry leaves extracts and 75% Nerium oleander dry leaves extract and 100% *Thevetia peruviana* dry leaves extract applied treatments. It was observed that dry leaf extracts of *N. oleander* have potent allelopathic properties than wet forms of respective leaf extract. It was noticed that, vinegar extracts of *T. peruviana* has suppressive effect against purple nutsedge in dry form only. It could also be stated that leaf extract of *N. oleander* has higher allelopathic suppressive effect on purple nutsedge than *T. peruviana*.

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EFFECT OF FRUIT PEELS AS A NATURAL FERTILIZER ON GROWTH AND YIELD OF OKRA (*Abelmoschus esculentus* L.)

R. M. Dayarathna

ABSTRACT

Present study was carried out at the Crop Farm, Eastern University, Sri Lanka during the period of January 2019 to April 2019 to study the effect of different fruit peel powder application on growth and yield of okra (Abelmoschus esculentus (L.) Moench). This experiment was carried out in a Completely Randomized Design (CRD) with six treatments having twenty replicates. Treatments were, recommended fertilizer application at basal and topdressing (T1, control), half dose of recommended fertilizer application at basal and topdressing times with 1g of banana peel powder (T2), 1g of pomegranate peel powder (T3), 1g of orange peel powder (T4), 0.5g each of banana and pomegranate peel powders (T5) and 0.5g each of orange and banana peel powders (T6) at both times. The results reveals that application of fruit peel powder at basal and top dressing had significant differences ($P<0.05$) on plant height, number of leaves per plant, leaf area, leaf area index, chlorophyll content, days to 50% and 100% flowering, number of flowers per plant, fresh and dry weights of leaves, stem, root and fruit, fruit length and girth and sun dried weight of seed. Further significant difference ($P<0.01$) in cumulative yield as well as pick wise yield were noted. At 1st, 2nd, 3rd and 4th picking, the highest value was obtained in T6 and lowest value in T1. The highest value of cumulative yield was gained in T6 (6.15 ton/ha) followed by T2 (4.75 ton/ha) while lowest value was gained in T1 (2.02 ton/ha). Application of fruit peel powder in to the soil leads to improve growth and yield of okra in sandy regosol compared to recommended inorganic fertilizer and present study suggested that, among the all tested treatments, half recommended fertilizer application at basal and topdressing times with 0.5g each of orange and banana peel powders at both times (T6) followed by half recommended fertilizer application at basal and topdressing times with 1g of banana peel powder at both times (T2) would be the most suitable fruit peel powders to get higher growth and yield of okra in sandy regosol.

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EFFECT OF FOLIAR APPLICATION OF BANANA (*Musa acuminate* L.) PSEUDOSTEM BASED ENRICHED SAP ON GROWTH AND YIELD OF COWPEA (*Vigna unguiculata* L. Walp.)

L. F. Vidarshana

ABSTRACT

The field experiment was conducted to study the effect of foliar application of banana (Musa acuminate L.) pseudostem based enriched sap on growth and yield of cowpea (Vigna unguiculata L. Walp.) during the January to April 2019 at the Crop Farm, Eastern University, Sri Lanka. The experiment was laid out in Randomized Complete Block Design with five treatments having four replications. Treatments were; Urea, TSP, MOP as basal and topdressing as recommended rate (T1), Urea, TSP, ½ MOP as basal with recommended topdressing and 1% Pseudostem sap solution (T2), 3% Pseudostem sap solution (T3), 5% Pseudostem sap solution (T4) and 7% Pseudostem sap solution (T5) at 3rd, 5th, 7th and 9th week after planting. The results revealed that application of banana pseudostem had significant differences ($P<0.05$) on plant height, leaf area, root length, chlorophyll content, days to 50% flowering, number of flowers per plant, fresh weights of plant, leaves, root and stem, dry weights of stem from 4th to 10th Week after planting (WAP). Also significant difference ($P<0.05$) were noted on number of pods per plant and sun dried weights of pods, number of seeds per pod, sun dried seed weight of 100 seeds, total pod and seed yields at each picking. The highest cumulative seed yield of 8.01 ton/ha was noted in T2 and lowest value of 2.18ton/ha in T1.

