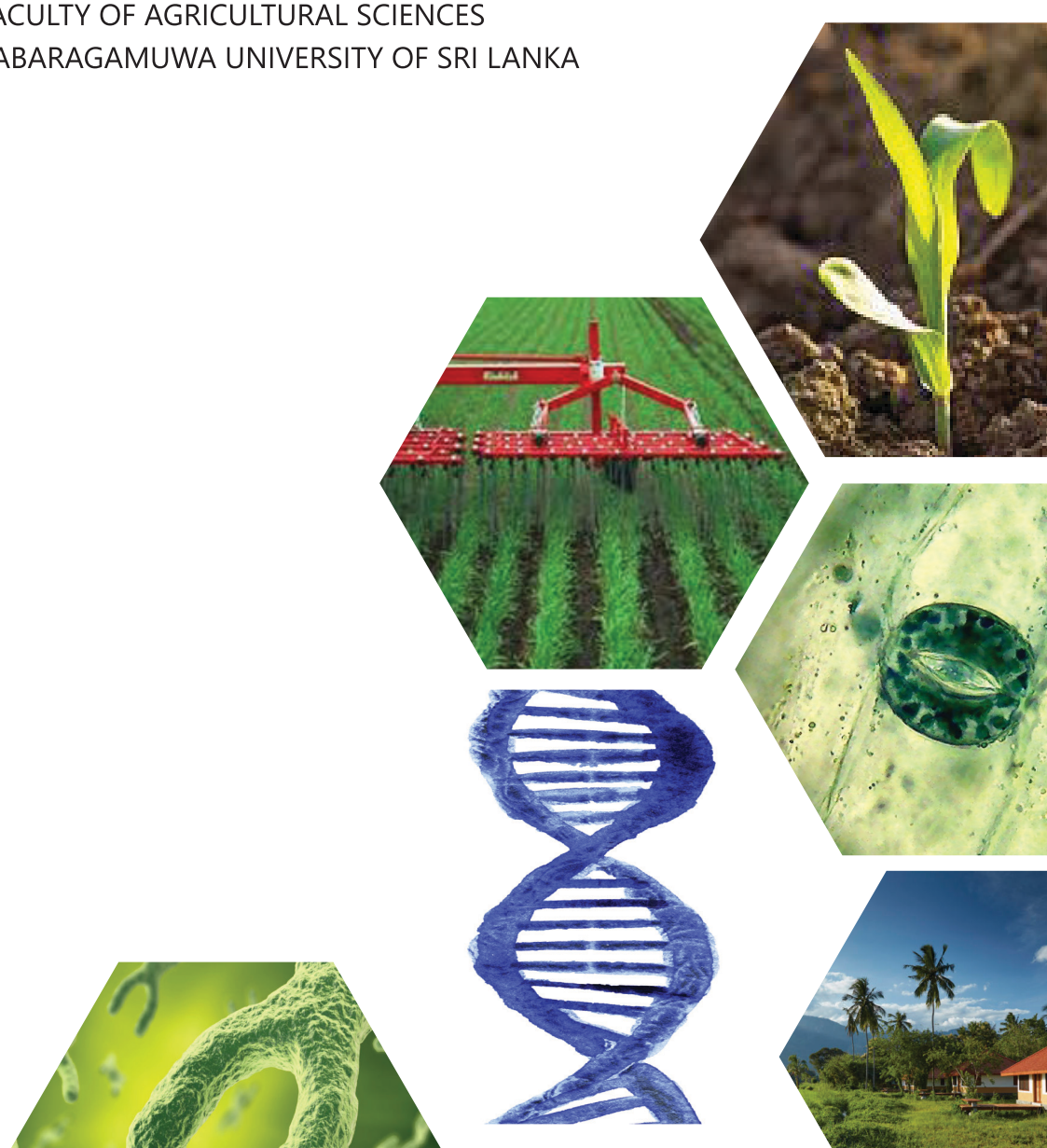
PROCEEDINGS OF THE UNDERGRADUATE RESEARCH

ISSN 2714-1497 | Volume 01-2019

FACULTY OF AGRICULTURAL SCIENCES
SABARAGAMUWA UNIVERSITY OF SRI LANKA



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A MESSAGE FROM THE DEAN

It is indeed a privilege for sending a congratulatory message for the Undergraduate Research Proceedings-2019 organized by the Faculty of Agricultural Sciences under the flagship of Department of Export Agriculture and Department of Livestock Production of Sabaragamuwa University of Sri Lanka. This is a particularly fascinating time to study Agricultural Sciences. Major technological advances and business options are opening up many new areas, from ecosystems to nano-technology, food and agribusiness management to animal bioresource production, animal ethics with animal welfare issues together the boundaries between traditional areas are blurring as inter-disciplinary research leads to rapid progress on a wide range of issues in environmental, health and technology related industries that underpin the future prosperity and quality of life in Sri Lanka. Advanced Science degree and specialist streams within the undergraduate curricular that provide more directed science training for agricultural science students especially for BSc Agricultural Sciences and Management, and in most cases, opportunities for industry placements. Innovations in Animal Sciences, Food Science, Food technology, Plant biotechnology, export agriculture crops and varied food business opportunities are the platform for professionals, researchers, food manufacturers, start-up founders, students and policy makers to discuss advancements in the world of food production and food security. This mini conference will discuss about the innovations in the Plant and animal industry and provide the opportunity to network and collaborate with the all attendees including students where main intention to create a platform to encourage young students towards the research culture. In our next era we will turn our capacities outward, partnering with centers of excellence across and beyond SUSL to tackle the grand challenges that matter most to broad constituencies. How can we expand economic opportunity? Increase access to services and other resources? Promote food security? Animal welfare and ethics? Build sustainably? Serve justice? By leveraging the university's collateral strengths, we can help build the next economy and polity for Faculty of Agricultural Sciences of Sabaragamuwa University– as well as for other places wrestling with the challenges and opportunities of modernization.

Professor Manjula P.S. Magamage
Dean - Faculty of Agricultural Sciences

A MESSAGE FROM THE HEAD- DEPARTMENT OF EXPORT AGRICULTURE

With a great pleasure I write this message for this issue of publication which is I considered more important activity pursued by the Faculty of Agricultural Sciences.

Doing scientific research is most important responsibility of Universities to cater new knowledge to the scientific world to go for better outcome for betterment of the mankind. Undergraduate research is starting venture for scientific research and hence need good recognition. Publishing the findings is also having similar value, as the findings goes to public and will use as a base for future research and automatically will have value with good recognition.

Undergraduate researches, though categorized as student research, are also equally important as having outstanding findings. With that view in mind, I personally happy to see undergraduate findings are in print. Printing is the last step of long term tiresome work of collecting documents and compiling them with correction of reviewer comments and contact reviewers and authors vice versa. I must appreciate work done by publishing committee and editors of this work to bring this publication into good standard. This will more helpful for our students for their carrier as having sort of scientific publication.

I hope this product have good value among university community and outside community with similar interest.

Dr. P.K. Dissanayake
Head/Department of Export Agriculture
Faculty of Agricultural Sciences

A MESSAGE FROM THE HEAD- DEPARTMENT OF LIVESTOCK PRODUCTION

It is a great pleasure to have the opportunity to send a message to this important event of releasing the Abstract Book with the abstracts of researches conducted by the final year undergraduates of the Faculty of Agricultural Sciences of the Sabaragamuwa University of Sri Lanka.

