

**NSATRS - 2021**  
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**28<sup>TH</sup>**



# **Proceedings of the 2<sup>nd</sup> National Symposium on Agro-Technology and Rural Sciences**

**A Way Forward for Smart Agriculture Towards Rural Development**



University of Colombo  
Institute for Agro-Technology and Rural Sciences,  
Weligatta New Town, Hambantota, Sri Lanka

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## **TABLE OF CONTENTS**

Editorial Board.....	I
Organizing Committee.....	II
Panel of Reviewers .....	III
Message from the Vice Chancellor.....	V
Message from the Director.....	VI
Message from the Coordinator.....	VII
Message from the Secretary .....	VII
Abstract Index .....	IX

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## MESSAGE FROM THE VICE CHANCELLOR

I congratulate the Director, Heads of Departments, Chairperson, academic members of the organizing committee, administrators and students of UCIARS for the excellent team effort in conducting the Second National Symposium of Agro-Technology and Rural Sciences (NSATRS 2021) amidst challenges posed by the pandemic. Your chosen theme on “**A way forward for smart agriculture towards rural development**” personifies the Sri Lankan priorities in addressing food security.

I am cognizant that the UCIARS is a centre of excellence in the field of Agro-Technology and caters to the needs of our country by creating scientists cum entrepreneurs for the betterment of Sri Lanka’s agricultural sector. This symposium provides a platform to bring researchers, entrepreneurs, innovative farmers and the industry together to deliberate and discuss on the diverse areas of Agro-Technology. I am very confident that the UCIARS will embark on a process of unveiling appropriate and sustainable discoveries, thereby converting the findings into practical applications for the farming community.

It is noteworthy that the contributions of the academic and support staff along with the students to the physical, managerial and academic endeavors of the institute are wide and varied. The University of Colombo is indeed proud of the incredible development witnessed at the UCIARS, over a relatively short period, portrayed by a remarkable teaching-learning environment achieved with charm and simplicity.

Your collective efforts to make the Second National Symposium on Agro-Technology and Rural Sciences 2021 a success is highly appreciated. I wish you fruitful deliberations and scientific networking that would ensure this to be an annual event in the UCIARS calendar.

Stay safe and healthy!!

Senior Professor Chandrika N Wijeyaratne  
Vice Chancellor  
University of Colombo  
Sri Lanka





## **MESSAGE FROM THE DIRECTOR**

I am delighted and proud to deliver this message as the Director of the University of Colombo Institute for Agro Technology and Rural Sciences (UCIARS) to the Virtual Second National Symposium on Agro Technology and Rural Sciences 2021 (NSATRS 2021) on the theme of “**A way forward for smart agriculture towards rural development**”. The symposium will provide a comprehensive overview of the research conducted in the field of Agro Technology and Rural Sciences over the past years.

This institute endeavors to generate well rounded students with knowledge, talents, skills and attitudes with more exposure to outside expertise and practical trainings. The NSATRS 2021 provides the second opportunity to young academics, researchers and students, a platform for exchanging new findings, creative ideas, views and showcasing their talents and it will continue annually to ensure that UCIARS is a promising model in the academic sphere. Hence, UCIARS plays a significant role in knowledge sharing, technology generation & dissemination, product development & patenting and creation of agro-entrepreneurs which make direct contributions to the betterment of the agriculture sector in Sri Lanka.

I congratulate the organizing committee of the NSATRS 2021 for compiling all valuable scientific information as a proceeding which is a commendable team effort of staff and students of UCIARS.

My profound blessings to you all and very best wishes for all your future endeavors!

Professor Sutharsan Somasundaram  
Director  
UCIARS



## **MESSAGE FROM THE COORDINATOR**

It is a great pleasure of publishing the second proceedings of NSATRS – 2021 with dedicated and lavish contribution of everyone at the University of Colombo Institute for Agro Technology and Rural Sciences. The key goal of the symposium was to provide a platform to share and exchange the expertise, experiences and research findings and to create a forum specially for young researchers and to discuss the challenges and future directions in different research in Argo Technology. The proceeding provides a glimpse of the diverse interests on Agro Technology based research and its new directions. Hence, this symposium provided a great opportunity for sharing brilliant ideas and stimulating awareness and concerts for inspiring the national agriculture beyond the production.