Application of banana pseudostem sap in to the soil leads to improve growth and yield of cowpea in sandy regosol soil compared to recommended inorganic fertilizer and present study can be suggested that, among the tested treatments recommended dosage Urea, TSP and half recommended dosage with MOP with 1% banana pseudostem sap at 3rd, 5th, 7th and 9th week after planting (T2) would be the most suitable concentration to get high growth and yield of cowpea in sandy regosol.

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EFFECT OF SPLIT APPLICATION OF JEEVAMRUTHA ON GROWTH AND YIELD OF RADISH (*Raphanus sativus* L.)

M. M. Sanoos

ABSTRACT

Soil application of fermented liquid Jeevamrutha to radish crop helps in reducing the loss of nutrients by leaching, soil fixation and volatilization. This ultimately increases the availability of nutrients at the point of absorption in the sandy regosole. An experiment was conducted at Crop Farm, Eastern University Sri Lanka to study the effect of split application of Jeevamrutha on the growth and yield of radish. The experiment was laid out in a Completely Randomized Design. Treatments were Recommended fertilizer ( ), 10 tones/ha compost and 1500 ℓ/ha of Jeevamrutha as a basal ( ), 10 tons/ha compost and 750 ℓ/ha of Jeevamrutha as a basal with 750 ℓ/ha of Jeevamrutha at 10 days after sowing ( ), 10 tons/ha compost and 500 ℓ/ha of Jeevamrutha as a basal with 500 ℓ/ha of Jeevamrutha at 10 and 20 days after sowing ( ) and 10 tons/ha compost and 375 ℓ/ha of Jeevamrutha as a basal with 375 ℓ/ha of Jeevamrutha at 10, 20 and 30 days after sowing ( ). The study revealed that tuberous root diameter and length were significantly ($P<0.05$) varied at harvest. The highest root diameter and length of 3.59 cm and 23.60 cm were noted in . Further fresh weight of leaf was high in (42.3 g) and was not differing with tested treatments except . The highest root weight of 90.64 g was noted in at 7th week after sowing. Further, total marketable yield per ha showed significant difference ($P<0.05$) at 7th week after sowing and it was high in (43.86 tons/ha) followed by (42.88 tons/ha). However, there were no significant variations between and . Present study concluded that 10 tons/ha compost and 500ℓ/ha Jeevamrutha as a basal with 500ℓ/ha of Jeevamrutha at 10 and 20 days after sowing would be the most suitable split application to obtain higher growth and yield of radish.

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APPLICATION OF VERMIWASH ON GROWTH AND YIELD PERFORMANCES OF GREEN GRAM (*Vigna radiata*) IN SANDY REGOSOL