As I believe, the greatest asset to a developing country such as Sri Lanka is the human resources with proper technical knowledge, skills and positive attitudes to assure a prosperous future. Hence, there will be no greater challenge than to build a community of scientific and technological personnel, highly skilled, enterprising and motivated to produce leading edge research. It is only such research that will enable the country to develop a solid scientific base. This kind of exercises will initiate the building of research personnel and creating a research culture in universities. Therefore, I congratulate to all who are leading this valuable exercise and involve in numerous activities related to this. May I express the plea that this important practice be sustained for the future.

Dr. T. Sanjeewa Prasad Jayaweera
Head/ Department of Livestock Production
Faculty of Agricultural Sciences

FORWARD

It is my pleasure and a great privilege to present to you the second issue of the Proceeding of the Undergraduate Research Seminars conducted in 2019 at the Faculty of Agricultural Science, Sabaragamuwa University of Sri Lanka. Innovative findings of multidisciplinary research and new concepts created by our undergraduates under the supervision of well qualified academic staff attached to two departments covering the areas of Commercial Horticulture, Plantation Management, and Livestock Production to make a significant contribution to new knowledge while attracting the attention of the international audience. I am very much proud to convey the spirit of these findings will be extremely useful to fulfill the research gap upon the above fields. On the other hand, the aim of this fruitful exercise is to provide a forum for the dissemination of original research concepts in all areas related to the agriculture sector.

The diverse experience of the faculty board members allows our editorial panel to lend their expertise to a broad spectrum of scientific fields mentioned the above. And the entire editorial board and I strongly encourage our undergraduates to submit their novel and insightful valuable findings gathered even during the short-time period to educate and support the discipline of Agriculture.

I extend my profound appreciation to all personnel who gave invaluable comments in numerous ways to make this fruitful exercise a success.

Senior Professor Lal P. Vidhana Arachchi
Editor-in-Chief

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DEPARTMENT OF LIVESTOCK PRODUCTION

DEPARTMENT OF EXPORT AGRICULTURE

EFFECT OF SODIUM CHLORIDE (NaCl) ON GROWTH AND DEVELOPMENT OF THE CINNAMON (*Cinnamomum zeylanicum Blume*) SEEDLINGS

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ABSTRACT

Sri Lanka is the world's largest producer and the exporter of true cinnamon (*Cinnamomum zeylanicum* Blume). Cinnamon growers in some areas in southern province add "Agriculture salt" to the soil as an amendment without any recommendation, expecting a higher growth of the plants. No research has been conducted so far to identify the effect of Agriculture salt on growth and development of the cinnamon plants. The experiment was carried out to investigate the effect of Agriculture salt as a soil amendment on the growth of cinnamon plant (*Cinnamomum zeylanicum* Blume) at the National Cinnamon Research and Training Center, Palolpitiya, Thihagoda, under rain shelter condition with transparent polythene. Nine treatments, namely 0% Sodium Chloride (NaCl) (T1), 1% NaCl (T2), 2% NaCl (T3), 3% NaCl (T4), 4% NaCl (T5), 5% NaCl (T6), 10% NaCl (T7), 15% NaCl (T8) and 20% NaCl (T9) were tested in Complete Randomized Design with three replicates by establishing new cinnamon plants through seeds. The highest soil EC was observed in T9 (0.67dS/m) and gradually decreased with the concentration. Salinity caused reduction in seedling emergence. No any significant difference was found among T1, T2, T3, T4 and T5 treatments in relation to the growth parameters of number of leaves and shoot height. The highest dry weight of above ground bio mass, maximum root length and total fresh weight of plant was recorded in T5 and it was significantly different from the other treatments. No significant difference

was found among T1, T3, T4, T5 and T7 treatments in relation to the total root length. No any significant difference was found among T1, T2, T3, T4, T5, T6 and T7 treatments in relation to dry root mass. Growth parameters of T8 and T9 are different from all other treatments showing poor performances. There is an effect of salt on root growth rather than the shoot growth of the cinnamon seedlings up to 4% concentration and when the concentration is higher than 4%, germination was delayed. 4 percent sodium chloride is the critical concentration for the root growth of cinnamon seedlings.

Keywords: *Cinnamon, Growth and development, Sodium chloride*

EVALUATION OF *EUCALYPTUS* SPECIES AND PROVENANCES TRIAL IN THE UPCOUNTRY INTERMEDIATE ZONE IN SRI LANKA

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ABSTRACT

Timber requirement for constructions and furniture industry is expanding in the country. In order to supply the increasing demand of the timber, selection and improvement of high yielding tree species is a timely requirement. Therefore, Forest Department in 1995 established Eucalyptus species and Provenances trial at Erabedda, Walimada at Upcountry Intermediate Zone. The trial comprises with *Eucalyptus grandis* (2 Provenances), *Eucalyptus cloeziana* (4 Provenances), *Eucalyptus urophylla* (1 Provenances), *Eucalyptus microcorys* (2 Provenances) and *Eucalyptus dunnii* (2 Provenances). The experiment was laid in Randomized Complete Block Design with 4 replicates, each plot consists 25 trees at the establishment. Along with thinning at 3 stages (7 years, 13 years and 18 years after planting) stem diameter at Breast Height (DBH), tree height, tree stem volume, straightness, health and survival of tree were assessed. Data were analyzed using ANOVA, mean value were estimated using the software programs Dataplus and Genstat 5.3.2. Species, provenances and individual tree selection within species were performed using a simple selection index (Independent culling method) based on the relation between individual tree volume and stem straightness. Results indicates that there are significant differences ($P<0.05$) among Species and Provenances for stem diameter (DBH), tree height, tree volume, straightness, health and survival of tree. Among the five Eucalyptus species, *E. grandis* (1.34 m^3 volume) showed the best growth at the age 24 years and both *E. cloeziana* (0.98

m^3 volume) and *E. microcorys* (1.20 m^3 volume) also well performed than unsatisfactorily performed *E. dunnii* (0.75 m^3 volume). Significant variation among the provenances within species also showed (<0.050). At provenances level, *E. cloeziana* the provenance CSIRO No. 17008 (1.68 m^3 volume) was performed best growth at first (7 years) stage and *E. grandis* (CSIRO No. 17710) and *E. microcorys* (CSIRO No. 16455) provenances (1.42 m^3 and 1.22 m^3 volume respectively) also performed well. In phenotypic selection among volume and straightness within the species, *E. grandis* species and *E. cloeziana* (17008) provenance showed best yield performance compared with other species and provenances. The results suggest that *E. grandis* species and *E. cloeziana* (17008) provenances are the most performed Species and Provenances for future improvement programs and for commercial plantations establishment in upcountry intermediate zone in Sri Lanka.

