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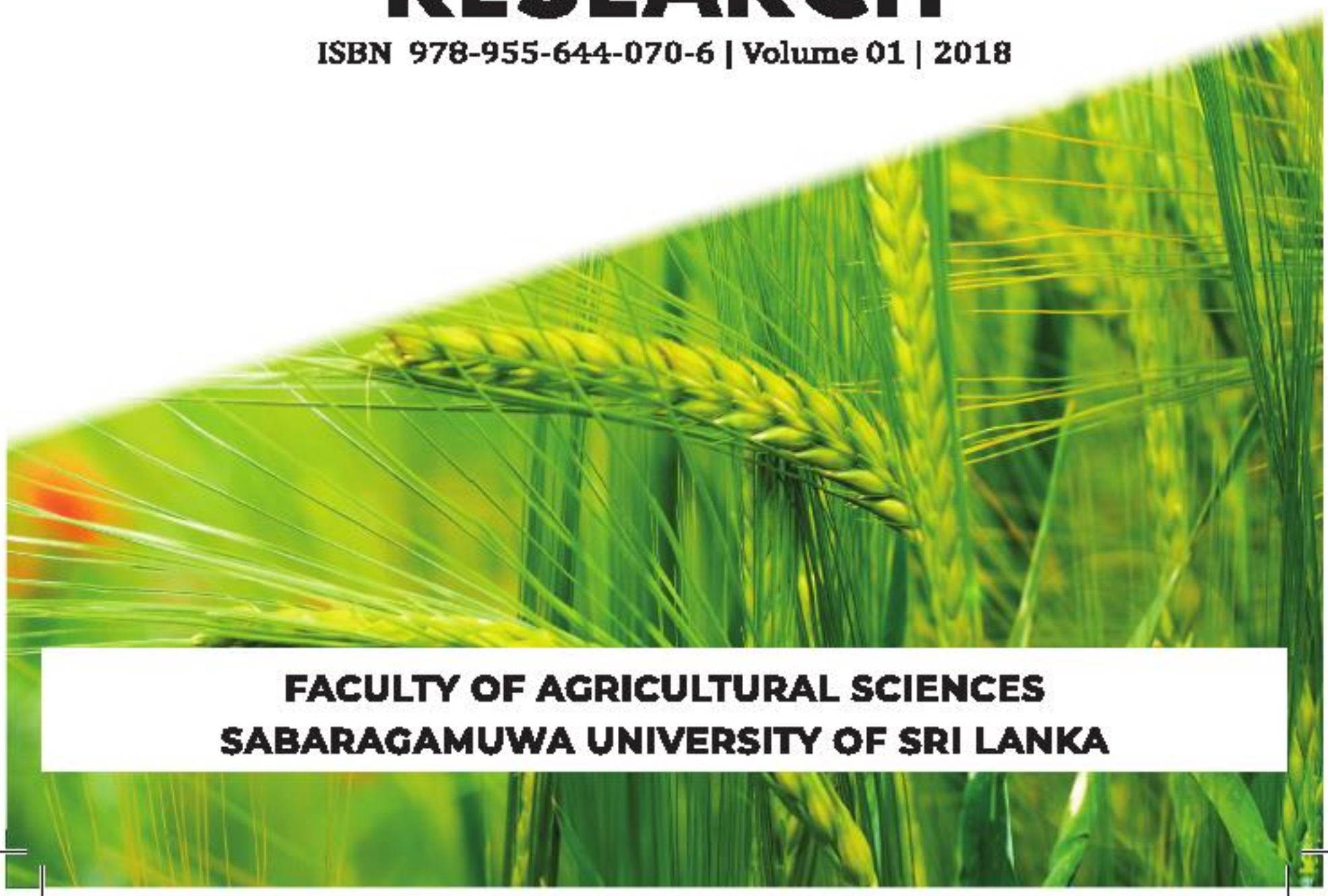

FACULTY OF AGRICULTURAL SCIENCES
SABARAGAMUWA UNIVERSITY OF SRI LANKA

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Faculty of Agricultural Sciences
Sabaragamuwa University of Sri Lanka
PO Box 02
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Editorial Committee

A Message from the Dean

It gives me great pleasure to present first undergraduate research proceedings of the 2018, Faculty of Agricultural Sciences of Sabaragamuwa University of Sri Lanka. Our faculty continues to unearth important insights into the world of Agriculture, life Sciences and management towards the sustainable agricultural entity. Whether they are being recognized for their research, published in top-tier journals, quoted in the media or presenting across the world at conferences, their knowledge translates into accelerated learning in the classroom. It is gratifying to know that we had far more requests for publications for this inaugural undergraduate proceeding than could be accommodated in the proceedings book. I am sorry that some of you were not chosen to publish.

We wish to thank the planning committee for their hard work in selecting the best papers. It was not an easy task. I would also like to thank the coordinators of Industrial training programme and external supervisors — governmental, non-profit, and private for without your support, this publication could not have taken place. Many agencies, research institutions, public interest groups, and the banking industry have shared their expertise. It is hoped that by this cross-functional sharing of information a better understanding of the agriculture and social relationships will result.

We met in beautiful Belihuloya on 19th and 20th June 2018, to share our thoughts, knowledge, and even to celebrate our successes, but let us remember that although we have come far, we still have much to learn and do. The undergraduate research conference has truly become an multi-disciplinary event with representatives from various institutions. I hope that you enjoy these proceedings and use them to move forward to promote the Agriculture in Sri Lanka and world.

Last but not least, I am congratulating for all the participants, we are very grateful to the Editorial Chief, Professor MLMC Dissanayake, for preparing and coordinating many decisions.

Dr. Manjula PS Maganage
Dean
Faculty of Agricultural Sciences

The department is committed to supporting the mission of the of the faculty to develop leaders of distinction in agricultural sciences and managemnt. It does this through excellence in classroom instruction, by motivating students to acquire the knowledge, skills, and competencies sought by employers, and by creating knowledge that informs and advances the science of management. Agriculture sciences faculty are leaders as teachers, mentors, and scholars. They are committed to student success and to being positive role models. They are advancing their fields of expertise, regularly publishing their research in the leading academic journals. Bringing leading edge research to the classroom means that students benefit from recent advances in knowledge and the wisdom and insights of faculty at the forefront of their profession. Book of abstracts bundling the outcomes of the final year research is another milestone of the faculty. Our aim is to provide an environment in which facilitate research, knowledge dissemination and empower graduates. Special thanks goes to the all those who were instrumental in publishing the book of abstracts and I wish to congratulate to the all authors who joined to publish their work.

Prof. Achini De Silva
Head
Department of Agribusiness Managament

It is with great pleasure I would like to forward my message to the Proceedings of the Under Graduate Research as it is a major annual event in the Faculty of Agricultural Sciences. Enhance the undergraduate research in any mean is an important consideration for upgrade the students analytical thinking in scientific manner. The motivation and appreciation of their findings could be achieved through publishing the work in a printed document. In this situation I must appreciate for initiation of this work for the benefit of students, benefit of the faculty and university as a whole. Initially department of export Agriculture published an abstract book of previous year students' findings and this time I am happy to see all the department contribute to have one publication in the faculty.

The idea of publishing students' final year research as an abstract book has been raised eight years ago. Due to different reasons that process was not reach to successful stand. Therefore publishing this first abstract book I can consider as an important milestone in concern with the academic excellence of the faculty of agricultural Sciences.

Further, I expect this process will continue with more developments consists with excellent research outcomes in future.

Dr. P. Kapila Dissanayake
Head
Department of Export Agriculture

I am glad to have the opportunity to send a message to this important event of releasing the first Proceedings of the Undergraduate Research with the abstracts of researches conducted by the final year undergraduates of the Faculty of Agricultural Sciences of the Sabaragamuwa University of Sri Lanka.

The human resources with proper technical knowledge, skills and positive attitudes is a great asset for a small developing country such as Sri Lanka 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. Sanjeeva Prasad Jayaweera
Head
Department of Livestock Production

Foreword

It is our great pleasure to present the first ever Proceedings of the Undergraduate Research conference held on 19th and 20th June 2018 at Faculty of Agricultural Sciences, Sabaragamuwa University 0f Sri Lanka. Faculty of Agricultural Sciences had been facilitating for a wide range of undergraduate research for more than 20 years with the collaboration of leading Sri Lankan Research Institutes and industries. Therefore Faculty decided to publish their research output as a proceeding, which supports and highlights the research being done by our undergraduates. The first volume of the proceedings includes 36 research findings covering the area of Agribusiness Management, Commercial Horticulture, Plantation Management, and livestock production.

I extend my profound appreciation for the hardworking people that made this possible. I would like to express my sincere appreciation to Dean of the Faculty, Heads of departments, coordinators of Industrial training programme, all academic and non-academic staff members of the faculty, external supervisors and members of the editorial board for their valuable contribution to complete this publication. Finally, I acknowledge diligent work of our reviewers who took their time to peer review all papers.