P. S. Rajasooriya

ABSTRACT

Foliar fertilization is one of the important methods to apply nutrients to crops. It has been used as a mean of supplying supplemental doses of minor and major nutrients, plant hormones, stimulants, and other beneficial substances. A field experiment was conducted at the crop farm, Eastern University, Sri Lanka to study the effect of vermiwash application on growth and yield of green gram (Vigna radiata), variety MI 5 in Sandy Regosol. The experiment was laid out in a Randomized Complete Block Design (RCBD) with five treatments and four replicates. The treatments were recommended inorganic fertilizer application (T1), ½ doses of recommended basal and top dressing with 25% vermiwash (T2), 50% vermiwash (T3), 75% vermiwash (T4) and 100% vermiwash (T5). Vermiwash was applied at once in two weeks and the performance was recorded at 2nd, 4th, 6th, 8th weeks after planting (WAP). The results revealed that number of branches and leaves per plant, total number of nodules and effective nodules, number of flowers, days for 50% and 100% flowering, number of pods per plant and number of seeds per pod were significantly ($P<0.05$) varied at 8th week after planting and it was high in T4. Minimum duration of 30 days and 35 days were taken by T4 for 50 % and 100 % flowering respectively. Foliar application of vermiwash increased the root length and fresh and dry weights of root were high in T5 followed by T4 at 2nd, 4th, 6th and 8th WAP. However, there was no significant ($P>0.05$) variation between T5 and T4 in dry weight of shoots. Further, application of vermiwash significantly influenced ($P<0.01$) plant height, fresh weight of plant, shoots and roots, dry weight of roots, chlorophyll content, leaf area, leaf area index, TSS, yield and yield components. Yield of 7.25 tons/ha was achieved in T4 and it was 2.5 times greater compared to control. The minimum TSS observed in T4 (4.3 Brix) can be recommend for diabetic patients. This study suggests that application of ½ doses of recommended basal and top dressing with 75% vermiwash (T4) would be more suitable for cultivation of green gram in sandy regosol.

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ANIMAL SCIENCE

NON- CONVENTIONAL FEEDS FOR RUMINANTS IN CHENKALADY VETERINARY REGION

I.C. Gunawardhana

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 2019 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 was 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. Utilization of non-conventional feed resources (NCFR) by farm animals was important and timely for the area of Chenkalady veterinary region. All the identified farmers were highly depended on NCFR. Main reason for not using some NCFR by farmers is that the farmers have lack of knowledge and awareness about some NCFR like slaughter house waste, feather meal, fish meal etc. There are some other problems in material collection, lack of supporting services and lack of storage facilities for NCFR in farmer fields. NCFR don't need extra maintenance like grasses. So, the use of NCFR as feeds for ruminants is

highly advantageable to their economy. Usage of NCFR is indirectly helps to the waste management in farmer fields. 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.

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EFFECTS OF PLANT SPACING ON PRODUCTIVITY AND NUTRIENT COMPOSITION OF HYBRID NAPIER GRASS-CO3 (*Pennisetumperpureumx Pennisetumamericarnum*) IN THE EUSL LIVESTOCK FARM

W. T. Amali

ABSTRACT

Feeding standards of ruminant livestock could be significantly enhanced through the cultivation of improved quality forages which are suitable for different agroclimatic conditions of the country. Hybrid Napier cultivars CO3 is the most popular among ruminant rearing farmers. Hence, an experiment was carried out to assess the growth parameters, herbage yield and chemical composition of hybrid Napier CO3 (*Pennisetum perpureum* X *Pennisetum americarnum*) at the Livestock farm of Department of Animal Science, Faculty of Agriculture, Eastern University Sri Lanka. The experiment was conducted during the period of February to April 2019 with four different spacing such as 50cmx25cm,50cmx45cm, 50cmx65cm and 50cmx85cm with five blocks under randomized complete block design. Growth parameters (plant height, leaf length, leaf width number of tillers per clump, leaf area) were measured at two-week intervals from 4th week up to the 8th week. In addition, productivity of fodders such as yield and proximate composition of the forage also measured.

Collected data were subjected to Analysis of Variance (ANOVA). The means were separated using Duncan's multiple range test at 0.05significance level. Results obtained indicated that productivity of CO3 is superior in 50cm x45cm spacing of growth under the conditions in Eastern University Livestock farm, and resulted the highest ($p<0.05$) dry matter yield of 56.19g per plant in 50 cmx45 cm spacing. And lowest dry matter yield of 38.49g showed 50cmx85cm spacing. In terms of chemical composition 50cmx 45cm spacing showed highest total ash content (16.68%), fat content (5.94%) and fiber content (33.13%) on dry matter basis.