***Keywords**: Eucalyptus, Growth, Provenances variation, Selection*

EFFECT OF DIFFERENT POTTING MIXTURES ON SOIL MOISTURE CONSERVATION AND GROWTH OF BLACK PEPER (*Piper nigrum*) UNDER DIFFERENT IRRIGATION INTERVALS

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ABSTRACT

Black pepper (*Piper nigrum* L.) is one of the most important and valued spices in the world. At present, water has become a limiting factor for the crop production. Nursery stage of black pepper requires higher moisture for the production of healthy planting materials. Incorporation of moisture retention substances into nursery mixtures is one of the best options to retain required amount of irrigation water and to increase the irrigation interval. The aim of the present study was to evaluate the effect of various potting mixtures which contain different moisture retention substances and various irrigation intervals on growth of black pepper at the nursery stage. A factorial experiment was conducted as Complete Randomized Design along with 3 replicates. Four potting mixtures namely A1; top soil : cattle manure : sand : coir dust (1:1:1:1), A2; top soil : cattle manure : sand : coir dust : super absorbent polymers (1:1:1:1:2g/pot), A3; top soil : cattle manure : partially burned paddy husk biochar (1:1:2) and A4; top soil : cattle manure : plant wood biochar (1:1:2) were tested with four different irrigation intervals (4 days, 6 days, 8 days and 10 days).There was a significant difference among the various potting mixtures with respect to fresh weight of roots, fresh weight of shoots, dry weight of roots, dry weight of shoots, inter nodal length, root length, shoot length, number of leaves, stem diameter and soil moisture retention. Irrigation intervals have significantly affected

on fresh weight of roots, fresh weight of shoots, intermodal length, root length and soil moisture retention of the pepper plants. A2 potting mixture which contained Super Absorbent Polymers has shown the best growth performances when compared with the other potting mixtures. Even though, A4 potting mixture has shown higher moisture retention. It did not demonstrate comparable growth performances. Therefore, application of Super Absorbent Polymers to the nursery potting mixtures can increase the irrigation interval up to 8 days without compensating the growth at the nursery stage of black pepper.

***Keywords**: Black pepper, Irrigation interval, Potting mixture, Super Absorbent Polymers*

EFFECT OF SIZE AND COLOUR OF POLY BAGS ON GROWTH OF RUBBER (*Hevea brasiliensis*) PLANTS UNDER NURSERY CONDITIONS

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ABSTRACT

Problems regarding rubber nursery management include limited availability of top soil, high transportation cost, limited space, higher price of poly bags and handling difficulties. Heat stress is also considered to be a major problem, especially for growth and bud grafting success during dry spells in rubber nurseries. Therefore, study was conducted to evaluate the growth performance of rubber (*Hevea brasiliensis*) seedlings and budded plants raised in different sizes of poly bags; standard size (Control: 15cm×37.5cm) and reduced sizes(T1:12.5 cm×32.5 cm, T2: 12.5 cm×37.5 cm, T3:15 cm×32.5 cm). Further, performances of rubber plants raised in standard coloured (black) and alternative coloured (transparent) poly bags were evaluated. Growth parameters of rubber seedlings and budded plants such as stem diameter, stem height, number of leaves, chlorophyll content, leaf area, length of tap root, dry weight of shoots and roots of rubber seedlings(3 months intervals before bud grafting).In addition, budded plants (green budding with Clone RRISL 2001) bud grafting percentage(21 days after bud grafting), sprouting percentage(7,14,21 days after cut back), shoot angle, shoot length, number of leaves, tap root length (21 days and 28 days from cut back) and dry weight of roots and shoots were recorded. Significant differences were observed for some growth parameters of seedlings raised in different sizes of poly bags. Control treatment (standard size) had higher mean value for leaf area (540.54±47.55cm^2). Mean dry

weight of shoots (10.85±1.95 g) and early secondary and secondary roots (0.71±0.06 g) of T3 showed comparatively higher values to the control, T1 and T2 treatments. No significant differences were observed for shoot and root parameters of budded plants. A significantly higher mean leaf area value (2342.08±203.86cm^2) was recorded for seedlings raised in black colored poly bags as compared to transparent poly bags. Nevertheless, a significantly higher value for mean dry weight of secondary roots (0.79±0.14 g) was recorded for seedlings raised in transparent poly bags. However, a higher sprouting percentage was observed for the plants raised in black colour poly bags as compared to the transparent polybags. As the cost of a transparent poly bag is a little higher than a black colour polybag and no significant differences in seedlings parameters, use of transparent polybags to raise seedlings in nurseries established in the Wet Zone is the good alternative.

Keywords*: Growth parameters, Polybag size, Polybag colour*

EVALUATION OF PHYSICO-CHEMICAL COMPOSITION OF DIFFERENT PAPAYA (*Carica Papaya* L.) VARIETIES AVAILABLE IN THE MARKET

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ABSTRACT

Papaya (*Carica papaya* L.) is an economically important tropical fruit which exhibits different physico-chemical properties relevant to varieties present in the market. Therefore, a laboratory experiment was conducted at the Fruit Research and Development Institute, Horana to investigate the different physico-chemical characteristics in five papaya varieties namely, Horana Hybrid, Red Lady, Maradona, Vega and Red Royal. Fruit weight, length, width, circumference, flesh weight, seed weight, flesh thickness, peel thickness, pH, titratable acidity, total soluble solids, total sugar, reducing sugar, non-reducing sugar, vitamin C, beta-carotene and antioxidant activity were measured separately. Completely Randomized Design (CRD) was used with three replicates. The highest fresh weight (1.401±0.23kg) and circumference (39.03±3.26cm) were recorded in variety Red Royal. Variety Red Lady showed the highest seed weight (79.06±0.63g) compared to other varieties. The maximum length (24.36±2.19cm), width (11.86±1.15cm) and peel thickness (1.26±0.15mm) were recorded in Maradona. Also, the highest total soluble solids (12.13±0.25Brix) and titratable acidity (0.085±0.005%) were recorded in Maradona variety. The highest non-reducing sugar content (3.90±0.04%) and beta-carotene content (57.66±5.17mg/100g) were recorded in variety Red Lady and highest total sugar content (10.33±0.06%) and reducing sugar (7.49±0.07%) content were recorded

in variety Red Royal. Simultaneously, the highest antioxidant activity (3.06±0.12%) was recorded in Red Royal variety. The pH range was 5.4 to 5.7 and vitamin C range was 40.36 mg/100g to 44.65 mg/100g among these varieties. Therefore, this study concludes that the Red Lady, Red Royal and Maradona varieties have some desirable physico-chemical characteristics among compared varieties and those varieties are more important in commercial production.

***Keywords**: Anti-oxidant, Papaya varieties, Physico-chemical composition*

EARLY SELECTION OF RUBBER (*Hevea brasiliensis*) BASED ON BARK ANATOMICAL CHARATERISTICS OF MOTHER PLANT NURSERY

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ABSTRACT

Rubber hybridization and selection program focus on evaluation of genetic potential of planting materials to develop superior clones and the process takes minimum of 20-25 years. Selection of accessions which have best genetic potential at the early stage is important to shorten and strengthen the breeding cycle. Twenty-four accessions at mother plant nursery belongs to the year 2012 hand pollinated progeny were selected for the study. Average yield and girth were measured as yield and growth parameters of each accessions. Density of the latex vessels, number of latex vessel rows and average latex vessels diameter were measured as bark anatomical parameters. Independent data sets of yield and growth parameters and bark anatomical traits of 20 accessions were subjected to step wise agglomerative hierarchical clustering for grouping similar traits. According to the multivariate analysis of variance, three selected bark anatomical traits were identified as significant parameters for early selection of accessions. Depending upon the range of diversity, discriminant function was developed. Accordingly, 65% of yield variability was able to be explained by using above mentioned bark anatomical parameters. Therefore, model was validated with independent data sets of four accessions. Accordingly, four accessions were successfully grouped in their respective groups. In conclusion, bark anatomical parameters used in present study could be

used as potential indirect selection of rubber progenies at mother plant nurseries.