Prof. Chandrika Dissanayake
Editor in chief

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Department of Agribusiness Management

Development of A Method For Estimation of Average Paddy Yield in *Ampara* District of Sri Lanka

B.W.C.M. Ariyasena and A.W. Wijeratne

Abstract

In Sri Lankan Agriculture sector, paddy cultivation is one of the most important component in the sector. Thus, it is essential requirement for most accurate and reliable data collection approach and statistical analysis to identify the real situation of the sector. The Department of Census and Statistics of Sri Lanka is conducting many census, surveys and registers for updating the paddy statistics in Sri Lanka. The annual crop cutting survey is carried out in both Yala and Maha seasons to estimate the average paddy yield. The existing methodology of crop cutting survey can further be improved in order to make the task easier while increasing the accuracy of statistics. Hence the purpose of this study is to develop method for yield estimation of paddy and to test the proposed method with field data in Ampara District of Sri Lanka. In this method the paddy cultivated area measurements were taken by using GIS technology and yield measurements were taken by weighing the harvested yield. The weight measurements were subjected to different scaling factors derived through this study. The sample survey of the new methodology was carried out in Ampara district for 2 paddy varieties namely BG357 and AT362 for 2017/2018 Maha season. Stratified and Random sampling methods were used for selection of paddy parcels. Average paddy yield, Scaling factors and Cost of production of these two paddy varieties were calculated separately. This study was done using both questioner survey and experimental survey. The study disclosed that the Average paddy yield for BG357 paddy variety is 1818.02 kg acre^{-1} (4490.50 kg ha$^{-1)}$ and Average paddy yield for AT362 paddy variety is 1880.91 kg acre^{-1} (4645.85 kg ha$^{-1)}$ in Ampara district in 2017/2018 Maha season. The study reviewed that scaling factor for After Drying stage for AT362 is 0.93516 and for BG357 is 0.91260. The scaling factor after milling stage for AT362 is 0.6708 and for BG357 is 0.64476. The study shows that the Cost of Production of paddy cultivation in Ampara district in Maha season (2017/2018) for BG357 is 62578.33 Rs/ Acre or 34.43 Rs/ kg. For AT 362 it is recorded as 60403.47 Rs Acre-1 or 32.66Rs/ kg. According to the Central bank report (2017), cost of production in 2015/2016 Maha season was 18.82 Rs kg^{-1} in Ampara district. Research results revealed that higher increase of cost of paddy production within two years from 2016 to 2018.

Keywords: ***Paddy, Yield estimation, Sri Lanka***

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

Patterns of and Framework to Promote Foreign Direct Investment in Sri Lanka

G.G.M.S. Abeywickrama and S.T.C. Amarasinghe

Abstract

In the era of globalization, foreign direct investment plays an important role in the development of the nation. Foreign direct investment can make a positive contribution to a host economy by supplying capital, technology, and management resources that would otherwise not be available and the boost that country's economic growth rate. This study attempts to develop a framework that Board of Investment can use to improve their effectiveness in attracting FDI using a qualitative approach. A case study on Board of Investment in Sri Lanka was carried out to gather information. The Board of Investment was studied in terms of structural and functional characteristics. BOI's legal state, its relationship to the governmentand its relationship to the private sector were the main structural characteristics and the information provision, investor facilitation and investor services, image building, investment targeting and policy advocacy were the main functional characteristics that BOI is using to strengthen its role. Setting objectives, structure of investment promotion, competitive positioning, marketing and company targeting, project handling, after-care and product improvement, monitoring and evaluation were the main instruments that BOI is using to promote investment. The pattern of FDI were analyzed in terms of inward FDI, outward FDI, cross-border merger and acquisition, green-field investments andsector-wise. There has been a remarkable increase in FDI inflow in Sri Lanka during the year 2016 to 2017 and 2017 showed the highest FDI inflow in Sri Lanka.

Keywords: ***Foreign direct investment, Framework, Board of Investment, patterns of FDI***

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

Mapping of the Maize Value Chain and Assessment of the Relationship Between the Buying Price and Farmer Loyalty Towards the Buyer: A Study in *Anuradhapura* and *Monaragala* Districts

K.K.A. Kiriveldeniya and H.S.R. Rosairo

Abstract

Maize is a widely used ingredient in poultry feed production. With the increased demand for poultry products, national production of maize has increased by 14% from 2011 to 2014. Agribusinesses firms' vertical integration in the maize value chain under outgrower operations is to promote maize cultivation and to mitigate farmers' limitations in production. For the sustainability of the outgrower operations, it is important to identify inefficiencies and to identify the main factors by the agribusiness firms. To map the value chain and to assess the value addition, convenience sampling and value chain analysis was adapted. Multistage cluster sampling was adapted to select a sample of outgrower farmers from Anuradhapura and Moneragala districts. Farmer loyalty was assessed by adapting Farmer Loyalty Index and Spearman's correlation test was used to detect any relationship between a firm's price and farmer loyalty. The study revealed that higher yields from hybrid varieties cultivation enabled the farmers to obtain higher income in maize cultivation. Even though it was 30% and 37% of outgrower farmers respectively showed a very high and high loyalty towards the firm, only 33% of respondents were been loyal to supply their total harvest to the firm. Correlation test results further revealed that competitive pricing of the outgrower operator had a weak positive effect on outgrower farmer to sell their total harvest from outgrower operations. Due to lack of farmer awareness about the fraudulent practices of middlemen adapted during purchasing, absence of income deductions for loan settlements, sales charges and higher prices of non-out grower operators had increased the side sales while making the outgrower farming as a less effective business strategy for an ensured continuous supply of maize for agribusinesses firms.

Keywords: O*ut grower operations, maize value chain, farmer loyalty, pricing*

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

Entrepreneurial Orientation and Innovation: A Study of Ceylon Cinnamon Value Chain

M.P.M.M. Silva and M. Esham

Abstract

Sri Lanka is the largest true cinnamon producer in the world. Cinnamon plays a significant role in the Sri Lankan economy as the 4th largest export crop. The global demand for cinnamon has grown during the recent years. However, Sri Lankan market share has not increased due to high competition from the global Cinnamon industry. Therefore, Sri Lanka has to strive to maintain high-quality standards and to add values to expand its market share. This study is undertaken to identify innovative practices adopted by value chain actors, the entrepreneurial orientation of actors and the training needs of value chain actors. Galle, Matara, Ratnapura and Kalutara districts were selected for the study. Both primary and secondary data were used and data collection tools employed were interviewer administrated questionnaire and focus group discussions. The sample comprised of 127 cinnamon growers, 120 cinnamon processors, 32 cinnamon traders and 23 cinnamon exporters selected by using a multistage sampling method. The data were analyzed using descriptive statistics, principal component analysis, Garret ranking and Spearman correlation method. Results revealed that majority of the growers were small-scale operators, practiced conventional farming and they were not entrepreneurially oriented. Processors too showed similar features. The exporters were entrepreneurially oriented and showed a high level of proactiveness, risk-taking,and innovativeness. Traders were proactive but did not show high levels of risk-taking and innovativeness. SWOT analysis was performed to identify the training needs of upstream value chain actors. Entrepreneurial training, especially to enhance innovative capacity of upstream actors was identified as a major training need.

Keywords: *Ceylon cinnamon, entrepreneurial orientation, innovativeness, proactiveness, risk-taking, value addition*

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

Estimation of Demand for Recreational Benefits of "*Kaudulla*" National Park (KNP) in Sri Lanka

H.M.L. Wijesekara and P. Sivashankar

Abstract

The national parks are full of opportunities for various recreational benefits. Present society places greater demands on wilderness and natural areas for variety of services including biodiversity, wildlife habitats and recreation opportunities. In developing countries eco-tourism play an important role in ensuring both natural resources conservation and economic growth. This study attempts to estimate the demand for recreational benefits of the Kaudulla National Park (KNP). The specific objectives are i) to estimate the district wise visitation rate and total travel cost ii) to estimate the relationship visitation rate and total travel cost, iii) estimate the demand for KNP, and iv) estimate the total and district wise recreational value of KNP. A sample of 100 visitors was sampled using systematic random sampling method and Zonal travel cost method was used calculate the recreational values. The study shows that the recreational value of KNP is Rs.286.1million rupees per year, but the total economic value could be many times higher than this. Calculations showed the maximum revenue from the park could be obtained if the entrance fee is raised to Rs.4092 per visit for locals. This may however reduce the present visitor number by 292.83%, but it will improve the total revenue of the park by 99.34 %. Local visitors' willingness to pay is Rs.120 per visit and this may reduce the present visitors by 99.34% but increase the total revenue by 94.22%.

Keywords: *Demand estimation, recreational benefits, zonal travel cost method, national parks, environmental valuation*

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

Department of Export Agriculture

Impact of Perennial Intercropping Systems on Soil Quality of Major Coconut Growing Areas in Sri Lanka

O.J. Hettige[1], S.H.S. Senarathne[2] and Lal P. Vidhana Arachchi[1]

Abstract

Perennial intercropping is one of the best options for increasing the productivity of coconut lands. The aim of the study was to identify the impacts of perennial intercropping systems on soil quality of major coconut growing areas in Sri Lanka. The most commonly grown four intercrops viz; Cocoa, Cinnamon, Pineapple, Pepper were selected as treatments and compared with the mono crop (control). Soil samples were collected from Aththanagalla, Bopitiya, Makandura, Narammala, Opatha and Walpita to analyze soil total N content, available P content, Organic C content, pH, EC and soil microbial activity. Two sets of composite soil samples from top soil and subsoil (15 and 30cm depth) were collected in each location for each treatment. Results envisaged that there was no significant difference observed on any of analyzed criteria in Aththanagalla, Bopitiya and Opatha soils in between mono cropping system and intercropping system. However mono cropping system in Makandura observed a significantly higher pH and available P content. Furthermore, mono cropping system in Narammala observed a significantly higher pH while mono cropping system in Walpita observed a significantly higher EC. Furthermore, Different intercropping systems affect differently on soil quality in various locations. However Pepper is most suitable for Aththanagalla and Opatha areas while Pineapple is most suitable for Walpita and Bopitiya areas also Cocoa is most suitable for Makandura and Narammala areas over other treatments. It is evident from results that, there are impacts of intercropping system on soil quality.