The responses to the call for papers were overwhelming and I would like to express my sincere gratitude and appreciation for all reviewers who helped us to maintain the quality of manuscripts included in this proceeding. I would like to express my thanks to the members of the organizing team for their hard work, commitment, and dedication extended to make this a success. The support received and enthusiasm witnessed by all have truly exceeded our expectations. The symposium that covers timely important subject areas was indeed a step taken by UCIARS to promote the knowledge and enthusiasm of entrepreneurs across it's vision of "Entrepreneurial Agriculture and Sustainable Natural Resource Management ".

Enjoy the technical programme please and pleasantly invite your deliberations for applications of technical intelligence for the betterment of Agriculture in Sri Lanka.

Dr. Sujatha Weerasinghe  
Coordinator / NSATRS 2021



## **MESSAGE FROM THE SECRETARY**

It is a great honor to me and I am privileged to compile research articles as the secretary of the 2<sup>nd</sup> National Symposium on Agro-Technology and Rural Sciences 2021 (NSATRS 2021) which builds a congregation platform for the professionals in the field of agriculture. The University of Colombo Institute for Agro-Technology and Rural Sciences is now, for the 2<sup>nd</sup> consecutive year, congregating NSATRS 2021 on a timely important theme ‘A way forward for smart agriculture towards rural development’. The main objective of NSATRS 2021 is to bring academics, researchers, and professionals in diverse subject areas that help to face emerging challenges and promote new horizons that foster enhanced agricultural performances.

I take this opportunity to express my heartfelt gratitude to all my colleagues of the organizing committee of NSATRS 2021 who sacrificed their time and energy out of the clock to make this event a great success. I herewith welcome and thank all invitees, authors, participants and all well-wishers, on behalf of the UCIARS. The organizing committee believes time at the symposium would be productive and more informative. I wish you all a very fruitful and pleasant stay at the NSATRS 2021. Hope and wish the NSATRS 2021 brings opportunities for all of us to gain new knowledge, reach new heights and look forward a sustainable future of the agriculture sector in Sri Lanka.

L. M. Rifnas  
Secretary / NSATRS 2021



## ABSTRACT INDEX

### SMART AGRICULTURE AND ECO-SYSTEM SAFETY

- INFLUENCE OF MICRONUTRIENTS ON YIELD AND THE QUALITY OF CAULIFLOWER (*Brassica oleracea* L.)**  
*I. J. A. Ruhunuge\**, *P. H. S. L. Sandaruwan*, *M. Y. A. S. Rathnayake* and *J. P. Kirthisinghe* ..... 01
- DESIGN AND DEVELOPMENT OF CONCEPTUAL MULTI-STOREY CONSTRUCTED WETLANDS FOR HEAVY METALS REMOVAL BY PHYTOREMEDIATION**  
*M. R. Fathima Rashadha\** ..... 02
- TRANSITION TO CLEANER ENERGY: A CASE OF RURAL HOUSEHOLDS' WILLINGNESS TO PAY FOR IMPROVED COOK STOVES**  
*P. K. D. Vishmani*, *J. M. M. Udugama\**, *D. P. N. Ranadewa*, *K. A. N. A. Appuhami* and *T. P. S. R. Guruge* ..... 03
- ECO-FRIENDLY BIO PRILLS WITH WATER HYACINTH (*Eichhornia crassipes*) TO RAISE NURSERY PLANTS**  
*H. I. G. K. Anuruddi*, *K. P. Samarasinghe*, *L. M. Rifnas*, *S. S. Weerasinghe\** ..... 04
- WATER HYACINTH BASED ORGANIC GROW BAGS FOR URBAN GARDENING**  
*H. I. G. K. Anuruddi*, *K. P. Samarasinghe*, *L. M. Rifnas* and *S. S. Weerasinghe\** ..... 05
- GROW BAGS FROM BANANA (*Musa spp*) PSEUDO STEM FOR URBAN FARMING**  
*K. P. Samarasinghe*, *H. I. G. K. Anuruddi*, *L. M. Rifnas* and *S. S. Weerasinghe\** ..... 06
- TECHNIQUE TO REMOVE THE ASH ADHERED ON BANANA (*Musa spp*) LEAVES BEFORE CURING AS FOOD WRAPPERS**  
*W. G. C. Madushani\**, *I. C. Dodampe* and *S. S. Weerasinghe* ..... 07
- EFFECT OF ORGANIC MANURE ON PERFORMANCES OF PADDY (*Oryza sativa*) CULTIVATION IN AMPARA DISTRICT**  
*H. M. A. Y. A Sandaruwan*, *H. I. G. K. Anuruddi*, *S. S. Weerasinghe\** and *M. F. A. Saneer* ..... 08