Keywords: *Hevea breeding, Cluster analysis, Latex vessels, Girth, discrimination function*

EFFECT OF DIFFERENT NUTRIENTSUPPLEMENTSON INDUCTIONOF FLOWER INITIATIONIN BLACK PEPPER (*Piper nigrum* L.) UNDER SUPPLEMENTARY IRRIGATION

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ABSTRACT

Black pepper (*Piper nigrum* L.) popularly known as "King of spices" is the largest commodity in the international spice trade. Lack of uniform flowering is a major problem in black pepper cultivation due to climate variation. Owing to that, farmers have to face lot of difficulties during harvesting and processing of black pepper. Therefore, this study was conducted at Intercropping and Betel Research Station, Narammala (IL1a) to increase the crop productivity though stimulation of uniform flower initiation. Well grown black pepper (Hybrid-Panniyur-1) plants were given various nutrient supplementswhichT1-without any application as the control, as foliar applications of Urea and MOP mixture at the rate of 1%, 1.5%, 2% per plant as T2, T3,T4 orderly three times in two weeks interval, as soil applications of 60 g (T5), 65 g (T6), 70 g (T7) of secondary and micronutrients (SMN), 10 g, 15 g, 20 g of Urea and MOP per plant as T8, T9, T10, and 10 g (Urea+MOP) + 60 g SMN (T11), 15 g (Urea+MOP)+ 65g SMN (T12), 20 g (Urea+MOP)+70 g SMN (T13). Among the treatments, the highest number of spikes (128) was recorded in T13 compared to the control (60) at each spike initiation. The best vegetative growth (number of leaf bud initiation-128) was also recorded in T13 compared to the control (41). However, the lowest number of days (14) were taken by T4 to initiate spikes after the treatment application compared to the control (24). The highest spike length (15.23 cm) was also recorded in T4 compared to the control (11.66

cm). There was no significant difference between T4 and T13 on number of spike initiation and number of leaf bud initiation. Hence, among the treatment combinations T4 (2% Urea+ MOP) foliar application and T13 (20 g (Urea+MOP) +70 g SMN) soil application perform superior. Moreover, these results need to be confirmed by further studies.

***Keywords**: Black pepper, Flower initiation, Micronutrient*

EFFECT OF DIFFERENT MULCHING MATERIAL ON SOIL MOISTURE RETENTION AND LEAF YIELD OF BETEL (*Piper betle* L.)

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ABSTRACT

Betel (*Piper betl*e L.) is an important export agricultural crop with considerable economic value. It is popular around Gampaha and Kurunegala districts which belong to wet zone and intermediate zone. Betel is a succulent plant, thus very sensitive to soil moisture. Optimum soil moisture condition promotes continuous vegetative growth and higher leaf yield. Hence, mulching is a very important practice in betel cultivation. Thus, the selection of good mulching material from available resources is an important decision for successful betel cultivation. Therefore, this experiment was carried out at Intercropping and Betel Research Station, Narammala with an objective to compare the soil moisture conservation practices with respect to growth of betel under different mulches namely, cinnamon shavings, paddy straw, cinnamon leaves, biodegradable polythene, gliricidia leaves and dried water hyacinth. Coconut fronds were considered as the control and betel cultivar Maneru was selected for the experiment. Soil moisture content under different mulches was evaluated using TDR sensor during the experimental period. The experiment was laid out in a randomized complete block design with four replicates. Results showed that the highest moisture content (27.38% ± 3.64) and soil temperature (32.37^{0}C ± 0.10) were reported from betel vines applied with dried water hyacinth, while the control showed the lowest. However, canopy temperature in

different mulches was not significant. Vegetative growth parameters such as number of leaves, total shoot height, intermodal length and leaf area of betel were significantly higher in and cinnamon leaves compared to other treatments. It is evident from results that applied betel vines showed better performances on growth parameters compared to other treatments.

Keywords: *Growth parameters, Mulches, Soil moisture, TDR sensor*

EFFECT OF SPERMIDINE ON COCONUT (*Cocos nucifera* L.) IN-VITRO CULTURE

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ABSTRACT

Coconut(*Cocos nucifera* L.) is a cross pollinated palm and propagated only by seeds. Coconut palms raised from seeds show a wide variation in the field due to their high heterozygous nature. Tissue culture is the only vegetative propagation method available for coconut. There is a high potential for the un-fertilized ovary explants in clonal propagation. However, due to high recalcitrant nature of coconut with respect to tissue culture, various problems have been encountered during *in vitro* propagation. Polyamines are a recent addition to the class of plant growth regulators and play a vital role in several plant growth and development processes. The present experiment was conducted to evaluate the effect of spermidine on coconut *in-vitro* culture. The experiment was conducted at the Coconut Research Institute, Lunuwila. Three factor factorial Randomized Complete Block Design was used. Treatment combinations: palm type(responsive/putative and non-responsive palms), media (two media with two 2,4-dichlorophenoxyacetic acid concentrations as 600 µM and 160 µM) and with and without spermidine, were replicated six times. The callus induction was obtained by culturing unfertilized ovaries at -4 stage. Data were recorded at the fifth week after culture establishment. There was no significant effect of palm type on mean callus percentage ($P>0.05$). A significant difference was observed in callus initiation between the two media tested. Medium A showed significantly higher mean callus initiation and higher percentage of browning explants compared to those in medium B. There was no significant difference of callus initiation between media with or without

spermidine. In conclusion, spermidine has no effect on callus initiation of coconut ovary cultures.

Keywords: *Callus initiation, Coconut, In-vitro culture, Ovary, Polyamine*

COMPARATIVE STUDY ON CHEMICAL COMPOSITION, CURCUMIN CONTENT AND PROXIMATE ANALYSIS OF DRIED TURMERIC ACCESSIONS (*Curcuma longa* L.)

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ABSTRACT

Turmeric*, Curcuma longa L.* is known as a major spice, coloring and flavoring agent widely cultivated in Asian countries. The most imperative fraction of turmeric is curcumin, the major component being responsible for its biological actions. Variations in chemical composition of different accessions of turmeric in Sri Lanka are not quantitatively and qualitatively analyzed. This study was mainly focused to determine the major chemical compounds and curcumin content of different turmeric accessions collected from different locations and cultivated thereafter at the Department of Export Agriculture in Matale under recommended management practices. Major chemical compounds in the volatile oil were determined using the Gas Liquid Chromatography and curcumin content was evaluated using the spectrophotometer. The results clearly revealed that there were significant differences ($p<0.05$) among turmeric accessions in major chemical compounds and curcumin contents. Major chemical compounds were ar-turmerone and curlone. Their mean values ranged from 51.35±0.46 to 11.45±0.63 and 62.47±0.31 to 36.03±0.03 respectively. Curcumin contents ranged from 6.47 ± 0.19 to 3.64 ± 0.13. Further, results envisaged that oleoresin content, volatile oil content, total phenolic content and proximate composition were significantly higher in accession No. 3 and 32 compared to other accessions. It is evident that curcumin content of all accessions are in standard level. However, the chemical composition was varied in different accessions.

Moreover, cluster analysis revealed that all accessions were classified into three groups based on their curcumin and ar-turmerone content. Therefore, information of present study will be extremely useful to initiate turmeric breeding programs.