Keywords: *Cinnamon, Cocoa, Pepper, Pineapple*

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Effect of Incorporated Bark Powder of *Cinnamomum zeylanicum* on Physiochemical Properties of *Caryota urens* Jaggery

K.A.S.Madushan, T.Liyanage, J.B.D.A.P.Kumara, G.E.M.Wimalasiri and J.Liyanage

Abstract

Kithul jaggery is a natural sweetener made by the concentration of phloem sap of *Caryota urens* (Fishtail palm-Kithul) with no chemical additives. According to folkloric knowledge, Kithul sap based products such as jaggery possess health promoting properties and benefits. However, these functional properties of Kithul sap based products have not been scientifically investigated. There are no reports available on important properties such as antioxidant activity, Total Polyphenolic Content (TPC), Total Flavonoid Content (TFC) of traditional Kithul jaggery. *Cinnamomum zeylanicum* (Cinnamon) bark is widely used as a flavoring ingredient in several foods. The major flavoring components of this bark often reported include cinnamaldehyde, cinnamic acid, cinnamyl alcohol, coumerin and eugenol. Cinnamon bark is also known for antioxidative, antimicrobial and ant carcinogenic properties owing to the presence of phenolic compounds. Production of cinnamon powder incorporated Kithul jaggery is ideal value added product for utilization of cinnamon bark powder as a nutrient rich and healthy sweetener with good flavor, color, odor, texture and overall acceptance compared to traditional Kithul jaggery. Kithul jaggery samples prepared according to the traditional method and it was analyzed by the determination of ash percentage, TPC, TFC, total reducing sugar, antioxidant activity and moisture percentage. A combination was analyzed for the above properties between traditional pure Kithul jiggery (TPKJ) and cinnamon incorporated Kithul jaggery (CKJ).Traditional pure Kithul jaggery and Cinnamon added jaggery products were evaluated through an untrained sensory panel. Accordingly, incorporation of 4%w/w cinnamon bark powder was selected as the product with best favor characteristics. Cinnamon incorporated Kithul jaggery and TPKJ and were analyzed for their reducing sugar. Reducing sugar content was not significant difference between TPKJ and CKJ (4%w/w). Moisture percentage was significantly difference in CKJ compared to TPKJ and ash percentage was not significant difference in CKJ compared to TPKJ. Extracted percentage was not significant difference in CKJ compared to TPKJin 80% ethanol solution for dried sample preparation to determination of TPC, TFC and ABTS radical scavenging assay. But, extracted percentage of Cinnamon bark powder was significant different compared to both of jaggery.

TPC, TFC and ABTS radical scavenging assay were evaluated and these were not significant difference in CKJ compared to TPKJ. Solution rate was not significant difference in CKJ compared to TPKJ.Cinnamon bark powder consist with 4%w/w percentage could be incorporated to traditional pure Kithul jaggery (TPKJ). There was a significant difference for moisture content in CKJ (4%w/w) compared to TPKJ. There was not significant difference in all the chemical properties and other physical properties of CKJ (4%w/w) compared to TPKJ.

Keywords: *Cinnamon, Jaggery, Kithul, Physiochemical*

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Assessment of Water Management System at Walawa Special Area of Mahaweli System to Enhance the Agriculture Sector

D.D.A.S. Perera[1], A.D. Ampitiyawatta[1] and C.D.M. Liyanaarachchige[2]

Abstract

Water management is the best approach to increase the agricultural sector in Sri Lanka. Accordingly, Walawa irrigation system in Udawalawa area was started in 1967 to enhance the agricultural sector in southern region of Sri Lanka. After few decades in operation, water demand was increased with the extent of cultivation. Capacity of water in Udawalawa reservoir was not sufficient to irrigate the whole extent of cultivation. Extent of cultivation should be increased to develop the agriculture sector in Walawa area and then water conservation becomes a necessity. By considering the water conservation, water management system was introduced in 1992. However, proper study was not conducted to evaluate the suitability and efficiency of water management practices used.Therefore, this study was conducted to evaluate the used water management practices and their affect on agriculture sector. Demographic factors of farmers, information on cultivated crops,problems regarding water management and farming were collected as primary data through detailed and structured questionnaire from randomly selected 150 farmers out of 24,285 settlers in all blocks of Walawa special area. Cultivated land extent, yield of paddy, banana, other fruit crops, other field crops from 1985 to 2016, amount of water issued from Udawalawa reservoir and rainfall data were collected form department of agriculture and Resident Project Manager's office (RPM office) at Embilipitiya as secondary data. Water productivity, land productivity, cropping intensity and problems related to farming were calculated by using Microsoft office excel - 2016. After started water management practices crop water productivity of paddy fluctuated between 0.41-0.56 MT/Acre feet during 1995 -2017 in Yala season and it was 0.42-0.53 MT/Acer feet in Maha season. Higher land productivity (5.97 Mt/Ha) was observed in Suriyawewa block in 2017 Yala and 2017/18 Maha seasons. Cropping intensities of various blocks were fluctuating between 2017 Yala and 2017/18 Maha seasons. 78% of farmers are suffering from problems related to water and 65% farmers have a severe problem on water among the selected group. Since most of farmers in the area having problems related to water, current water management systems need to be improved in future for enhancing the agriculture sector in Walawa special area.

Keywords: *water management, Walawa special area, irrigation, crop water productivity, land productivity*

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Screening the Efficacy of Plant Extracted Herbicide Against Weeds in Tea Lands (*Camellia sinensis* L.)

W.M.C. Pushpa Kumara[1], M.S.D.L. De Silva[2] and A.S. Karunaratne[1]

Abstract

Weed is a plant, grown in an undesired place while interfering to the Agricultural goals. Controlling of weeds by following chemical methods are most convenient, cost effective and lesser disturbance to the soil properties than manual weeding. After banning some post emergent herbicides, tea sector faced huge problem in controlling weeds. Therefore, this study was conducted to investigate the efficacy of 71.96% w/w EC of Pelargonic acid from Rapeseed (Brassica napus) oil to control weeds in tea lands. Six rates of Pelargonic acid (20.3, 30.4, 40.6, 50.7, 60.9 and 81.2 l/ha) as treatments were tested with three replicates in high, mid and low elevations of tea lands while comparing with selective post emergent herbicide (40% MCPA) recommended by Tea Research Institute of Sri Lanka. Visual observations and Quadrat samples of weeds were taken from each plot and dry weight of quadrate samples were recorded in time intervals including pre-assessment. The efficacy rate of plant extracted herbicide was differed based on elevation. In high elevation, 50.7 l/ha and 60.9 l/ha were the most effective rates in controlling weeds. Pelargonic acid rate 60.9 l/ha in mid elevation and 50.7 l/ha, 60.9 l/ha and 81.2 l/ha rates in low elevation were performed well in controlling weeds in comparison to recommended herbicide treatment (3 l/ha) up to 4WAA (four weeks after application). Regrowth was observed after 4WAA in high and mid elevations whereas at 3WAA in low elevation. Application of Pelargonic acid at the rate of 60.9 l/ha could be used to control weeds up to period of four weeks in tea lands at all elevations base on the cost factor. Results of visual scoring showed that Spermacoce latifolia, Erigeron sumatrensis, Crassocephalum crepidioides like problematic weeds in high elevation, Ageratum conyzoides, Grass weeds of Cyrtococcum trigonum at mid elevation and Spermacoce latifolia, Ipomoea obscura, Commellina diffusa and Cyperus rotundus weeds in low elevation were most susceptible to Pelargonic acid 71.96% w/w EC. Pelargonic acid has effectively control some of weeds which couldn't control via synthetic herbicide application. Plant extracted herbicides generally required high volume compared to the chemical herbicides and therefore Pelargonic acid could be suggested to use as spot application for Integrated Weed Management program in tea lands.

Keywords: *Pelargonic acid, Plant extracted herbicide, Rapeseed oil, Tea lands, Weed control*

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Effect of Different Concentrations of Indole-3-Butrtic Acid (IBA) on Rooting Performance of Carnation (*Dianthus caryophyllus*) Top Cuttings

S.L.D. Ranasinghe[1], G.D.K. Kumara[1] and J.K.M.B. Jayawrdhana[2]

Abstract

Carnation is among the ten most popular cut flowers in the world. Carnations are commercially propagated through cuttings: most widely used method in vegetative propagation. Ceylon Foliage (Pvt) Ltd at Welimada also produces rooted plugs by top cuttings for the export market. However, it takes four weeks to produce a rooted plug with export standards. Application of growth regulators has been reported to improve rooting performance in carnation cuttings. Therefore, present study evaluated the effect of different concentrations of indole-3-butric acid (IBA) on rooting of carnation top cuttings and followed by achievement of export standards. The experiment was carried out under tropical greenhouse conditions using 1 mg/L, 3 mg/L, 5 mg/L and 7 mg/L IBA concentrations over fifteen plug trays with coco-peat pellets as the medium. All treatments were arranged in Complete Randomized Design (CRD) with each treatment replicated three times with thirty five repeated observations. It was found that there is a significant effect of IBA concentrations on number of rooted plugs and achieving the quality standards specified by the buyer. The best IBA concentration was recorded as 5 mg/L in terms of rooting performance and achievement of quality standards (>90%). Most interestingly, this method achieves export standards in rooted plugs within three weeks reducing production time by one week which is more economical than existing procedure.

Keywords: *Carnation, Export quality standards, IBA concentrations, Rooting performance, Top cuttings*

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Assessment of the Ground Water Contamination by Nitrate and Phosphate Due to Fertilizer; Case Study of Vegetable Cultivation in NuwaraEliya District

M.L.D.V. Bhagya[1], A.S. Karunarathne[1] and S.K. Gunatilake[2]

Abstract

Upcountry vegetable farming is one of the intensive cultivated farming systems which consume a high volume of fertilizers and agrochemicals, especially due to the short duration of crops and highly favorable humid conditions for rapid spread of pests and diseases. Excessive applications of fertilizer and agrochemicals to the soil contributes to contamination the soil, water resources resulting threat to the animal and human body, as well as environment. The overall aim of the study is the assessment of ground water contaminations with nitrate-N, phosphateand heavy metals due to fertilizer in vegetable cultivation in Nuwara Eliya District. Thirteen villagers in Nuwara Eliya district which is located in central province in Sri Lanka were selected for the current study. Water samples were collected from thirteen shallow spring wells and Haggala forest which is considered as a reference.Samples were collected during February to May 2018 that represented "Maha season". Soil sampling, collection of metrological data and demographic information in farming area were done in parallel to the water sampling. Water analysis parameters of pH, Electrical Conductivity, Total dissolved solid andSalinitywere measured in situ using pre-calibrated multiparameter while alkalinity measured using digital titrator. Nitrate-N, Phosphate and fluoride in the samples were measured by Hach DR 2400 portable spectrophotometer. Soil was tested for the pH, Electrical conductivity, Available Phosphorous, Exchangeable potassium and organic matter.Analyses were done using the SPSS software. Results showed a varying the nitrate-N and phosphate contamination pattern during the cropping season.