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

G. S. Hansani

ABSTRACT

This research study aimed to investigate the quality attributes of probiotic-fermented low-fat yogurt enriched with Oat β-glucan (OβG) during cold storage (5 0C) for 21 days. Low-fat yogurt formulation was based on substitution of fat in the low-fat milk with OβG (0.75%, w/v). Four formulations of yogurt were prepared. The control formulation was (without the addition of OβG) prepared from full cream cow milk and fermented by yogurt starter (YS). The first treatment was prepared from low fat milk without OβG and fermented by YS. The second treatment was prepared from low fat milk with the addition of OβG and fermented by YS (YSOβG). The third treatment was prepared from low fat milk without OβG and fermented by Bifidobacterium lactis Bb-12, and Lactobacillus acidophilus LA-5 (PYS). The fourth treatment was prepared from low fat milk with the addition of 0.75% OβG and fermented by Bifidobacterium lactis, and L. acidophilus (PYSOβG).

All samples were evaluated for their chemical composition, microbiological properties, the viability of probiotic microorganisms, sensory quality attributes during the storage period. The results indicated that addition of OβG improved the survival of probiotic bacteria and yogurt starter culture during storage period wherein the OβG-enriched yogurt had high viable count. The highest lactic bacteria count was 8×105 CFU/ml, which guarantees their effect and ability to survive in the digestive tract and spread in the intestine. There were some significant differences ($p \geq 0.05$) in the treatments due to the microbiological activities and the chemical composition. Total solids, ash, total titratable acidity, total soluble solids increased during refrigerated storage and moisture, pH and lactose decreased during refrigerated storage. On the other hand, the addition of OβG improved the formation of flavor compounds in yogurt. The substitution of fat with OβG significantly enhanced sensory attributes of

yogurt, wherein OβG-enriched samples recorded high score and acceptability. It could be concluded that substitution of fat with OβG is a sufficient delivery truck of probiotic culture and OβG could be used safely in functional dairy products.

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

D. S. Jayalath

ABSTRACT

Dried leaf powder consists of valuable natural antioxidants as the bio active compounds. Therefore, sausage can be enriched by incorporation with dried leaf powder. The aim of present study was to evaluate the nutritional, physical properties, antioxidant and microbiology of sausages incorporated with dried leaf powder namely, dried Moringa oleifera leaf powder, dried *Camelia sinensis* leaf powder and *Cinnomomum zeylanicum* leaf powder at the rate of concentration 0.5%. Sausage samples were analyzed for physico-chemical and sensory properties during refrigerated stored at -10 0C. The physico-chemical and sensory characteristics were analyzed at day one , week one, week two , week three, week four of storage period.

Moisture content, dry matter, ash, pH, texture profile colour, antioxidant activity and microbial activity were significantly difference ($p<0.05$) among the treatments. Dry matter and ash content were significantly ($p<0.05$) higher in sausage incorporated with Moringa oleifera leaf powder 36.75±0.04%, 3.39±0.07%, respectively. Fat content of sausage sample was significantly ($p<0.05$) higher (12.97±0.15%) in *Cinnomomum zeylanicum* incorporated sausage sample. pH was significantly ($p<0.05$) higher (6.77±0.02) in without leaf powder added sausage sample. Also *Cinnomomum zeylanicum* leaf powder incorporated sausage sample had significantly higher hardness (3.77±0.25N) compared to the without leaf powder added sausage sample. *Cinnomomum zeylanicum* showed the significantly ($p<0.05$) highest antioxidant activity (1867.92±2.23mM/g) compared to other treatments. Total bacterial count was lower (5.6×104CFU) in *Cinnomomum zeylanicum* leaf powder incorporated sausages. II

Staphylococcus aureus presented lower (3×103 CFU) in Moringa oleifera leaf powder incorporated sausages. *E. coli* and *Salmonella* were negatively presented in the all the treatments.