Keywords: *Turmeric, Gas Liquid Chromatography, Spectrophotometry*

EFFECT OF ASSOCIATED MICROBES ON PRODUCTION OF SECONDARY METABOLITES OF WALLA PATTA (*Gyrinops walla*) IN *IN VITRO* CULTURES

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ABSTRACT

Walla Patta, scientifically known as *Gyrinopswalla,* which can produce agar wood through a self-defense mechanism, is an endemic plant to Sri Lanka. Agarwood is a highly expensive resinous heartwood product which is used mainly for perfumery and medicine manufacturing. These resinous secondary metabolites are produced due to the natural microbial infection in the plant. This experiment was conducted mainly to evaluate the effect of associated fungi and actinomycetes on the production of secondary metabolites of Walla Patta (*Gyrinops walla)in vitro* culture. The experiment was started with 3 months old calli. During the callus multiplication period an experiment was carried out to evaluate the efficiency of callus multiplication for *Gyrinops walla* in solid and liquid media under light and dark conditions for four weeks. Experiments were laid out with Completely Randomized Design with six replicates. At the end of the period, the best callus multiplication was recorded from solid media under light condition with the highest scores of 24. With the multiplicated calli five treatments including the control were designed to evaluate the microbial effect on calli by analyzing the secondary metabolite content. Live associated fungi, attenuated associated fungi, live associated actinomycetes and attenuated associated actinomycetes were co-cultured with *Gyrinops walla* calluses in the same system. After 2 weeks the secondary metabolites content of calli was analyzed by Gas Chromatography- Mass Spectrometry technique, Thin Layer Chromatography method and Total Polyphenolic Content Assay. The

calli that co cultured with live associated fungi and live associated actinomycetes showed the highest secondary metabolites content rather than attenuated models. According to the Total Polyphenolic Content Assay, the highest Polyphenolic content was recorded from the treatment that cocultured with live associated fungi with 1.60 µg GAE/g FW value. This experiment concluded that associated microbes of *Gyrinops walla* act as biotic elicitors and stimulate the secondary metabolites production in calli.

Keywords*: Actinomycetes, Walla Patta, Associated microbes, Fungi, Secondary metabolites*

IMPACT OF DIFFERENT AERATION METHODS AND APPLICATION FREQUENCIES ON POTATO MINI TUBER PRODUCTION IN DEEP FLOW TECHNIQUE

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ABSTRACT

Potato (*Solanum tuberosum* L.) is one of the popular crops among upcountry farmers. The main constraint related to cultivation of this crop is lack of high-quality seed tubers at low price at the correct time. To reduce the cost of production, farmers and institutes try to produce seed potatoes through hydroponic systems. Deep flow hydroponic system is one of the best ways of producing seed potato to overcome the prevailing constraints. The present study was carried out to assess the impacts of various aeration methods and their application frequencies on seed potato production in deep flow hydroponic system. The experiment was carried out as Completely Randomized Design with four replicates in a greenhouse, at Regional Agriculture Research and Development Centre, Bandarawela during February to July, 2019. Three weeks-old potato (Variety-Granola) plants were established in deep flow hydroponic system. In this experiment oxygen was supplied using an aquarium pump (2.7 ppm-O_2), submersible pump (2.4 ppm-O_2) and shower method (2.3 ppm-O_2) in three times per day (9.00 a.m., 12.00 p.m. and 3.00 p.m.) and four times per day (8.30 a.m., 10.30 a.m., 12.30 p.m. and 2.30 p.m.). The control was just replacing water by 1-week intervals without using any aeration method. Growth parameters such as plant height, root length, root volume, number of lateral branches, number of leaves, number of stolon, number of tubers, tuber diameter and pest and disease incidences were recorded. According to the results significantly higher plant height (131.8 cm), root length (30.5 cm), root volume (3.2

ml) and a higher number of tubers (16) were found in aquarium pump treatment ($P<0.05$) and it was 41% higher than the control. The higher number of root disease infected plants were found in the control. By considering the aeration frequency, 3 times aeration per day was more cost effective. It is evident from results that supplying of oxygen three times per day using an aquarium pump employed for high productivity. Furthermore, root disease infection (root rot) caused by *Pythium* spp. can be reduced by improving aeration in a nutrient medium.

Keywords: *Deep flow technique, Mini tuber, Oxygen enrichment, Seed potato.*

EFFECT OF DIFFERENT GROWTH PROMOTING SUBSTANCES ON SHOOT AND ROOT GROWTH OF BLACK PEPPER *(Piper nigrum* L.*)* CUTTINGS

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ABSTRACT

In Sri Lanka, though the conventional vegetative propagation through cuttings is commercially adopted in black pepper cultivation, the availability of high quality planting materials is one of the major constraints in increasing the crop productivity. Use of growth promoting substances is found to be helpful in removing the barriers imposed by genetic and environmental factors by raising the production of high quality planting materials. Therefore, the present study was designed to study the effectiveness of growth promoting substances and the best concentration level for vegetative propagation of black pepper cuttings, i.e. hybrid Dingirala. The experiment was conducted in a net house and consisted with ten treatments which are triplicated using Complete Randomized Design. The treatments comprised of three concentration levels of three commercially available plant growth promoting substances, namely; common synthetic growth regulator IBA; (500,1000and1500 ppm), brown sea weed extract from *Ascophyllum nodosum* (20000,40000and60000 ppm) and seed suspension extract from *Lychnis viscaria* (200,400and600 ppm) with the control. Results showed that there is a significant effect from growth promoting substances containing IBA, brown sea weed extract and seed suspension extract containing products on shoot and root parameters of black pepper. The effective concentration of 500 ppm IBA had significantly increased the dry weight of shoots (1.10 g ±0.07) and fresh weight of roots (1.82 g

±0.12) against the control. Significantly the highest shoot length (28.22 cm ± 4.53), the highest total root length (163.707 cm ±12.43), the highest dry weight of roots (0.11 g ±0.01) and the highest number of primary roots (22.17 ±0.20) were recorded in 1000 ppm IBA compared to the control. Both 1500 ppm IBA and 600 ppm seed suspension extract showed significantly higher fresh weight of shoots (8.12 g ±0.72 and 7.61 g ±0.97 respectively) where significantly the highest stem diameter (4.67 mm ±0.68) was recorded in 1500 ppm IBA comparative to the control. There was no significant treatment effect present on number of leaves per plant, number of days taken to 50% shoots initiation and number of survived plants at the end of the experiment. However, IBA had significantly responded for most of the growth parameters where IBA at 1000 ppm had performed the best. Therefore, it is evident from results that the IBA is helpful in vegetative propagation of black pepper cuttings compared to the organic plant extracts tested.

Keywords: *Vegetative propagation, Organic, Plant extract, Rooting, Hormones*

SCREENING THE EFFICACY OF HERBICIDE (GLUFOSINATE AMMONIUM 280g/l SL) AGAINST WEEDS IN TEA LANDS

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ABSTRACT

Weed is a plant which grows in an undesired place while interfering to the crop growth. Controlling of weeds by following chemical methods are most convenient, cost effective and lesser disturbance to the soil than manual weeding. After banning some post emergent chemical herbicides, tea sector faced huge problem in controlling weeds. This study was conducted to investigate the efficacy of Glufosinate ammonium 28% SL to control weeds in tea lands in comparison to Glyphosate 36% w/v which is the standard herbicide as post emergent non selective. Four treatments of Glufosinate ammonium (500, 600, 700, 800 ml/ha in 500 L/ha of water) were tested at high, mid and low elevations of tea lands. For mid and low elevations, rates of Glufosinate ammonium were compared with two rates of Glyphosate (1.4, 2.8 L/ha in 500 L/ha of water) and one rate of Glyphosate 36% w/v (1.4 l/ha in 500 L/ha of water) for high elevations. Weed injury rate was observed visually. Fresh weight of weeds using Quadrate samples were taken from each plot and dry weights of weeds were recorded by keeping samples at 85°Ctemperature for 16 hrs. Data was analyzed using One Way ANOVA following with Duncan multiple test to compare means of each treatments and Dunnett's multiple comparison to compare means of treatments with standard treatment of Glyphosate 36 %w/v. The results revealed that the effective rate of Glufosinate ammonium herbicide was 700 ml/ha for controlling weeds in all the elevations. Re-growth was observed 2 months after across elevations. Conclusion could be made that the effective rate at 700ml/ha of Glufosinate ammonium can be used

as non-selective post emergent herbicide as an alternative to Glyphosate and the recommendation will be confirmed by further studies on MRL (Maximum Residue Limit) analyses.