### AGRICULTURAL INNOVATIONS FOR FOOD SECURITY

- EFFECTIVENESS OF MORINGA (*Moringa olifera*) LEAVES AGAINST COWPEA WEEVIL (*Callosobruchus maculatus*)**  
*D.M.N. Dissanayake* and *R.F. Niranjana\** ..... 09

<b>EFFICACY OF LEMONGRASS (<i>Cymbopogon citratus</i>) AND WATER HYACINTH (<i>Eichhornia crassipes</i>) AGAINST COWPEA BEETLE (<i>Callosobruchus maculatus</i>) IN STORED COWPEA</b> <i>A. P. T. H. Pihilladeniya and R. F. Niranjana*</i> .....	10
<b>ISOLATION, IDENTIFICATION AND CHARACTERIZATION OF POTENTIAL PROBIOTIC BACTERIA FROM COW COLOSTRUM FROM SRI LANKAN DAIRY CATTLE FARMS</b> <i>R. M. S. P. Rajapaksha* and J. A. M. S. Jayathilake</i> .....	11
<b>EFFECT OF SELECTED MEDICINAL PLANTS ON THE QUALITY OF GREEN GRAM SEEDS TREATED FOR <i>Callosobruchus maculatus</i> UNDER LABORATORY CONDITION</b> <i>M. T. F. Rumaisa* and R. F. Niranjana</i> .....	12
<b>BIOACTIVE CONTENT, IN VITRO ANTIOXIDANT AND ANTI INFLAMMATORY POTENTIAL OF SELECTED SRI LANKAN EDIBLE FLOWERS</b> <i>G. Janarney*, K. D. P. P. Gunathilake and K. K. D. S. Ranaweera</i> .....	13
<b>IDENTIFICATION OF THE ASSOCIATION OF PHYTOPLASMA WITH LEAF SCORCH DECLINE IN WELIGAMA COCONUT LEAF WILT DISEASE AFFECTED AREA THROUGH MOLECULAR DETECTION</b> <i>P. H. P. R. De Silva, S. A. C. N. Perera and R. N. Attanayake*</i> .....	14
<b>EVALUATION OF NUTRIENT COMPOSITION FOR NOVEL LOW-COST MEDIA (LCM) FOR ISOLATION OF ACTINOMYCETES</b> <i>C. P. Jeyachandran, P. Ranasinghe*, H. M. R. M. Thilakarathne and A. A. Lunuwilagae</i> .....	15
<b>VEGETATIVE PROPAGATION OF <i>Antidesma alexiteria</i> L. (HINEMBILLA), AN UNDERUTILIZED FRUIT SPECIES: EFFECT OF STEM CUTTING TYPES, POTTING MEDIA AND AUXIN APPLICATION</b> <i>R. P. I. V. Somasiri, H. M. Herath*, R. M. C. S. Ratnayake and R. A. S. P. Senanayake</i> .....	16
<b>POTENTIAL OF BOTANICALS AS BIOPESTICIDES IN INSECT PEST MANAGEMENT</b> <i>M. S. M. Imthiyas and N. Sivasubramaniam*</i> .....	17
<b>YIELD AND PEELING PERFORMANCES OF CLONAL-CUTTINGS AND SEEDLINGS OF CINNAMON (<i>Cinnamomum zeylanicum</i>)</b> <i>B. S. Bandusekara, S. S. Weerasinghe* and K. G. G. Wijesinghe</i> .....	18
<b>DEVELOPMENT OF STERILIZATION PROTOCOL FOR <i>IN-VITRO</i> PROPAGATION OF <i>Cleistanthus collinus</i> Roxb.</b> <i>Y. S. P. Sewwandi, S. Subasinghe and N. Dahanayake*</i> .....	19
<b>REVIEW ON EFFECTS OF AFLATOXIN</b> <i>M. G. W. K. Weerasinghe, A. A. R. P. Lakshani and N. Dahanayake*</i> .....	20