During storage, the ash and dry matter content were significantly ($p<0.05$) increased and fat content was significantly ($p<0.05$) decreased. pH content was significantly ($p<0.05$) decreased and antioxidant activity also decreased. Organoleptic properties were evaluated through the panel of 30 members. As a result of organoleptic characteristics revealed that, 0.5% *Cinnomomum zeylanicum* leaf powder added sausage had highest consumer preference of taste and aroma. Moringa oleifera leaf powder incorporated sausages had highest mean score of texture and without leaf powder added sausage sample had highest preference for colour. However, higher overall acceptability of sensory panel was *Cinnomomum zeylanicum* leaf powder incorporated sausages. Finally, it could be concluded that the *Cinnomomum zeylanicum* leaf powder incorporated chicken sausage most important in enhancing the quality of the chicken meat sausages.

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EVALUATION OF CHEMICAL, PHYSICAL, MICROBIAL AND SENSORY PROPERTIES OF GARLIC BUTTER BY USING COW MILK

M. S. Nayanangani

ABSTRACT

Butter is a popular dairy product composed of mainly milk fat and other minor components such as water, vitamins, enzymes and minerals which beneficial for health. The aim of this present study was to investigate the effect of garlic (Allium sativum) powder addition on the chemical, physical, microbial, sensory properties of butter, incorporated with garlic the rate of 2% garlic chips and 2% garlic powder (w/w) and 2% garlic chips and 4% garlic powder (w/w). Butter samples were analyzed for physical, chemical, microbial and sensory properties during refrigerated storage at 7 °C. The physico-chemical (moisture, total solids, fat, free fatty acids, titratable acidity, pH), microbial and sensory characteristics (texture, taste, mouth feel, after taste, appearance, colour, aroma and overall acceptability) were analyzed, at day 1, week 1, week 2, week 3, week 4, week 5, week 6 and week 7 of storage.

Moisture, total solids, fat, free fatty acids, titratable acidity and pH were significantly difference ($p<0.05$) among the treatments at day one. The results of this study revealed that, the moisture (14.09±0.10%) and total solids (85.91±0.10%) content were significantly ($p<0.05$) higher in butter without incorporated garlic chips and powder. Fat content (80±0.00%) was significantly ($p<0.05$) lowest in butter incorporated with 2% garlic chips and 4% garlic powder. And free fatty acids was significantly ($p<0.05$) highest in butter incorporated with and 2% garlic chips and 4% garlic powder and lowest in butter without added garlic chips and powder. pH (6.09±0.03%) was significantly ($p<0.05$) lowest in butter incorporated with 2% garlic chips and 4% garlic powder. And titratable acidity (0.13±0.02%) was significantly ($p<0.05$) lower in butter without added garlic chips and powder. 2% garlic chips and 4% garlic powder added butter showed the highest (48.75±1.18) antioxidant activity.

During storage, the pH value was significantly ($p<0.05$) decreased and fat content and hardness of butter was not significantly ($p>0.05$) different during 7 weeks of storage period. pH content was significantly ($p<0.05$) decreased and titratable acidity was increasing with the storage period. During storage period of 7 weeks, the cohesiveness, gumminess and springiness were significantly ($p<0.05$) increased. 2% garlic chips and 4% garlic powder treated samples showed the lowest

yeast/mould and coliform counts. Organoleptic properties were evaluated though the panel of 30 members. As a result of organoleptic characteristics revealed that, 2% garlic chips and 4% garlic powder added butter had the highest mean score of overall quality of all sensorial properties namely, texture, taste, mouth feel, after taste, appearance, colour, aroma and overall acceptability. Results revealed that most of the panelist accepted, which butter made from 2% garlic chips and 4% garlic powder than other types of butter.