Accordingly 87% of the spring wells showed acidic pH values, higher than maximum permissible level by WHO recommendations. Average pH value is 5.68. Accordingly 7% of the wells were showed elevated nitrate-N level while average nitrate-N level is 4.45 mg/l. Phosphate concentration was varying between the 0.02 to 0.38 mg/l. while average phosphate concentration is 0.08 mg/l. Accordingly, there were no any wells showed higher level of phosphate concentration than WHO recommendations. The effect of fertilizer application on ground water depends on soil type, amount of application of fertilizer, amount of organic matter in the soil and climate conditions.

Nevertheless, the results of this study suggest that applying the correct rate of fertilizer and at the optimum time would have a substantial effect on reducing nitrate-N and fertilizer losses while conserving the ground water resources. Ground water resources of the Nuwara Eliya vegetable cultivated area are not contaminated by fertilizer residuals although it applied excess amount of fertilizer.

Keywords: *Acidification, Nitrate-N contamination, Phosphate contamination, up country vegetable*

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Identification of Correlation between Weather Parameters and Development of Onion Anthracnose Caused by *Colletotrichum Gloesporioides*in Sri Lanka

B.S. Boralessa[1], W. Menaka K. Fenando[2] and M.L.M.C. Dissanayake[1]

Abstract

Onion anthracnose caused by *Colletotrichum gloeosporioides* is a serious issue in onion cultivation by causing high yield loss.The study was carried out to find out the association between weather factors and planting time for disease severity in *Maha* season 2017/18. As treatments, four different planting times (T1, T2, T3, T4) with one week interval were chosen. All treatments were arranged in Randomized Complete Block Design with each treatment replicated three times. Rainfall, Minimum temperature, maximum temperature, canopy temperature and relative humidity data were taken. Rainfall, Minimum temperature and maximum temperature data were taken from Meteorological department sub-station at Mahailluppallama and Cumulative rainfall was calculated using daily rainfall data.Relative humidity was taken from one plant from one plot using thermo hydrometer.Canopy temperature was taken from 4 plants from each plot by using Infra- red thermometer. Disease severity index (DSI) was taken according to the scale with 2-3days interval. Data were statistically analyzed by using the SAS computer software package version 9.0. After the disease initiation, there was no any significant differences among treatments ($P > 0.05$) in every disease rating time.When considering all the weather parameters, cumulative rainfall ($p<0.0001$), minimum temperature ($p=0.0192$), morning relative humidity ($p=0.0440$) and evening canopy temperature (0.0957) had significant correlation with the disease severity index (DSI).Other weather parameters were not showing significant co-relation.Cumulative rainfall and evening canopy temperature mainly contribute to the onion anthracnose disease development and Cumulative rainfall contribute 95.09 % and evening canopy temperature contribute 2.02 % to the anthracnose DSI model. Also changing the time of planting did not show significant effect on the disease severity progress in *Maha* season.

Keywords: *Colletotrichum gloeosporioides, Correlation, Cumulative rainfall, Disease severity index, Relative humidity, Temperature.*

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In-vitro and *In-vivo* Antifungal Potential of Some Plant Extracts against *Colletotrichum gloeosporioides* causing Papaya Anthracnose Disease

V.S. Dahanayaka[1], C. Ranasinghe[2] and M.L.M.C. Dissanayake[1]

Abstract

Anthracnose, caused by *Colletotrichum gloeosporioides*, is one of the most widespread and devastating diseases of papaya, especially during storage.Control of Anthracnose disease has been accomplished primarily by the application of chemical fungicides. As a result the risk of high levels of toxic residuesincreases, which is particularly serious since papaya fruit is consumed in relatively short time after harvest.Plant extracts are emerging as safer alternatives to conventional fungicides for the control of plant diseases. The present investigation was conducted with the objectives of evaluating six different plant extracts for their antifungal activity against *C. gloeosporioides in-vitro* and *in-vivo*. Plant species, *Cassia fistula* (Golden shower), *Lantana camara* (Lantana), *Moringa oleifera* (Drumstick), *Ocimum tenuiflorum* (Maduruthala), *Ricinus communis* (Edaru) and *Solanum torvum* (Tibbatu) were screened *in-vitro* using agar incorporation method. Based on *in-vitro* experiment, aqueous extracts(10% and 20%) of two plant species (*L.camara*, *O. tenuiflorum*) were used for *in-vivo* study. Conidial suspension of *C. gloeosporioides* was prepared from 10 day old culture and adjusted to $1x10^5$ spores/mL using hemacytometer. Surface-sterilized Papaya fruits were sprayed with each plant extract separately and control fruits were sprayed with sterile distilled water and allowed to air dry. Spore suspension of *C.gloeosporioides* was sprayed evenly on treated papaya fruits. Other than diseases severity, soluble solids content, pH and fruit mass loss were evaluated. Methanol extract of *L. camara* of 100 µl from the concentration of 50 mg/ml resulted in the highest mycelia growth inhibition (90.71%)followed by *O. tenuiflorum*(45.71%) and *M. oleifera* (44.76%) against *C. gloeosporioides*. Out of tested extracts, *L. camara* gave the lowest disease severity index (20%) at 20 percent concentration and maintained optimum quality of papaya fruit during 7 days experimental period. The study revealed that *L. camara* exhibit strong antifungal activities against *C. gloeosporioides* and has potential for being formulated into botanical fungicides to control papaya anthracnose.However, further studies are required to isolate antifungal compounds present in these plants species.

Keywords: *Antifungal, Carica papaya, Colletotrichum gloeosporioides, Lantana camara, Plant extracts*

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Remediation of Cadmium (Cd) Contaminated Montane Forest Soils (Horton Plains) : Will Rubber (*Hevea brasiliensis*) Nut Shell and Rice Husk Bio Char be Effective Remediating Agents?

J.S.R. De Silva[1], P.I. Yapa[1], R. Bandara[2] and A.A. Seneviratne[3]

Abstract

Horton Plains, one of the two montane forests in Sri Lanka and habitat to many endemic species of plants and animals, has been severely affected by forest dieback. Past research has identified a direct link between soil pollution with Cadmium (Cd)and the phenomenon of forest die back. As a consequence, forest dieback is increasing proportionately to the soil pollution. As such, it is imperative to protect Horton Plains, and this study focuses on identifying a cost-effective remediation technique to neutralize soil Cd, and thereby reducing forest dieback. This experiment was conducted for a period of three months. Soil samples were collected from Horton Plains, mainly Thotupolakanda site which shows more than 90% severity of forest die back. Three soil amendments were used in this research as; bio char prepared using (i) rubber nut shells, (ii) rice husks, and (iii) bio char occurring naturally in Horton Plains. Along with the control treatment (only soil), this experiment consisted of four treatments, of 5 replicates. Treatments were added to the soil samples and available Cd was extracted using standard methods in literature, and the Cd concentrations were analysed using the Atomic Absorption Spectrophotometer (AAS). Horton Plains forest soil used for the study showed the pH of 5.4 and the Cation Exchange Capacity (CEC) was 210 c mols kg $^{-1}$ of soil. The soil was highly rich with organic matter and the soil organic matter (SOM) content has reached 13.4%. Immobilization of Cd added to the soil was observed and it was significant ($p < 0.03$). However, the control(only soil) has also shown its ability to immobilize soil Cd. Thus, it appears that the presence of extraordinary level of SOM and active natural sorbents in SOM such as humic acid and fulvic acid have masked the effect of all the biochar treatments. The amount of Cd used for spiking the soil was 0.1 µg and the minute quantity may have been immobilized by the SOM. However, the study proved the possibility of neutralizing Cd toxicity in the soil by using natural sorbents. And other treatments did not show that much of Cd neutralizing.

Keywords: *Horton Plains, forest dieback, soil remediation, Cadmium, Bio char*

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Effect of Biochar (carbonized plant material) on Growth of Coconut Seedlings (*Cocos nucifera* L) in the Coconut Nursery

K.G.N.C. Dharmalal[1], S.H.S. Senarathna[2] and L. P. Vidhana Arachchi[1]

Abstract

Coconut (*Cocos nucifera* L) is one of the predominant plantation crops in Sri Lanka. The success of a coconut plantation, in terms of its establishment as well as its future performance, is heavily dependent on the quality of the seedling used. Thus attention needs to play to raise healthy seedlings in coconut nurseries. Coconut nurseries adopt different agronomic practices to produce good quality seedlings. In this process, applying biochar is becoming an increasingly common practice in plant nurseries. Therefore the effect of biochar on root and shoot development of coconut seedlings was evaluated under nursery conditions in a plant house for a period of fifteen weeks. Different ratio of biochar and coir dust were introduced to poly bags while, top soil with organic matter was used as the control. Complete Randomize Design (CRD) with twenty replicates were followed. Leaf area, shoot and root growth were evaluated with respect to different treatment. Overall results showed that leaf area, shoot and root growth were significantly higher in coir dust introduced treatment compared to biochar treatments. However, dry weight of primary roots was significantly higher in biochar treatments. It is evident from results that coir dust incorporation into polybags media is much better than biochar.