***Keywords**, Alternative herbicide, Glufosinate ammonium, Weed control, MRL (Maximum Residue Limit)*

EFFECT OF STORING TIME AND STORING METHOD ON SPROUTING ABILITY OF GINGER (*Zingiber officinale* Rosc.)

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ABSTRACT

Ginger (*Zingiber officinale* Rosc.) is one of the most important spice and medicinal crops in the world. Ginger usually propagates by rhizomes and approximately 17-20% of annual production is stored as seed rhizomes. Commonly, paddy husk is used as a media for storing seed rhizomes. However, information on optimum storage time and the effect of storage media (paddy husk) on sprouting of ginger seed rhizomes are lacking. Therefore, present study was conducted to investigate the optimum time duration from harvesting to subsequent sowing and the effectiveness of paddy husk as a media for ginger seed storage. The experiment was conducted as two factor factorial study by using Complete Randomized Design (CRD) with three replicates. Ginger seed storing time (1, 3, 5, 7 and 9 weeks after harvesting) and storage method (store with paddy husk and without paddy husk) were considered as two factors. Sowing ginger seed rhizomes soon after harvesting was used as the control. Accordingly, storing time period and method were not significantly affecting on seed rhizome moisture content at planting. Early sprouting (1±0week) of seed rhizomes were observed when they stored for seven weeks in paddy husk medium and that was taken longest time (2.2 ±0 weeks) when seed rhizomes were stored for three weeks in paddy husk medium. However, storing method was not significantly effect on growth parameters such as number of leaves, dry weights and plant height. Therefore, this study concludes that the best storage time for ginger seeds is seven weeks after harvesting for early sprouting and for better

growth interims of number of leaves and leaves dry weight. Storage media(paddy husk) was not shown any significant effect on ginger seed rhizome physical (moisture content per unit gram of dry weight of rhizome on sowing date), phonological (time take to 50% sprouting) and growth parameters (number of leaves, dry weight of leaves, pseudo stem, roots and rhizome) during the study period.

Keywords: *Ginger seed rhizomes, Paddy husk, Sprouting, Storage period*

BIOLOGY AND FEEDING PREFERENCES OF *Spodoptera frugiperda* (LEPIDOPTERA: NOCTUIDAE) ON SELECTED VEGETABLES

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ABSTRACT

Fall Armyworm, *Spodoptera frugiperda* (J.E. Smith) (Lepidoptera :Noctuidae) has identified and confirmed as a novel invasive pest of Maize in Sri Lanka recently. Since there were many evidences for attacking other crops including vegetable, it is vital to study on the host range of Fall Armyworm in vegetable crops and biology of the pest under local conditions. Therefore the objective of the study was to study biology and feeding preferences of *S. frugiperda* on selected vegetables. During the experiment, newly hatched larvae were fed with Maize, Cabbage, Okra, Beans, Radish and Brinjal leaves. Maize was used as positive control. Duration from larva to adult, pupal weight, pupal length, sex ratio, survival percentage and oviposition on different vegetable crops were evaluated. Host selection by Fall Armyworm neonate larvae was evaluated by the larval feeding preference test. Results of the feeding preference test envisaged that there wasn't host dependent variability among neonate larvae for Maize, Cabbage, Radish and Brinjal. The highest damage was reported in larvae fed on Okra (50%-75%) and (25%-50%) damage was showed in Beans after 48 hours. Although neonate larvae were dispersed on different hosts, highest survival was reported in larvae fed with Maize (80%). Simultaneously, the shortest larval development period was examined in Maize and the longest was in Brinjal. Further, larvae fed with Maize showed the shortest larva-adult period (22 to 26 days) compared to other vegetables. Results of the no-

choice and free-choice tests were reported that the highest evidences for oviposition by the moth in Maize compare to other crops. Subsequently, least egg masses were found on Okra and oviposition was not showed on other hosts in free choice test. Least oviposition was shown on Cabbage, Okra, Beans and Radish in no choice test. With the absence of the most susceptible host (Maize) for oviposition except Brinjal, other host plants showed a possibility for laying eggs by the pest. Among the tested host plants of the pest, the highest survival percentage was recorded (80%) in Maize and as the most susceptible host. Subsequently there was a risk of survival by *Spodoptera frugiperda* in other host plants namely Radish (53.3%), Cabbage (33.3%), Okra (13.3%), Beans (13.3%) and Brinjal (10%) under laboratory rearing facility.

Keywords: *Biology, Fall Armyworm, Maize, Oviposition, Spodoptera frugiperda, Vegetables*

DETERMINATION OF MOST APPROPRIATE POPULATION MONITORING TECHNIQUE FOR *Deltocephalus menoni*; (Hemiptera: Cicadallidae), THE VECTOR OF SUGARCANE WHITE LEAF DISEASE IN SRI LANKA

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ABSTRACT

Sugarcane White Leaf Disease (WLD) is a destructive phytoplasma disease in Sri Lanka. WLD is primary transmitted by infected seed cane and secondary by leafhopper vector; *Deltocephalus menoni.* As, it is abundant in all commercial cane growing areas of the country and there is a definite correlation recorded in the level of WLD, accurate measurement on population level of vector has become vital in designing an effective program for vector management. Therefore, this study was designed and conducted with the objective of determining the best monitoring method for - *D. menoni*. It was conducted at the research farm of the Sugarcane Research Institute, Uda Walawe from March to June 2019. Suitability of Sticky traps (Red, yellow, Blue and Transparent), Light traps (white and blue lights), Sweep net (during morning and evening) were evaluated to select the most suitable population monitoring technique for the WLD vector. Data collection was done at three-day intervals and meteorological data and lunar phase also recorded to study their effect for population counts. Average numbers of *D. menoni* captures by each considered methods was compared using the least significant different technique. Pearson correlation coefficient test was performed to determine the effect of relevant meteorological factors and lunar phase on population data. No significant difference was recorded between average number of vectors trapped in the sweep net count in the morning (6.36±0.7) and evening (5.79±0.74). There was no strong

correlation recorded between population of *D. menoni* and among any of the considered weather factors during the study period. Highest capture of *D. menoni* was recorded in transparent sticky traps and lowest capture was recorded from the Red colour sticky traps. In light traps, average trap capture was significantly high in white light (11.91**±1.37)** comparatively to the blue light (8.09**±1.33)**. Strong correlation (0.97: *p*= 0.001) was recorded between cloud cover and vector population. Negative correlation (-0.64: *p*= 0.02) was recorded between lunar phase and vector population. Vector population recorded in sticky traps were significantly less and cost of monitoring is high whereas vector population in light traps was fluctuated significantly. Since, sweep net monitoring is the most appropriate population monitoring technique for *D. menoni*.