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INCIDENCE OF SUBCLINICAL MASTITIS IN MILKING COWS AT VANTHARUMOOLAI, KOMMATHURAI, MAWADI-VEMBU AND KARADIYANARU VETERINARY RANGES OF BATTICALOA DISTRICT

Y. C. Ranaweera

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 Vantharumoolai, Kommathurai, Mawadi-Vembu and Karadiyanaru veterinary ranges in Batticaloa District, Sri Lanka and in relation to the major pathogens, risk factors and economic losses. In this study, a total of 100 lactating cows were randomly selected to identify SCM using California Mastitis Test (CMT) from Vantharumoolai, Kommathurai, 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 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. Some factors significantly ($p < 0.05$) affected prevalence of SCM.

Prevalence of SCM was high in housing provided in terms of OR 0.211 compared with housing not provided. The hand milking with calf OR value was 0.212 had higher chance of SCM compared with hand milking without calf. The without isolated cows from infected cows OR value 5.105 compared with isolated infected animals from cows. The without washed hands OR value was 0.114 compared with washed hands. As well as the incidence of mastitis had more chance for CMT positive in terms of OR value for incidence of mastitis in the farm was 14.000 times more than reference with not incidence of mastitis were associated with higher chances of subclinical mastitis in terms of odd ratio. Finally, it could be concluded that the many factors were significantly influencing the subclinical mastitis in the study area.

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ENHANCEMENT OF NUTRITIONAL VALUES OF LABNEH BY ADDING FRESH LEAF (*Moringa oleifera*) EXTRACT AS INNOVATIVE DAIRY PRODUCT

C. R. Heendeniya

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 present 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 concentration 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 ^{0}C. The physico-chemical (ash, dry matter, FFA, protein, titratable acidity, pH, mineral contents) were analyzed at day 1, week 1, week 2, week 3 and week 4 of storage. And sensory characteristics (colour, taste, texture, flavor and overall acceptability) were analyzed at day 1, week 1 of storage period. Ash, dry matter, fat, pH, titratable acidity and mineral contents, were significantly difference ($p<0.05$) among the treatments at day one. The results of this study revealed that, the ash (0.28±0.01%) and dry matter (57.62±0.06%) content were significantly ($p<0.05$) higher in Labneh incorporated with of 0.6% fresh Moringa leaf extract. Fat content was significantly ($p<0.05$) higher (7.13±0.15%) in Labneh incorporated with of 0.6% fresh Moringa leaf extract. pH was significantly higher (4.87±0.01%) in Labneh incorporated and titratable acidity was significantly ($p<0.05$) lower (1.32±0.01%) in Labneh without leaf extract added. During storage, the ash and dry matter content were significantly ($p<0.05$) increased and FFA content was significantly ($p<0.05$) increased. pH content was significantly ($p<0.05$) decreased and titratable acidity was increasing with the storage period. Organoleptic properties were evaluated though the panel of 20 members. As a result of organoleptic characteristics revealed that, 0.2% fresh Moringa leaf extract added Labneh had the highest mean score of overall quality of all sensorial properties namely, colour, taste, texture, flavor, and overall acceptability. Results revealed that most of the panelist accepted.

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EFFECT OF PHYSICAL, NUTRITIONAL AND SENSORY PROPERTIES OF SAUSAGE INCORPORATED WITH DIFFERENT NON-MEAT INGREDIENTS