Keywords: *Biochar, Coir dust, coconut seedlings*

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Assessment of Rapid Bioassay Technique for Detection of Chlorothalonil (Fungicide) Residue in *Alternanthera sessilis*

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Abstract

Indiscriminate use of pesticide has caused to pesticide residue in agricultural commodities and it has become a major issue of human health. The conventional analysis of pesticide residues is a labor intensive, time consuming, sophisticated instrumented and expensive procedure.As a consequence, current methods of analysis provide a limited sample capacity. In the present study, a rapid and cost effective biological test has been tested for its suitability and practicability to detect fungicide residue at local conditions present in Sri Lanka. *Bascillus thurenginensis* bacteria cultures were used for their sensitiveness for fungicide residue to compare residue free samples with residue presence samples. *Bascillus thurenginensis* broth cultures were obtained by overnight shaking of broth inoculated by slant cultures of *Bascillus thurenginensis*and used as the assaying solution of Mukkumuwenna leaf extracts obtained after application of different Chlorothalonil doses viz; 0ml/ha, 825ml/ha, 1650ml/ha, 2475ml/ha and 3300ml/ ha.Growth inhibition of bacteria was assessed by determining the reduction of absorbance of contaminated sample after afixed reaction period. Data showed that fungicide free sample did not inhibit while all the tested doses inhibited the replication of bacteria. Inhibition percentage was significantly different with fungicide free samples but no significant within different doses throughout the study period. Different fungicide doses showed different reduction rate of inhibition percentage with time. Inhibition percentageof 3 days and 5 days after application and inhibition of 14days and 21 days after application were significantly different with all the treatments. Five samplesapplied 1650ml/ ha dose with different time period after application were tested by the present conventional method. It is evident from results that tested method is rapid and cost effective compared to the conventional method currently use in Sri Lanka.

Keywords: *Bascillus thurenginensis, Inoculation, Medium, Mukkumuwenna*

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Relationship between Stress Degree Days and Initial Growth Performances of Black Pepper (*Piper nigrum* L.)

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Abstract

Pepper (*Piper nigrum* L.) is the most important crop among the spices. The fully mature berries are the harvest of the crop. In 2015, Sri Lanka recorded maximum production as 31,000 Mt in the history however there is big potential in the world market. The most important limiting factor for growth and production of pepper is water stress.The water stress is most sensitive during the flowering season. Therefore, sufficient irrigation for pepper is essential during lack of rainfall. The water stress is estimated by stress degree days(SDD) and that is measured by variation of ambient and canopy temperature. Estimation of SDD is very important for forecasting growth and yield performance of a crop. Therefore objectives of this study are to study the stress degree days (SDD) of pepper under different rates of irrigation and to find the relationship between SDD and growth parameters of pepper during the initial growth stages.A field experiment was laid out according to RCBD with5 different irrigation treatments of 10,8,6,4 and 2 liters per day per vine and 4liter per vine was considered as the control. Each treatment has four replicates. As growth performances,plant height, number of leaves and intermodal length were measured with two weeks interval. Leaf area was also recorded at the end of the study period.Ambient and canopy temperatures were measured daily and SDD values were calculated.Various plant growth parameters and SDD values were evaluated with regards to response to different water stress conditions. Though the data show a increment of growth parameters such as plant height, number of leaves and intermodal lengthamong the treatments that is not significant within the initial three months of the study period ($p>0.05$). However, there is a inverse relationship between SDD and growth parameters with low regression values (0.05, 0.08,0.07,0.012) at the end of the study period. Hence, SDD may have a relationship for growth and yield parameters of pepper. Since the pepper is a perennial crop, with a short study period (3 months), it is not reasonable for giving a strong conclusion. It is recommended to do the same experiment for about one year for a strong conclusion.

Keywords: *pepper, water stress, growth parameters, stress degree days*

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Application of Improved Traditional Wet Method to Produce Good Quality Virgin Coconut Oil in Pilot Scale

K.C. Kaushalya[1], C. Yalegama[2] and A.D. Ampitiyawatta[1]

Abstract

At present virgin coconut oil(VCO) is gaining wide popularity in the world as the healthiest and versatile oil. The existing processes of the production of VCO are dry and wet methods. Among those methods, dry method is being practiced in commercial scale in Sri Lanka and that involve high labor cost and expensive machineries. Wet methods are used to produce VCO in commercial scale in Philippine. However, Applicability of wet methods in pilot scale has not been studied in Sri Lanka up to now. Therefore this study is to investigate the potential of producing VCO by wet methods in pilot scale. Objective of the study was to check the quality and quantity parameters of the VCO produced by wet methods. Two wet methods, namely Modified Kitchen Method (MKM) and Natural Fermentation Method (NFM) were used as treatments with three replicates. Quality and quantity parameters were analyzed with Kruskal Wallis procedure for mean separation. The NFM and MKM had yield percentages as 18.79% and 20.7%and those were not significantly different and both were also not significantly different with the dry expeller method to produce VCO. The oil recovery percentages of NFM and MKM respectively 48.99% and 56.5% were significantly lower than the oil extracted by dry method. The results were also very similar in laboratory scale. All the quality parameters were within the Sri Lankan standards specified by SLSI Quality parameters, Moisture percentage, Free Fatty Acid percentage, Peroxide value and Color of VCO produced by MKM and NFM were not significantly different with the laboratory scale. The VCO obtained by NFM had significantly high antioxidant value compared to MKM and no detection was observed for total plate count in VCO obtained by MKM.A peroxide value was not detected in NFM and MKM had significant low peroxide value and it was lower than the SLSI standards. It is evident from results that the wet methods can be recommended for producing VCO in commercial scale and studies are required to improve the oil recovery percentage.

Keywords: ***dry expeller method, modified kitchen method, natural fermentation method, virgin coconut oil, wet methods***

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Evaluation of Zeolite Beads and Silica Gel Desiccants on Drying Vegetable Seeds to Low Moisture Content Suitable for Sealed Storage in Sri Lanka

P.A.G.C. Kumari[1], M.G.D.L. Priyantha[2], and A.A.Y. Amarasinghe[1]

Abstract

Seed storage is generally a greater problem due to rapid deterioration of seeds under tropical conditions in Sri Lanka. Seed longevity is largely dependent on moisture content of orthodox seeds. Commercial seed producers face in a problem with seed drying under bad weather condition resulting with rejection of seed lot under seed certification standard. Desiccant drying is one of seed drying methods and Zeolite beads and Silica gel are used as desiccants. Zeolite beads have high affinity to water even in low humidity condition while, silica gel is the widely use desiccant. This experiment was conducted to evaluate silica gel and zeolite beads desiccants on drying tomato, okra and vegetable cowpea seeds. Two experiments were carried out with calculated desiccant to seed ratio and sealed storage under ambient conditions with or without desiccant. Experiments were laid out with Completely Randomized Design with four replicates. Seeds dried very rapidly with zeolite beads compered to silica gel within 3 or 6 days in both experiments. Seeds of tomato, okra and vegetable cowpea with zeolite beads were reached their final moisture content from 9.5%, 13.3% and 12.8% to 6.8%, 9.9% and 9.8% respectively, and remained almost unchanged under sealed storage with or without desiccant. However, moisture content of tomato, okra and vegetable cowpea seeds did not reach their target moisture contents of 5.0%, 8.0% and 7.0% respectively. Tetrazolium test at different storage time is failed to explain the effect of desiccants drying on seed viability due to imbibition damage. This experiment concludes that vegetable seeds can be successfully dried to low moisture content with silica gel or zeolite beads desiccants, but zeolite beads are more effective.

Keywords: *Deterioration, Okra, Tomato, Vegetable cowpea, Viability*

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Recovering and *In-vitro* Hardening of Contaminated Tissue Cultured *Anthurium andreanum* Plantlets Using Different Media and Fertilizers

W.C. Madushani[1], K.A.C.N. Senevirathne[2] and P.K. Dissanayake[1]

Abstract

Floriculture is a fast emerging industry in the world. Anthurium is a highly prized and high demanded floricultural plant belongs to the family Araceae. Anthurium is propagated by tissue culture as an alternative tool for rapid multiplication of high quality, disease free planting materials. Contamination being the greatest problem in the technique, it affects the economy and quality of the product. There is a research gap to identify the best media and fertilizer types to recover the contaminated tissue cultured *Anthurium andreanum* plantlets. A laboratory experiment was conducted with inert particles and different fertilizers. Three media types with different compositions : M1 sand and coir dust (1:1), M2- sand, coir dust and charcoal (1:1:1), M3 -sand, coir dust, charcoal and tile pieces (1:1:1:1) and five fertilizer types: F1- 100% recommended chemical fertilizer only, F2- 50% chemical fertilizer only, F3- 50% Chemical fertilizer and 50% Biofilmbiofertilizer, F4- 100% Biofilmbiofertilizer and F5-distilled water were used. The contaminated tissue cultured plantlets were established in the bottles containing sterilized media and then fertilizer was applied. After three and half months of establishment the plant height, plant fresh weight(g), number of leaves, chlorophyll content(SPAD), total root length (cm), survival rate and dry weight were recorded. It was found that M3 with F3 treatment showed the highest significant effect on growth rate and survival rate (100%) of contaminated tissue cultured plantlets than other treatments. M3 with F1 treatment showed the lowest plant height, fresh weight, chlorophyll content, total root length, dry weight and survival rate (50%).

Keywords: ***Anthurium andreanum, Biofilmbiofertilizer, Contamination, Inert particles, Tissue culture***

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Evaluation of Physical and Chemical Characteristics of Wood Apple Fruits (*Feronia limonia* L.) of Selected Promising Accessions

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Abstract

Wood apple (*Feronia limonia* L.) is an underutilized fruit crop in Sri Lanka. There are only few commercially cultivated wood apple orchards in Sri Lanka. Presently, there is a growing interest to cultivate wood apple under commercial scales. However, unavailability of good quality wood apple varieties is a constraint for commercial growers. Therefore, it is important to introduce good quality varieties by identifying quality characters of wood apple trees and fruits. Hence, the present study was conducted to identify the best wood apple accessions with good quality characteristics of fruits. Wood apple fruits were collected from an *ex-situ* field Gene Bank at Grain Legumes and Oil Crops Research and Development Centre in Angunakolapelessa (An Institute under Department of Agriculture) from ten accessions. Physical characters including fruit colour, shape, weight, length, middle circumference, percentage of pulp weight, percentage of peel weight, seed amount, peel thickness, chemical characters including pH, titratable acidity, total soluble solid content, moisture content, ash content and sensory evaluation for appearance, aroma, taste and overall acceptability were evaluated to select best accessions. Highest fruit weight (440.71g±19.21), length (9.02cm±0.20), middle circumference (29.58cm±0.44), percentage of flesh weight (68.31%±1.19), peel thickness (4.65mm±0.16) were recorded in ACC53. Highest preference for taste, aroma, appearance and overall acceptability were also recorded in ACC53, followed by ACC31, ACC01 with high overall acceptability. There was no significant difference among ACC14, ACC52, ACC31, ACC01 and ACC53 in terms of highest preference for taste. Those accessions recorded high total soluble solid content (13brix±1.15, 13.33brix±0.33, 13.66brix±0.33, 15brix±0, 14.66brix±0.88 respectively) with low acidity content (0.93%±0.01, 0.85%±0.02, 0.8%±0.03, 0.91%±0.03, 0.86%±0.04 respectively). The study revealed that, ACC53 is the best accession. Further, ACC14, ACC52, ACC31 and ACC01 are good accessions according to chemical characters and sensory evaluation.