## **A REVIEW OF NUTRACEUTICAL HABIT OF TURMERIC**

*M. M. N. T. Bandara, N. Dahanayake\*, P. C. D. Perera and S. Subasinghe* ..... 21

## **COCONUT OIL INDUSTRY IN SRI LANKA**

*A. A. R. P. Lakshani, N. Dahanayake\* and M. G. W. K. Weerasinghe* ..... 22

## **A STUDY ON STORAGE STABILITY OF GLUTEN-REDUCED LEAVENED FLAT BREAD NAAN PRODUCED FROM COMPOSITE BLENDS OF SWEET POTATO AND WHEAT FLOUR**

*S. Dhushane\* and T. Mahendran* ..... 23

## **MORPHOLOGICAL CHARACTERIZATION OF *Terminalia catappa* L. (TROPICAL ALMOND) IN GALLE DISTRICT, SRI LANKA**

*K. G. Ketippearachchi\*, S. Subasinghe, N. P. Vidanapathirana and T. D. Silva* ..... 24

## **EFFICACY OF BOTANICAL EXTRACT AGAINST THE PAPAYA MEALYBUG (*Paracoccus marginatus*) (Williams & Granara de Willink, 1992)**

*B. U. N. S. Amarasena, K. Pakeerathan\* and B. Charitha* ..... 25

## **EFFECTS OF SEED TREATMENTS AND GROWING MEDIA ON GERMINATION OF VARA (*Calotropis gigantea*) SEEDS**

*K. Kumara, S. A. P. Nelka\*, S. Subasinghe, N. P. Vidanapathirana and H. I. G. K. Anuruddhi* ..... 26

## **DEVELOPMENT OF AN IN-VITRO PROPAGATION PROTOCOL TO INDUCE SUCKERS FROM SOUR BANANA**

*H. K. S. N. Kumari, H. Rohanadheera\* and N. P. Vidanapathirana* ..... 27

## **EFFECTS OF CINNAMON (*Cinnamomum zeylanicum*) POWDER EXTRACT AGAINST THE PESTS OF RADISH (*Raphanus raphanistrum* Subsp. *Sativus*)**

*S. J. Tharanga, N. P. Vidanapathirana\* and A. J. M. C. M. Siriwardana* ..... 28