A. S. Gunasekara

ABSTRACT

Non-meat ingredients are used to impart flavor, slow bacterial growth and increase the yield of the sausage production. Therefore, the aim of this present study was to investigate the nutritional value, physical properties, microbial content and shelf life of chicken sausage incorporated with non-meat ingredients namely, soy protein powder, non-fat milk powder and potato starch at the rate of concentration 2% (w/w). Sausage samples were analyzed for physical, nutritional and sensory properties during refrigerated storage at -10 ^{0}C. The nutritional, physical (moisture, dry matter, ash, fat, pH, texture and color) and sensory characteristics (colour, taste, texture, flavor and overall acceptability) were analyzed, at day 1, week 1, week 2 and week 3 of storage. Moisture, ash, dry matter, fat, pH, texture and color were significantly difference ($p<0.05$) among the treatments at day one. The results of this study revealed that, the dry matter (36.67±0.17%) ash (3.00±3.00%) and pH (6.45±0.03%) content were significantly ($p<0.05$) higher in chicken sausage incorporated with of potato starch. Fat content was significantly ($p<0.05$) higher in chicken sausage incorporated with soy protein powder (15.47±0.29%). Moisture was significantly higher in without added non-meat ingredient (control) sausage (70.74±0.12%). And hardness was significantly ($p<0.05$) higher in chicken sausage incorporated with of soy protein powder (4.8±0.3%). During storage the ash, pH content and dry matter content were significantly ($p<0.05$) increased and fat content and moisture content was significantly ($p<0.05$) decreased storage period. At week one, the higher hardness value (4.8±0.3 N) showed in soy protein powder incorporated chicken sausage and least value (4.8±0.3 N) showed in without added non-meat ingredient (control) sausage. Organoleptic properties were evaluated though the panel of 30 members. As a result of organoleptic characteristics revealed that, 2% of potato starch incorporated chicken sausage had the highest mean score of overall quality of all sensorial properties namely, color, taste, texture, flavor, and overall acceptability. Results revealed that most of the panelist accepted that sausage made from

2% of non-meat ingredient incorporated chicken sausage. Finally, it could be concluded that the non-meat ingredient is enriching the sausage manufacture and it is very much important in improvement of human nutrition.

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EVALUATION OF MELTING RATE, PHYSICOCHEMICAL AND SENSORY PROPERTIES OF ICE CREAM INCORPORATING PROCESSED GINGER

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ABSTRACT

Ginger incorporated ice cream can be considered as a herbal ice cream and health food. Ginger and processed products are rich source of natural antioxidants as the bio active compounds, where it fortified the ice cream. Therefore, the aim of this present study was undertaken to develop different forms of the ginger ice cream like ginger juice, ginger paste and ginger syrup were analyzed for physicochemical, physical, microbial and sensory properties during frozen storage at -10 ^{0}C. The physicochemical (total solid, moisture, ash, fat, titratable acidity, pH, total soluble solid, antioxidant), physical (first dripping time, melting rate, textural properties), microbial (total bacteria, *Staphylococcus aurus*, *E. coli*., *Salmonella* spp.) and sensory characteristics (colour, taste, texture, flavor and overall acceptability) were analyzed, at day 1, week 1, week 2, week 3 and week 4 of storage.

Inclusion of the juice, syrup and paste reduced total solids, fat, acidity and total soluble solid, and increased antioxidant activity. Ash content increased with the ginger paste, whereas it decreased with the ginger juice and syrup. First dripping time amplified and melting rate declined with all the ginger preparations. And also, textural properties increased and microbial activity decreased with ginger added ice creams. Further, all the processed ginger added ice creams achieved the highest overall acceptability scores than without ginger added ice cream.

The results of this study revealed that, the total solid (37.62±0.95%), fat (8.87±0.31%) and total soluble solid (29.07±0.95%) content were significantly ($p<0.05$) higher in without ginger incorporated ice cream. Titratable acidity (0.27±0.01%) content was significantly ($p<0.05$) higher in ice cream incorporated with ginger juice. pH was significantly higher in without ginger incorporated ice cream (6.59±0.01). Ginger juice incorporated ice cream showed the highest antioxidant activity (30.47±0.78 mM/g) and least value (9.13±0.31 mM/g) showed in without ginger incorporated ice cream. The first dripping time was significantly ($p<0.05$) higher in ginger paste incorporated ice cream (14.02±0.34 min) and lowest value showed in without ginger incorporated ice cream (6.36±1.01 min). Hardness were significantly ($p<0.05$) higher in ginger paste added ice cream and lowest in without ginger added ice cream. Moreover, microbial activity was lower (1.2×103) in ginger syrup added ice cream. During storage, the total solid, ash, fat, total soluble solid content, dripping

time and textural properties were significantly ($p<0.05$) increased. pH content, antioxidant activity and melting rate were significantly ($p<0.05$) decreased with the storage period. Organoleptic properties were evaluated though the panel of 30 members. As a result of organoleptic characteristics revealed that, 5% of ginger syrup incorporated ice cream had the highest mean score of overall quality of all sensorial properties namely, colour, taste, texture, aroma, and overall acceptability. Finally, it could be concluded that the processed ginger is enriching the ice cream manufacture and it is important to improvement of human nutrition.