Keywords: *chemical characters, physical characters, wood apple accession*

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Effect of Different Initial Pruning and Training Practices on Canopy Development of Black Pepper (*Piper nigrum* L.) using Planting Material Originated from Ground Runners

H.W. Rosayuru[1], H.M.P.A. Subasinghe[2] and W.G.C.Wekumbura[1]

Abstract

Black pepper (*Piper nigrum* L.) is the most used spice in the world because it has more uses and as well as it is the most economically important spice to cultivate in Sri Lanka due to premium price in the international spice trade. Intercropping with tea and coconut and monocrop cultivations are practiced by Sri Lankan farmers. However, initial pruning on black pepper vines not a common practice among farmers which resulted incomplete canopy filling and low plagiotropic branches at the lower part of canopy resulting lower yield. Therefore, the present study was conducted with the objective of evaluating the effectiveness of initial pruning and training practices on increasing number of orthotropic and plagiotropic branches in the canopy. Planting material originated from ground runners were used as planting materials. Randomized complete block design with five replicates and four treatments as Ground runner (without pruning or training as control), Pruned only, Trained only and Trained and Pruned pepper plants were used. Pruning of pepper vines was done at 70 cm height level and training of pepper vines was done using coiling and burying around the supports. After two and half month period reported that number of plagiotropic branches fromTrained and Pruned (12±1.68) followed by Trained only (11±0.76), Ground runner (7±0.39) and Pruned only (5±0.44)pepper plants respectively. The reportedorthotropic branches forTrained and Pruned, Pruned only, Trained only and Ground runner pepper plants were 4±0.31, 4±0.38, 2±0.17 and 2±0.24, respectively. The highest number of leaves (95±12.51) and total orthotropic shoot length (98.14cm±14.91) were also reported from Trained and Prunedpepper plants. According to the results, it was clear that Trained and Pruned pepperplants showed better performance for all growth parameters as compared to other treatments. Therefore, it can be concluded that training and pruning of ground runner pepper plants at the initial stages is more beneficial for having more number of orthotropic and plagiotropic branches.

Keywords: *ground runner, orthotropic branches, plagiotropic branches, Pruned, Trained*

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Effect of Super Absorbent Polymers (SAPs) on Irrigation Interval of Betel (*Piper betle* L.) at Nursery Level

T.H.M.C.B. Senaviratbna[1], K.D.N. Priyadarshani[2] and J.B.D.A.P. Kumara[1]

Abstract

Water scarcity is considered as a one of the most important limiting factor for expanding betel farming under predicted climatic change. Therefore, optimization of irrigation water use is given higher attention. As such application of Super Absorbent Polymers (SAPs) to increase soil moisture holding capacity was evaluated. A pot experiment was conducted to evaluate the effect of SAPs on growth of betel plants under different irrigation intervals. The experiment design was a factorial layout based complete randomized design with two main factors (application of SAP and irrigation interval). Application of SAP has two levels with SAP (ASAP) and without SAP (NSAP) and there were four levels in irrigation intervals as 2, 4, 6, 8 days. Results showed that, media with SAP significantly enhanced plant growth parameters including plant height, average internodal length, total leaf area, root to shoot ratio and total dry weights in 6 days (ASAP6) irrigation interval compared to the NSAP, 2 days (present farmer practice) irrigation interval. Moreover, in all ASAP treatments moisture holding capacity increased by 39 % and bulk density decreased by 25 %. Further, it has shown that, the application of SAPs increased water use efficiency by 88 % in ASAP6 treatment with 55 % less water consumption and 40 % more biomass production compared to farmer practice. Therefore, it is evident from the results that, the application of SAP at a rate of 2 g kg^{-1} of potting media could increase the irrigation interval up to 6 days without any negative effect on betel plant growth compared to the farmer practice.

Keywords: *Irrigation interval, Piper betle L., Super Absorbent Polymer, Water scarcity*

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Effect of Maturity Stage of Stigma and Time of the Day for Pollination on Seed Quality and Yield of *Platycodon grandiflorus* under Tropical Greenhouse Conditions

M.P.T.P. Subasinghe[1], G.D.K. Kumara[1], A. Balasooriya[2]

Abstract

Various types of flowering plants have been cultivated by the Hayleys Quality Seed Company to produce F1 hybrid seeds. Out of those crops, *Platycodon grandiflorus* has become one of the major export earning crops. Comprehensive knowledge on floral biology (i.e. flowering behavior, time of anthesis, pollen viability and receptivity stage of the stigma) of parent lines is very important to produce F1 hybrid seeds. However, unavailability of information regarding best receptive stage is a limitation and it has led to reduced seed yield. A study was carried out to study the effective receptive stage of *Platycodon grandiflorus* under tropical greenhouse conditions. Combination of parent lines 2012/99 (Female) and 2026/99 (Male) was used to produce F1 hybrid seeds of SPD 2008 variety. All female parent flowers were emasculated three days before pollination. Pollination treatment was started three days after emasculation and continued up to the seventh day. Artificial pollination was done either in the morning or in the afternoon on each day. The combinations of the pollination day after emasculation and the pollination time of the day were used as treatments. The ten treatments were replicated 15 times. Self-pollinating flowers were used as the control treatment. The research was conducted in Complete Randomized Design (CRD) and data were analyzed using Excel and Statistical Analytical Software (SAS) packages. The maximum seed yield of 81 per pod was recorded in the treatment of 'artificial pollination after five days of emasculation'. Pollination between 5-7 days of emasculation had no significant difference in seed yield. The artificial pollination in the afternoon between 3-4 days of emasculation is significantly better than artificial pollination in the morning in terms of yield. There was an inverse relationship between seed weight and number of quality seeds per pod. Pollinating *Platycodon grandiflorus* flowers either in the morning or in the afternoon, 5-7 days after emasculation gives a higher yield of quality seeds under tropical greenhouse conditions.

Keywords: *Hybrid seed production, Platycodon grandiflorus, Pollination time, Seed yield and quality, Stigma receptivity*

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Development of a Finely Ground Coconut (*Cocos nucifera*) Paste from Fresh Coconut Kernel for Domestic Culinary Purpose

D.S.S. Welagedara[1], C. Yalegama[2] and L.P Vidhana Arachchi[1]

Abstract

Fresh kernel is a good source of protein, fat, fiber and carbohydrate. In fresh state it contains considerable amount of moisture and sofreshly scraped coconut meat does not keep well as it is quickly attacked by bacteria and moulds. So the domestic coconut wastage is high. Provision of ready to use coconut paste is a convenient product for culinary purposes to Sri Lankan house wives. This study was conducted to develop a coconut paste from fresh coconut kernel and shelf life was determined. Coconut was scraped and blending at low, medium and high RPM speeds. In addition, steam treatment was given for scraped coconut for 45 minutes and paste was then prepared. Sterilized samples were then bottled and kept for the shelf life evaluation. Free Fatty Acid and Peroxide values were thereafter examined with time to evaluate rancidity,and microbial contamination was tested with Total Plate count. Results envisage that the proximate composition of fat, protein, fiber and moisture at medium RPM was significantly higher ($p<0.05$) compared to that of low and high speeds. Furthermore, Free fatty Acid and peroxide Values were not significantly different with the heat treatment ($p>0.05$). However, Total Plate Count was significantly high ($p<0.05$) even in sterilized heat treated samples during second and third weeks. At fourth week, Total plate Count was significantly higher in both treated and control sample. It is evident from results that blending of coconut kernel at medium speed and under the steam treatment can produce the suitable coconut paste for consumption.

Keywords: *Free Fatty Acid, Peroxide value, Rancidity, Rounds Per minute,Shelf life,Total Plate Count*

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In-Vitro Screening of Tomato (*Solanum lycopersicum L.*) Germplasm for Drought Tolerance

W.A.K.K. Withanage[1], G.G.S.U. Gamage[2] and P.K. Dissanayake[1]

Abstract

Tomato is an important vegetable crop and has a higher consumption rate all over the world, because of nutritional value and medicinal value. Tomato considered as a cash crop and highly demanded for irrigation water. Drought conditions limit the plant growth and productivity and it is a major abiotic factor affect for crop production. Tomatoes are grown in drought prone areas in Sri Lanka, with limited irrigation facilities. Development of drought tolerant varieties in tomato are focused by the Department of Agriculture, Sri Lanka to meet the demand of climate smart varieties in near future. Drought screening is much more labor and time consuming at field condition.Henceit is essential to develop laboratory methods to screen large number of germplasm for drought tolerance. Tomato germplasm screen under in-vitro condition by using polyethylene glycol (PEG-6000) for drought tolerance and it is an ideal method for screening large set of germplasm with less effort, accurately and cost effectively. A total of 150 tomato accessions are available in Plant Genetic Resource center, Gannoruwa. This experiment was carried out with 26 tomato accessions out of 150 at four concentrations (0, 20, 40, 60 g/l) of polyethylene glycol in completely randomized design. The seed germination and important seedling characters such as number of roots, root length, root weight, shoot length and shoot weight were recorded. According to the germination percentage accession 28, 250, 537, 1038, 1652, and 1657 were susceptible for the drought. Accessions 386 and 2138 have good root characteristics for drought tolerance, whereas accessions 6446, 84, 151, 1657, and2141 have moderate root characteristics for drought tolerance and accessions 1038, 537, 1653, and 1665 have poor root characteristic for drought tolerance. Accession 270 and 1662 can be used for further drought tolerance because of root growing ability in higher concentration of PEG. The best accession for drought tolerance is accession 6446.