Keywords: *Deltocephalus menoni, Light trap, Sticky trap, Sweep net, Vector*

ESTIMATING THE FLYING DISTANCE OF *Deltocephalus menoni*; (Hemiptera: Cicadellidae) THE VECTOR OF SUGARCANE WHITE LEAF DISEASE IN SRI LANKA

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ABSTRACT

Sugarcane White Leaf Disease (WLD) is considered as one of the major threats to sugarcane industry which causes severe reduction in sugar cane yield. Infested seed cane is considered as the primary cause of spreading the disease while an insect vector *Deltocephalus menoni*is considered as the secondary. Since the knowledge on mobility of vectors helps to manage secondary transmission, present study was conducted with the objective of estimating the flying distance of the vector. The research was conducted in an existing sugarcane plantation in Siyabalanduwa area owned by the Sugarcane Research Institute, Udawalawa. A three-month aged sugarcane field (20.25 ha) cultivated with the variety SL 96 128was selected for the study. Prepared traps were established in the selected field in a concentric manner in a 225m radius circle by starting from 10m distance from the center The flying distance of *Deltocephalus menoni*in sugarcane field was estimated by means of (MRR) mark release recapture experiments using a total of laboratory reared day-old 2400 vectors marked with Gel ink. Vectors were released at a central release point in a sugarcane field after the confirmation of successful marking. Data on number of *D. menoni* captured from each distances were recorded and compared using least significant difference (LSD) technique. Overall recapture rate was recorded as 4% and proportion of number of recaptured insects to number of total captured vectors was recorded as 7% and the estimated population of *D. menoni* in the particular

location (20.25ha area) was calculated as 6633. Marked insects survived up to 27 days and Trap capture was in a reducing pattern with the time increase. Maximum flight distance of *D. menoni* was recorded as 75m and it was only 0.08% of the total release. The number of released *D. menoni* was declined with the increase of the distance from release point. Mean dispersal distance of *D. menoni* was 2.3 m/day and no influence of the wind velocity was recorded during the study period. As maximum flying distance of *D. menoni* was reported as 75m, this finding could be effectively utilized in establishing commercial plantations and nurseries.

Keywords: *Deltocephalus menoni, flying distance, Mark release recapture, Sugarcane White leaf disease, vector*

NEWLY INTRODUCED CREEPER LEGUME (*Vigna marina*) AS A SOLUTION FOR ROAD CUTS PROTECTION IN SRI LANKA

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ABSTRACT

Accelerated soil erosion and landslides is a destructive consequence of road development and intensive agriculture in the central highlands. Therefore, cost-effective and sustainable slope stabilization techniques have become an urgent need to solve the problem. Properly designed vegetative covers play a significant role in slope stabilization and erosion control. However, average plants cannot thrive on extremely degraded soils in the affected area. Therefore, the introduction of an extremely low-demanding alien legume, *Vigna marina*, as a vegetation cover was tested as an appropriate option. Protection of bare road-cuts against soil erosion was the main focus of the study. The growth of *Vigna marina* under ideal to the lowest soil fertility status was tested using five treatments - i.e. control (T1), subsoil (T2), decomposing parent material (T3), 20% Pinus wood biochar + subsoil (T4), 20% Pinus wood biochar + decomposing parent material (T5). Control was the ideal soil fertility status as recommended by the department of agriculture for a similar plant (*Phaseolus vulgaris L.*). The highest growth in general was in T1 followed by T4 and T5, while T2 and T3 showed a comparatively poorer growth. Nitrogen (N) content of the soil has been significantly increased in T2, T3, T5, T4 respectively whereas, a significant decline in soil N was recorded in T1. A significant decline in phosphorous (P) and potassium (K) content in the soil was common to all. The highest N content of root nodules was in T5 and the lowest was in T1. The largest number and the dry weight of root nodules were observed in T4 and T5 compared to the rest. The poorest nodule activity was recorded in T1.

Vigna marina has a potential to thrive in heavily eroded land treated with Pinus wood biochar. Therefore, *Vigna marina* can be proposed as a cost-effective, sustainable slope stabilization technique in Sri Lanka.

Keywords**:** *Biochar, Decomposing parent material, Soil erosion, Subsoil, Vigna marina*

DIEBACK OF *Syzygium rotundifolium* IN RAJAWAKA FOREST RESERVE, SRI LANKA: IS SOIL LEAD (Pb) THE CAUSE?

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ABSTRACT

The forest dieback has spread across Sri Lanka and entered into Rajawaka natural forest as well destroying some tree species such as Naa and Syzygium. Eighty percent of the dead "Naa" (*Mesua ferrea*) trees were also relatively large with 150cm-250cm in girth at breast height (GBH). This research has focused on identifying a link between soil pollution with Cd and forest dieback. In addition, this study has attempted to understand the efficacy of Pinus wood biochar in neutralizing soil Cadmium (Cd). Soil samples were collected at 10 – 12 cm depth and 50 cm away from eight-dieback affected and eight healthy Naa trees for the laboratory trail. Soil properties such as soil texture, pH, Electrical Conductivity (EC), Soil Organic Matter (SOM) and soil microbial diversity were tested. The available soil Cd was also analyzed. Effectiveness of Pinus wood biochar in neutralizing available Cd in the soil was assessed using Cd-spiked soil samples treated with powdered *Pinus biochar.* These samples were left for incubation at room temperature for ten days. Available Cd concentrations were analyzed using the Atomic Absorption Spectrophotometer (AAS). Soil pH of healthy and dead soils were 4.11and 4.31respectively. The EC of healthy and dead soils were 50.17µS/cm and 122.12 µS/cm respectively. SOM content of healthy and dead soils were 9.32%and 8.69%respectively. The average microbial colony count of healthy soil was higher than

the soils collected near dead trees. Results envisaged that available soil Cd was significantly deferent between healthy tree soil samples and die back affected Naa tree soil samples. It also revealed that cadmium can be cause to die back of Naa trees and according to the experiment influence of *Pinus biochar* on detoxifying soil Cd result was significant. It suggested that *Pinus biochar* can be used as solution to the problem.

Keywords: *Bio char, Cadmium, Forest dieback, Immobilization, Rajawaka Forest*

COMAPARISON OF SOIL QUALITY IN MONO CULTURE FOREST (*Pinus caribae*), NATURAL FOREST AND ANALOG FOREST ECOSYSTEMS: MIRAHAWATHTHA SRI LANKA

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ABSTRACT

Soil quality is a reflection of the ability of a soil body to perform functions which are essential to people and the environment. Soil quality definitions emphasize several features at optimum level, chemical, physical and biological. However, the concept of soil quality is based on the premise that any of these features can be used to evaluate the degradation or improvement of soil ecosystem functions. Some soil quality parameters such as soil structure, organic matter content (OM) and microbial as well as microbial activity, are commonly used to evaluate sustainable land management in agro ecosystems. This study examined the soil quality of the three different ecosystems (Analog forest (AF), Natural forest (NF), and Monoculture forest (MF)). The study was undertaken in Belipola, Mirahawaththa, Welimada in Sri Lanka. (longitude 80^0 93397 E, latitude 6^0 87515 N). Agro ecologically area belongs to Up country Intermediate zone (IM1), and the recorded average temperature is 17.5 -20 ^{0}C while the rainfall is 1500-2000 mm, respectively, in the area. Six soil samples were collected for each soil test (The samples were collected in zig – zag across the site). Apparent density, soil pH, soil organic matter, and microbial diversity were evaluated. Six plots (unit area $1m^{2)}$ of each ecosystem were measured for detecting the Earthworm presence indicators and observed the earthworm casts and count. The result by apparent density in NF showed the lowest value (1.09) and the highest value (1.34) in MF. Apparent density of AF value was 1.22. Soil pH was as; AF-6.5, NF- 6.2, and MF-5.9. Also, result of organic

matter content in NF-3.9%, AF- 3.1, and MF-1.2 was detected. Analysis of soil microbial diversity (number of colonies in Petri dishes) of three ecosystem was as; AF (range 137 to 296), NF (range 130 to 335), and MF (range 12 to 21). Numbers of earthworm casts per square meters in AF (range 5 to 13), MF (0), and NF (range 10 to 15) were recorded. It is evident from the results the soil quality of AF most close to the NF ecosystem compare with MF system. The study investigated that there is a large potential to restore the soil into becoming more analogous to the natural forest to enhance the soil quality through AF technology.