# **CLIMATE RESILIENT AGRICULTURE**

## **TIME SCALE VARIATION OF WATER QUALITY OF BATTICALOA LAGOON, SRI LANKA**

*M. S. M. Azaam\* and M. Sugirtharan* ..... 29

## **DEVELOPMENT OF A LOW COST AUTOMATED DRIP IRRIGATION SYSTEM BY USING INTERNET OF THINGS**

*S. S. V. Jayalath\* A. Narmilan and M. I. M. A. Hameed* ..... 30

## **DEVELOPMENT OF A SMART WEATHER MONITORING AND REAL TIME ALERT SYSTEM**

*L. P. S. S. K. Dayananda\*, A. Narmilan and M. I. M. A. Hameed* ..... 31

## **IMPLEMENTATION IOT (INTERNET OF THINGS) BASED SMART AGRICULTURE FERTILIZER SYSTEM**

*Nithun Madanayaka and B. L. Sanjaya Thilakarathne\** ..... 32

<b>EVALUATION OF THE PERFORMANCE OF POWER TILLER MOUNTED FERTILIZER APPLICATOR ON VARIABLE APPLICATION RATE</b> <i>K. H. D. Abeyrathna*, P. L. A. G. Alwis, and N. K. Hettiarachchi</i> .....	33
<b>EFFECT OF DIFFERENT SOIL AMENDMENTS ON SOIL MOISTURE RETENTION AND BEAN (<i>Phaseolus vulgaris</i>) CROP GROWTH</b> <i>M. M. P. A. Kumara, H. I. G. K. Anuruddi, S. S. Weerasinghe* and M. N. Somachandra</i> .....	34
<b>DESIGN PARAMETERS TO DEVELOP A CART FOR FIELD TRANSPORTATION OF PINEAPPLE (<i>Ananas comosus</i>)</b> <i>D. M. C. C. Gunathilake*</i> .....	35
<b>EFFECTS OF DIFFERENT MEDIA AND NUTRIENT SUPPLEMENTS ON VEGETATIVE GROWTH OF <i>Abelmoschus esculentus</i> L.</b> <i>D. D. L. B. R. Nawarathna* and S. Sutharsan</i> .....	36
<b>EMPOWERING RURAL COMMUNITY THROUGH NOVEL AGRICULTURAL TECHNOLOGY</b>	
<b>REVIEW ON STRATEGIES TO IMPROVE AGRICULTURE SECTOR OF SRI LANKA WITH SPECIAL REFERENCE TO POST COVID 19</b> <i>V. Anuraagan*, S. Sutharsan and S. Srikrishna</i> .....	37
<b>IMPACT OF WORKPLACE RELATIONSHIPS ON JOB SATISFACTION AMONG AGRICULTURE EXTENSION WORKERS: A CASE STUDY IN KANDY DISTRICT</b> <i>H. M. P. M. Dayarathne*</i> .....	38
<b>PRESENT SITUATION OF EMPOWERMENT OF WOMEN FARMERS: A CASE OF IMBULPE DS DIVISION IN SRI LANKA</b> <i>S. D. D. Rathnachandra* and S. H. P. Malkanthi</i> .....	39
<b>EXPORT PERFORMANCE OF ORNAMENTAL FISH INDUSTRY IN SRI LANKA: ESPECIALLY UNDER COVID-19 PANDEMIC SITUATION</b> <i>W. A. R. N. Weerasinghe* and S. H. P. Malkanthi</i> .....	40
<b>PERCEPTION AND PURCHASING BEHAVIOUR OF HOUSEHOLDS TOWARDS FRUIT AND VEGETABLES IN SRI LANKA</b> <i>U. D. R. Udari* and A. K. A. Dissanayake</i> .....	41
<b>HERBICIDE USAGE AND PADDY PRODUCTIVITY IN THE PERI URBAN AREAS: A STUDY IN THE GAMPAHA DISTRICT</b> <i>S. T. Hansika* and M. Esham</i> .....	42
<b>WOMEN EMPOWERMENT IN RURAL DEVELOPMENT BY USING ICT</b> <i>A. N. N. M. Gunasekara*</i> .....	43

<b>PRESENT STATUS AND CHALLENGES FOR ACHIEVING FOOD AND NUTRITION SECURITY: STUDY ON GONAPINUWALA DS DIVISION</b> <i>L. G. M. Prasangi*, S. T. C Amarasinghe and N. P. G Samantha</i> .....	44
<b>PRODUCTIVITY ISSUES IN PADDY FARMING: COMPARISON UNDER IRRIGATED AND RAIN-FED CONDITIONS</b> <i>A. A. Shantha and W. A. N. Maduchani*</i> .....	45
<b>THE IMPACT OF TECHNICAL TRANSFORMATION OF PADDY FARMING ON RURAL UNEMPLOYMENT</b> <i>R. N. Palliyaguruge* and A. A. Shantha</i> .....	46
<b>FORMULATION, EVALUATION AND ANTIBACTERIAL EFFICIENCY OF ALOE VERA-BASED HERBAL HAND SANITIZER</b> <i>T. T. M. Kumara, H. I. G. K. Anuruddi, W. G. C. Madushani and S. S. Weerasinghe*</i> .....	47
<b>REVIEW: ASSOCIATION IN-BETWEEN FOOD ADDITIVES AND NON-COMMUNICABLE DISEASES IN MODERN WORLD</b> <i>U. R. Chandimala* and P. C. Arampath</i> .....	48
<b>FARMER AWARENESS ON AGRO-CHEMICAL'S APPLICATION IN SOORIYAWEWA OF HAMBANTOTA DISTRICT IN SRI LANKA – A CASE STUDY</b> <i>W. G. K. Sarangi, B. P. Siriwardena*, T. G. B. Dhanushka and N. P. Vidanapathirana</i> .....	49
<b>A STUDY ON PERCEPTION OF SRI LANKAN SOCIETY ON CULTURED MEAT</b> <i>U. R. Chandimala*, N. P. Vidanapathirana and L. M. Rifnas</i> .....	50
<b>CONSUMER AND PRODUCER CONCERNS ON QUALITY OF DRIED FISH IN HAMBANTOTA DISTRICT</b> <i>H. M. M. T. Herath, H. K. R. S. Kumara* and H. I. G. K. Anuruddi</i> .....	51