Keywords: *Accession, Drought, In-vitro, Polyethylene glycol, Tolerance*

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Study on Nutritional Quality of Value-Added Products of Mango (*Mangifera Indica L.* Var. Tom JC)

T.P.K. Madhushankani[1], S.M.A.C.U. Senarathne[2] and A.A.Y. Amarasinghe[1]

Abstract

Mango (*Mangifera indica* L.) is the most abundant fruit crop in Sri Lanka and the post-harvest losses are very high. Value addition is very important to reduce the losses. The nutrition quality is a good quality indicator of value-added products. This experiment was carried out to study nutrition quality in value-added products of mango and to identify the best value-added product comparing to fresh mango. In this study, six value-added products of mango (*Mangifera indica* L. var. Tom JC) were analyzed for their protein, fat, fiber, carbohydrate, vitamin C, calcium, total sugar, total minerals and moisture content. The research was conducted in Complete Randomized Design (CRD) and data were analyzed in Statistical Analysis Software (SAS). When comparing with the row mango, mango nectar recorded the highest vitamin C content (10.7300mg/100g of fresh mango), moisture content (64.8100g/100g of fresh mango), calcium content (21.333 mg/100g of fresh mango), and fat content (0.4600g/100g of fresh mango). Dehydrated mango, mango jam and canned mango have a significant difference of carbohydrate with row mango. When considering the total sugar content, mango jam and pulp have high sugar content than fresh mango due to addition of sugar during processing. Dehydrated mango has the highest crude protein content (0.8033g/100g of fresh mango) when compared with fresh mango. The highest fiber content (2.9833g/100g of fresh mango) was recorded in mango jam. The high temperature was the major effect to loss the nutrition in the value-added products, during the various food processing methods. When considering overall nutrition content, mango nectar was boosted their nutritional quality than fresh mango. These results confirmed the previous information that mango nectar is a good source of nutrients in the human diet.

Keywords: *Value-added products, dehydrated mango, Mangifera indica L., Nutrition quality*

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Production of Potassium Enriched Compost (Super Compost) Using Natural Soil Microbial Cultures and Feldspar

E.A.N. Niroshani[1], D.M.P.S. Dissanayaka[2] and P.L Yapa[1]

Abstract

Among essential plant nutrients, potassium (K) is considered as a major nutrient that affects most of the biochemical and physiological processes in plants. Supplying a natural available K through a special compost mixture to plants in the available form will eradicate the requirement of chemical fertilizers such as Muriate of Potash. This study focused on producing special compost (Super Compost) that contains significantly higher amount of potassium in available forms. Study was done according to the Randomized Complete Block Design using farm waste inoculated with rich natural microbial cultures extracted from virgin soils. Seven treatments used were, compost, compost+10%felspar, sterilized compost+10% feldspar(Control), compost + 10% feldspar + microbial culture from Sinharaja soils, compost + 10% feldspar + microbial culture from Kalthota soils, compost + 10% feldspar + microbial culture from Sripada soils, compost +10% feldspar + compost tea. Feldspar was added at the rate of 10% on weight basis of the compost piles. Available K was analyzed in the flame photometer using digestion method. A pot experiment was conducted with nine treatments for MICH3 variety of chilli and BG250 variety of rice to evaluate the effect of different compost mixtures on plants. It was clearly evident that the K feldspar and natural microbial cultures have significantly increased the available K content in compost (P<0.001). The highest level of available K was detected in the treatment with microbial culture from Sinharaja (50g/l) followed the cultures from Kalthota natural forest (5g/l). Response to the microbial cultures from Sripada (50g/l) has been late but a jump in available K in the compost with feldspar was observed in the 12th week. Chilli yield has significantly been increased by the compost treated with feldspar (3Kg/30Kg) and microbes from Sinharaja (50g/l). Both the panicle formation and tillering of rice has significantly been increased by the same compost. Microbial cultures taken from Sinharaja (50g/l) and Kalthota (50g/l) natural eco systems are the effective microbial cultures, in solubilizing potassium from feldspar.

Keywords: *Agrochemicals, Microbial Cultures, Potassium Feldspar*

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Assessing the Efficiency of Remediating Agents on Pd Contaminated Soils in Horton Plains

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Abstract

Forest dieback in the Upper Montane, Rain Forests in Sri Lanka, Horton Plains, has by now grown out of control to result a disastrous environmental problem in the country. Horton Plains may be the most important forest resource in the country in terms of its service offered as the major water catchment and the biodiversity hot spot. Soil pollution by Pb has been identified as one of the major reasons for the forest dieback in Horton Plains. This study focuses on finding a cost-effective solution to remediate the contaminated soils in Horton Plains. The efficacy of three (3) natural geo-sorbents made from plant materials were used to assess the immobilization of soil Pb. Soil samples collected from the worst affected area with 100% forest dieback, Thotupolakanda, in Horton Plains were used for the laboratory trial. Three types of biochar materials – i.e., (a) Rubber Nut Shell (RNB) (b) Rice Husk (RH) (c) Naturally developed Biochar (HPB) in Horton Plains, were used to study the immobilization capacity of them with Pb in contaminated soils. Soils were spiked with standard Pb and treated with biochar and left for incubation at room temperature for 14 weeks. Soil pH was 5.4 and the Cation Exchange Capacity (CEC) was 210 c mols kg^{-1}. Soil organic matter (SOM) content was extraordinarily high to reach 13.4%. Soluble Pb in each treatmentwas analyzed in the Atomic Absorption Spectrophotometer (AAS). Before adding treatments, the content of Pb in all the biochar types used for the study was analyzed and was undetectable. It was evident that the Pb immobilization capacity of RHB is the highest – followed by RB ($P< 0.0001$). HP was proven to be ineffective in immobilizing soil Pb. HP collected from Horton Plains have not been made under controlled pyrolysis process and cannot even be considered as biochar. Thus, RHB appears to be a cost-effective material to remediate Pb contaminated soils in Horton Plains.

Keywords: *Forest Die back, Lead, Immobilization, Biochar*

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Department of Livestock Production

Effect of Selected General Health Parameters on Repeat Breeding of Dairy Cows at Dry Zone Dairy Farm in Sri Lanka

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Abstract

Repeat Breeding (RB) syndrome causes considerable economic losses in the dairy industry worldwide. Multiple etiologies have been suggested to cause RB syndrome in dairy cattle. Objectives of the current study were to investigate the relationship between nutrition, lameness and gastrointestinal parasitism on RB syndrome of cows in an intensively managed dairy herd in low country dry zone dairy farm in Sri Lanka. Body Condition Score (BCS), Locomotion score (LMS) and Fecal egg count (FEC) of the randomly selected exotic dairy cows (N = 80; jersey - 40 and jersey Friesian crossbreed - 40) were determined. Data were analyzed using Chi-Squaretest in SAS 9.0 version and graphically illustrated by using MS Excel (2016). BCS and LMS were scored using 1 to 5 point score system. FEC was measured by McMaster Fecal Egg Counting Procedure.57.5% of RB cows showed higher BSC values (BCS>4) and 15% showed lower BCS values (BCS<2) while 17.5%, 27.5% and 55% of Healthy Cows (HC) showed low, high and medium (BCS 4 -2) BCSs respectively indicating the BCS has a significant effect on RB syndrome (P<0.05). The LMS and FEC results displayed no significant effect (P>0.05) on RB syndrome where both HC and RB groups showed low percentages (5% and 10% respectively) of high LMS values (LMS>2) and lower percentages(13.75% and 6.25% respectively) of RB and HC groups showed FEC>200. In conclusion, this study showed that BCS can be effectively used to determine the occurrence of RB syndrome in a dairy herd.

Keywords: *Body condition score, Fecal egg count, Gastrointestinal parasitic infection, Locomotion score, Repeat breeding syndrome*

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Development of Ready to Eat Fish Paste using Chub Mackerel (*Scomber Japonicus*) Offcuts

H.M.M.C. Samarakoon[1], P.S. Kumara[1*], C.N. Walpita[1] and E. Udayatilake[2]

Abstract

The chub mackerel (*Scomber japonicus*) is one of the popular marine species used in fish canning industry yet the production of fish offcuts during canning process considered as a waste leaving significant loss to the manufacturer. The present study was focused on the development of a ready to eat fish paste using chub mackerel offcuts. Hence, three different recipes/treatments (R_1, R_2 and R_3) with three different offcut percentages (63.5%, 52.1% and 61.08% respectively) were used to find the best to be developed as a mackerel fish paste aiming local consumers for an affordable price. Further one commercial fish paste was used as a reference (R) to compare the relevant attributes with above treatments. To find the best recipe for chub mackerel, definite sensory attributes (color, texture, flavor, odor, spread ability and overall acceptability), physicochemical properties (color variation, pH) and the shelf life (Free Fatty Acid-FFA and Peroxide Value-PV and the detection of *Clostridium botulinum*) of the fish pastes were examined (r=3). Conferring to the sensory attributes, R_3 had the highest overall acceptability together with maximum scores for flavor, color and the texture which were significantly different to other treatments. The lowest acceptability was observed in reference sample but for spread ability. Proximate analysis revealed that there was a negative relationship between moisture and ash content in all samples since highest moisture content (65.24%) and lowest ash content (1.58%) detected in R whereas the lowest moisture (59.79%) and highest ash content (2.99%) were detected in R_2 yet the ash content was significant ($P<0.05$). Besides, R_3 had the highest crude protein (16.89%) and lowest crude fat (17.1%) levels. The detected color values had inverse relationship between color scores obtained from sensory evaluation. The pH of the fish pastes were shown a significant reduction ($P<0.05$) during first four weeks for all treatments and it was further reduced within next four weeks until it reached its lowest still within the acceptable level. The highest FFA value was detected in R_2 whereas the lowest value in R_3 which significantly ($P<0.05$) lower compared to the other treatments. The PV was not detected in any treatments. Lastly, these fish paste was examined for the presence of *C. botulinum* to assure the product safety and the *C. botulinum* was not present in tested treatments. In conclusion chub mackerel fish offcuts could be used to

prepare a fish paste using three recipes tested in this study however, R_3 (offcut - 61.08%) seemed the best recipe since it fulfilled the major requirements to be developed as a commercial fish.