Keywords: *Analog forest, Microbial diversity, Monoculture forest, Natural forest*

DEPARTMENT OF LIVESTOCK PRODUCTION

EFFECT OF SLAUGHTER AGE ON PHYSICOCHEMICAL AND FUNCTIONAL PROPERTIES OF BROILER CHICKEN (*Gallus domesticus*) LIVER

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ABSTRACT

Chicken liver is a highly nutritive edible organ meat which involves number of synthesis, metabolism, excretion, and detoxification processes. Although numerous studies have been conducted to evaluate the effect of slaughter age on the performances and other quality attributes of broiler chicken meat, little is known on the physicochemical and functional properties of edible organ meat including chicken liver. Hence, the present study was conducted to generate baseline information regarding the effect of slaughter age on physicochemical and functional properties of broiler chicken liver. Liver samples of the Hubbard classic broilers were collected from three different age groups as 28th, 33rd and 38th days' respectively. Fifteen liver samples (n=15) were collected from each age group and three replicates (r =3) were prepared via compositing five samples as one replicate. Effect of slaughter age had a significant ($p<0.05$) effect on physical properties such as width of right and left liver lobes, liver weight, pH and cooking yield. Conferring to the sensory attributes, liver samples from the birds slaughtered at 38th day had the highest significant ($p<0.05$) overall acceptability for colour, taste, and juiciness. Chemical properties also revealed that, 38th day slaughtered birds had the highest protein and fat content yet the highest moisture and ash contents were noticed from 28th day slaughtered birds. The highest energy content was noticed in the 38th day slaughtered birds and that was significant ($p<0.05$) compare to the other age groups. Amongst the functional properties, hematin content was significantly ($p<0.05$) higher

in 28th and 33rd days slaughtered birds compare to 38th day slaughtered birds. Furthermore, negative relationship was observed in terms of myoglobin and hematin content as previously described. Accordingly, slaughter age had a direct impact on liver physical properties whereas chemical properties which are important in nutritional prospect were not significantly affected except for energy.

Keywords: *Chicken liver, Slaughter age, Physical properties, Chemical properties, Functional properties*

EFFECT OF FERMENTED STAR FRUIT ON PHYSICOCHEMICAL AND ANTIMICROBIAL PROPERTIES OF COMMERCIAL CHICKEN SAUSAGES

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ABSTRACT

Incorporating fermented fruit drinks in sausages is a new trend for adding valuable compounds available within the fruit into sausages. Star fruit (*Averrhoa carambola*) is a fruit, rich in important compounds for human health. This study evaluated the effect of incorporation of fermented star fruit drink on the physicochemical and antimicrobial properties of chicken sausages. Fermented star fruit drink was added to the prepared chicken sausage batter in 4 levels (5%;T1, 7.5%;T2, 10%;T3, 12.5%;T4) and treatment without fermented drink was served as the control. Subsequently the sausages were checked for antimicrobial effect, moisture content, pH, water holding capacity, core color, texture analysis and sensory properties. Antimicrobial effect was studied by well diffusion method against the *Staphylococcus spp., Escherichia coli, Bacillus subtilis*, *Salmonella* spp. and *Klebsiella spp*. The results revealed that significantly high moisture content in all the treatments (highest in T1) except the control. Water holding capacity was higher in T1 whereas none of them had effect on pH level. The effect on texture profile exhibited higher hardness in T4, T3 and T1 respectively than the control but there was no effect on springiness. T3, T4 and T2 showed higher gumminess levels than the control. Cohesiveness and chewiness were comparatively higher in all treatments than control. Effect on core colour unveiled that, there was no effect to the lightness from the treatment levels where as T1, T4 and T3 showed higher redness levels compared to the control. Also, T1, T4 and T3 showed higher yellowness

values than the control. All the attributes of sensory evaluation (Appearance, tenderness, juiciness, aroma, texture, flavour, mouth feel and overall acceptability) except the color was better in control followed by T2.Moreover this study revealed that there is an antimicrobial effect of sausages incorporated with fermented star fruit drink against the *Staphylococcus spp., Escherichia coli, Bacillus subtilis* and *Salmonella* spp., whereas there was no effect on *Klebsiella spp.*

Keywords*: Chicken sausage, Fermented Star fruit, Antimicrobial properties*

EFFECT OF POULTRY CROSSES, TYPE OF INCUBATORS AND THEIR RESPECTIVE FUNCTIONS ON HATCHERY PERFORMANCE AND CHICK QUALITY

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ABSTRACT

The broiler meat industry has become the most popular and profitable business in the world as well as in Sri Lanka. In Sri Lanka parent birds are produced by three grandparent farms and nearly 166.99 million broilers produced annually. However, little has been studied on the influence of poultry crosses and the type of incubators (single and multi stage) and their functions on the hatchery and chick quality performances. This study was conducted to evaluate the effect of poultry crosses and type incubator and their practices on hatchery performance and chick quality. The eggs of two different crosses Hubbard classic and Arbor acre plus were used in two different incubators: single stage (SS) and multi stage (MS). A completely randomized design in a 2x2 factorial arrangement was applied. Eggs from both crosses incubated using above incubators with three replicates consisting 165 eggs in one crosses in each replicate were used from each crosses. . At the 18th day of incubation eggs were transferred to the hatcher. Initial eggs weight, eggs weight at 18th day and chick weight were measured and the weight loss during incubation and hatchability were also measured. Breakout analysis for unhatched eggs and clear eggs was done while analysing true infertility and early, mid, and late deaths. Chick quality was analysed by using tona score. Data was statistically analysed using two way analysis of variance. Results revealed that the single stage incubator had the highest weight loss within 18th day ($P<0.05$). Arbor acre plus showed the highest hatchability, chick weight and chick quality ($P<0.05$). The

multi stage incubator produced the highest chick weight ($P<0.05$). It can be concluded that the performance of the breed AA on hatchability and chick quality is better than that of breed HC and the type of incubators and their respective functions do not significantly affect on the most of hatchery performances.

Keywords*: Arbor acre plus, Hubbard classic, Chick quality, Hatchery performance, Single- and multi-stage incubators*

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PROCEEDINGS OF THE UNDERGRADUATE RESEARCH

ISSN 2714-1497 | Volume 01-2019

FACULTY OF AGRICULTURAL SCIENCES
SABARAGAMUWA UNIVERSITY OF SRI LANKA

Design and Layout Prasad C Iddamalgoda