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THE EFFECT OF *Terminalia catappa* L. LEAVES EXTRACT ON THE WATER QUALITIES, PERFORMANCE AND BLOOD PROFILE OF ORNAMENTAL FISH KOI CARP (*Cyprinus carpio haematopterus*) CULTURED

M. L. Siriwardana

ABSTRACT

Ornamental fish industry is one of the rapidly growing sectors in Sri Lanka. Fish farmers face lot of problems with the water quality maintaining and disease management in ornamental fish culture. Nowadays, there is a need of environment friendly, inexpensive and alternative water media. Therefore, this research aimed to determine the effects of *Terminalia catappa* L. leaves extract (TCL) on water quality properties, survival, blood profile and growth performance of ornamental fish Koi carp (*Cyprinus carpio haematopterus*) cultured. Hence, this experiment was conducted to study the suitability of replacing normal water with TCL.

The experiment was conducted at the Laboratory of the Department of Animal Science, Faculty of Agriculture, Eastern University, Sri Lanka, for a period of 45 days. T catappa dry and brown leaves were collected from the Eastern University, Sri Lanka. One hundred and sixty two fish were randomly assigned into the six triplicate groups and reared in various concentrations (T0 = normal water, T1 = 100 mg/l of TCL added, T2 = 200 mg/l of TCL added, T3 = 300 mg/l, T4 = 400 mg/l of TCL added and T5 = 500 mg/l of TCL added) with Completely Randomized Design (CRD). Data were collected for water quality parameters, feed intake, length and weight of Cyprinus carpio haematopterus fingerlings, starting from 74 days up to 119 days of growth. Weight were recorded at weekly interval and length were recorded once in two weeks. After 45 days, survival and blood profile were analyzed.

The present study showed that, there was a significance ($p<0.05$) difference in pH, DO, temperature, EC, turbidity, TDS with treatments throughout the experiment. The lowest pH value was observed in 500 mg/l of TCL added treatment. The DO values were decreased with the increasing concentration. The temperature was ranged between (29.53-27.50). Electrical Conductivity values were increasing with the TCL with concentration. Turbidity values were decreased with a decreasing concentration of TCL. Total Dissolved Solids values were increased with increasing concentration of (*Cyprinus carpio haematopterus*) culture. The Salinity was showed 1.006 ppt throughout the experiment. However, the present study was showed an accepted range of main water quality parameters such as pH, temperature and DO.

There were no significant differences ($p>0.05$) observed in the survival rate of (*Cyprinus carpio haematopterus*) during experimental time period. However, adding TCL above 300 mg/l showed high mean survival rate. Based on the current results it was found that groups of fish Koi carps Cyprinus carpio haematopterus treated with 400 mg/l of TCL have been recorded the lower RBC level and higher WBC, Hb, lymphocyte, monocyte, neutrophil, eosinophil and platelet count than in any other treatments whereas the lowest lymphocyte resulted in control treatment. Standard length gains and body weight gain, SGR, and FCR were significantly ($p>0.05$) differed between the treatments and best results exhibited in the treatment where 400 mg/l of TCL added. It could be concluded that, addition of 400 mg/l TCL enhanced the water quality parameters, survival rate, blood profile and growth performance of ornamental fish Koi carp (*Cyprinus carpio haematopterus*) cultured and that could be used as an alternative way to reduce diseases and problems related to water quality in ornamental fish culture.

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