Keywords: *Fish paste, Offcut, Scomber japonicus*

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Obtaining of Target Daily Weight Gain of Jersey Friesian Cross Bred Heifer Calves by Appropriate Feeding

J.M. Thalpavita Vidana Kankanumge[1], G. Weerakkody[1*] and K.G.D. Gunathilaka[2]

Abstract

Early puberty and conception of heifers depend on their proper growth. Proper growth of heifers will be achieved by gaining the target daily weight gain. Maintain the recommended weight gain is essential for generating the healthy and well grown heifers. Target daily weight gain of heifers can be achieved by balanced feeding. Target daily weight gain is varying according to cattle breeds and this study was conducted to obtain 550g/day/heifer of Jersey Friesian cross bred heifer calves. Four months old, Six Jersey Friesian cross bred heifer calves were allotted to the treatment group and another six heifers to the control group in a completely randomized design. The experimental diet which formulated according to the recommendation of National Research Council, 2001 was fed three times per day for 15 days with five days adaptation period. Farm diet was fed as the control diet. Live weight of each heifer in both treatment and control groups were measured once in three days. Average daily weight gain of treatment and control groups were 623.3g and 250g/day/heifer respectively. There was a significant effect of experimental diet on average daily weight gain of the heifer calves ($p<0.05$). The highest and lowest weight gains of experimental and control group were 680g, 560g, 320g, 200g/day/heifer respectively. The results revealed that the experimental diet gain the target daily weight gain of 550g/day/heifer of Jersey Friesian cross bred heifer calves.

Keywords: *Heifer calves, TMR (Total Mixed Ration), Weight gain.*

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Determination of the Best Washing Cycle for Production of Surimi from *Amblygaster Sirm* Fish

M.K.C. Priyadarshana[1] and C.N. Walpita[1*]

Abstract

Fish is considered as an important source of protein. As the qualities of fish are reducing with the time, preserving fish is an important matter. Making surimi is considered as one of the best ways of preserving fish with value addition. But there is a low availability of conventional fish resources used for surimi production and small pelagic fish has been identified as a better alternative. But there is a high content of dark muscles which is associated with high myoglobin content in these fish. As the whiteness is the major quality parameter which is inversely proportionate to the myoglobin content in surimi, pre washing is generally used. Additionally, pre washing reduces the excessive fat content and it increases the pH level leading to high gel strength in small pelagic fish. Therefore the major objectives of this study was to use ***Amblygaster sirm;*** a variety of small pelagic fish which not yet been used for surimi processing and to identify the best washing cycle to get the ideal whiteness level in surimi. For this study 05 treatments were used; T0 (Unwashed), T1 (Single washed), T2 (Double washed), T3 (Triple washed) and T4 (Quadruple washed) in order to determine the best washing cycles which give the lowest myoglobin contents. Tap water was used as the washing reagent in pre washing. For further selection of the best washing cycle, changes of pH, fat and protein contents of the washed mince were analyzed. Surimi product was developed by washing fish mince with the washing cycle, which showed the most cost effective and beneficial washing. There was a significant reduction in the fat content ($p < 0.05$) with the double washing while the reduction of fat content with quadruple washing is not significant. The pH values also showed a significant increase ($p < 0.0001$) in double washing and quadruple washing both compared to control. Double washing resulted a significant reduction in the myoglobin content of fish mince ($p < 0.0001$) compared to rest of the treatments. That reduction in myoglobin content was the percentage wise highest loss achieved through the least number of washing cycles. So washing two times leads low cost, low labour and low waste water than washing four times. Even there was a significant reduction of protein content ($p < 0.05$) in double washing and quadruple washing both; quadruple washing showed an excessive protein loss compared to double washing. So double washing was the best type of washing which produces best quality surimi.

Keywords: *Myoglobin, Surimi, Washed Mince, Washing Cycle, Washing Reagent, Whiteness*

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Effect of Hazzard Analysis Critical Control Point Plan for Temperature Control in Chub Mackerel (*Scomber japonicas*) Canned Fish Process Line

I.R. Gunasekara[1], C.N. Walpita[1*] and E. Udayatilake[2]

Abstract

Canning of Chub mackerel (*Scomber japonicus*) in Sri Lanka is done to supply increasing demand of canned fish to local consumers. However, histamine poisoning and many quality deformities in produced fish cans were found to be major food safety concerns. Pareto analysis in one of these processing lines have shown that most of these quality related problems arise mainly due to poorly controlled temperature in unit operations. Hazard Analysis and Critical Control Points (HACCP) is the best method of controlling the processing line for product and food safety. The aim of this study was therefore to determine whether the operational temperature in unit operations could be maintained within specified limits and histamine levels brought down to safe limits after implementing HACCP. The HACCP plan was implemented using Deming's cycle and unit operation temperatures were taken before and after implementation of HACCP during 3 months' time period using 90 sample from each unit. Ultimately results showed that histamine level was reduced to 17 -20 ppm which is below the previously determined acceptable level (50ppm). Meanwhile, number of defects of the products were declined up to 60 percent, and also final product quality and safety was assured. Overall findings reveal that temperature abuse and subsequent histamine formation in the canning process of *Scomber japonicus* can be effectively controlled by HACCP implementation.

Keywords: *Canned fish, HACCP, Scomber japonicus, Temperature*

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Comparison Between Sand Paper and Tissue Paper Egg Cleaning Methods on Hatchability and Chick Quality

M.K.T. Rupasinghe[1], H.M.G.P. Herath[1*] and G.A.S.N. Gamlath[2]

Abstract

Method of egg cleaning before incubation influences the quantitative and qualitative parameters of day old chicks. This study was carried out to evaluate the effect of sand paper and tissue paper egg cleaning methods on egg weight loss during incubation, hatchability and chick quality parameters. Nine hundred (900) dirty eggs from MX male x Cobb 500 female (38 weeks of age) were collected from the breeder farm. The eggs were randomly allocated as Complete Randomized Design (CRD) for two treatments each with three replicates (n=150 eggs). Eggs were cleaned by using sand papers (Grit 400) and tissue papers separately before cold storage. The eggs were incubated at temperature of 37.2^0 C, relative humidity 88.3%, ventilation 13.52 cubic meters/hr with turning up to 18th day and allowed to hatch during 18-21 days temperature of 36.9^{0}C, relative humidity 86.5%, and ventilation 28.7 cubic meters/hr without turning. The egg weight loss was measured at 18th day of incubation and hatchability, chick quality parameter such as chick weight, chick length and tona score were determined at the end of the hatching period (21st day). Hatching residues were collected separately at the end of incubation period and egg break out test was performed. Data was statistically analyzed using one way ANOVA. Results revealed that there were significantly lower (p<0.05) weight loss in, eggs cleaned by tissue paper (10.6 % ± 0.08) over sand paper method during incubation. The hatchability was significantly greater (p<0.05) in, eggs cleaned by tissue papers (92.88 % ± 0.58) while it was (88.66% ± 1.15) for sand paper method. The significant higher (p<0.05) values for chick weight (46.87 g ±0.31) and length (18.93 cm±0.04) were observed in tissue paper egg cleaning method compared to sand paper egg cleaning method. Tona scores were significant different (p>0.05) between two egg cleaning methods. Break out analysis showed that higher embryo mortality (5%) occurred in sand paper egg cleaning method. Therefore, it can be concluded that tissue paper egg cleaning method performs significantly better than sand paper egg cleaning method in terms of egg weight loss reduction, hatchability and chick quality.

Keywords: *Chick quality, Egg cleaning, Hatchability, Sand paper, Tissue paper*

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Correlation of the Age of Indian River Hens with Hatchery Performance and Chick Quality

K.R.U.S.K. Leelarathne[1] and M.A.J.P. Munasinghe[2*]

Abstract

The study reported herein was carried out to determine the correlation between the age of broiler breeder hens and hatchery performances and chick quality. A total of 6048 hatching eggs were obtained from Indian River broiler breeder hens at ages of 42, 46, 48, 57, 63, 67 weeks. Eggs (n=336)from each age groups were analyzed in for the production performance such ashen day production, hatching eggs percentage (%), average egg weight, fertility, hatchability, embryonic mortality, chick weight, chick yield and chick quality. Data were analyzed by using statistical analyzing software (SAS) 9.0 version andMicrosoft Excel 2010. Age of the hens had a strong positive correlation with both the egg weight and the chick weight ($p<0.001$). Hen day production, and the hatching eggs percentages were decreased with the advancing age of the broiler breeder hens ($p<0.001$). The lowest fertility and hatchability rates were recorded ($p<0.001$) from older hens at 67 weeks of age. The results also showed that the embryonic mortality and chick yield were improved ($p<0.001$) with advancing age of broiler breeders. The percentage of chicks with low quality scores were reported to be higher in older flock at age of 67 weeks than the younger flocks. More number of salable chicks (%) were recorded from younger flocks as compared to older flocks (42 weeks vs 67 weeks).Most of the performance evaluated had a negative correlation with the age of broiler breeders. It is evident that the age of breeders could be an important indicator for breeder and hatchery management decisions.

Keywords: *Broiler breeders, Production performance, hatchery performance, chick quality*

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