# **SMART AGRICULTURE AND ECO-SYSTEM SAFETY**

## INFLUENCE OF MICRONUTRIENTS ON YIELD AND THE QUALITY OF CAULIFLOWER (*Brassica oleracea* L.)

I. J. A. Ruhunuge<sup>1\*</sup>, P. H. S. L. Sandaruwan<sup>1</sup>, M. Y. A. S. Rathnayake<sup>2</sup> and J. P. Kirthisinghe<sup>3</sup>

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### Abstract

A field experiment was conducted at Batapola, Ambalangoda (WL4) during Maha season in 2019, to study the effect of Calcium (Ca) and Magnesium (Mg) on yield and the quality of cauliflower. In Sri Lanka, poor yield and quality of products are the major constraints in cauliflower cultivation. The Department of Agriculture (DOA) recommends a blanket fertilizer for all species of cabbage. In literature, it was found that an inadequate supply of micronutrients may be a reason for the lower yield of cauliflower in Sri Lanka. The soil was analyzed for available nutrients and identified the most deficit micronutrients as Ca and Mg. The experimental design was a Randomized Complete Block Design with 4 replicates. Five treatments were taken as DOA recommendation includes 10 mt/ha of composts with NPK (T1), NPK only (T2), NPK with Ca and Mg (T3). NPK with only Ca (T4), NPK with only Mg (T5). Here urea 110 kg/ha and triple super phosphate (TSP) 275 kg/ha and muriate of potash (MOP) 75 kg/ha were applied as basal dressing whereas 110 kg/ha of urea was applied as top dressing 1 and as top dressing 2; urea 110 kg/ha and MOP 75 kg/ha was applied. All the other cultural and management practices were done according to the DOA recommendation. Plant height and leaf area were measured up to 50% flowering and time taken to 50% flowering and final yield were measured. Post-harvest keeping quality was measured under the open-air condition and covered with 150-gauge low density polythene bags at room temperature. Plants are grown with NPK with Ca and Mg (T3) showed a significant positive effect on yield, leaf area, time was taken to 50% flowering and final yield. The post-harvest keeping quality was high in curds (cauliflower's head) obtained from (T3) and stored at different storage conditions moreover it was started to decay later than the other treatments.

Keywords: Blanket fertilizer, Cauliflower, Micronutrients, Post-harvest quality

## DESIGN AND DEVELOPMENT OF CONCEPTUAL MULTI-STOREY CONSTRUCTED WETLANDS FOR HEAVY METALS REMOVAL BY PHYTOREMEDIATION

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### Abstract

Phytoremediation offers a cost effective, safe and less technical alternative to conventional wastewater cleanup techniques. This study aimed to assess the removal efficiency of heavy metals (Pb, Cu and Cd) by phytoremediation using a conceptual Multi-Storey Constructed Wetland Units (upper, middle and lower cases stacked one above the other) under various environmental conditions such as inside & outside the greenhouse and with & without supplementary light inside the greenhouse. *Vetiveria ziznioides*, *Hydrilla verticillata* and *Eichhornia crassipes* were used in upper, middle and lower constructed wetland units respectively. The lengths, widths and heights of each multi-storey constructed wetland units were 55 \* 30 \* 30 cm, respectively. Two sets of multi-storey constructed wetlands were established outside the greenhouse without plants (control) and with plants. Another two sets of constructed wetland units were established inside the greenhouse with and without supplementary red light to study the greenhouse effect on pollutant removal. Synthetic wastewater was prepared to be used in the constructed wetland units and the inflow of the synthetic wastewater was adjusted to have required hydraulic retention time. The effluent from each constructed wetland units were collected for different consecutive days for four weeks. The parameters of Biological Oxygen Demand<sub>5</sub>, Chemical Oxygen Demand and concentrations of heavy metals were measured along with plant growth in the collected effluent. The constructed wetland units inside the greenhouse with supplementary red-light had the highest removal of Biological Oxygen Demand<sub>5</sub> (95%), Chemical Oxygen Demand (89%) and heavy metals, Cd (98.2%), Pb (100%) and Cu (100%) ( $P < 0.05$  for all parameters) when compared with all the other treatments. Multi-storey constructed wetland units with plants had highest removal of Biological Oxygen Demand<sub>5</sub>, Chemical Oxygen Demand, Cd, Pb and Cu when compared to control without plants. The plant growth rate was increased with the greenhouse effect and with red-light supplement. *Eichhornia crassipes* is the best choice out of three plants used to remove the above mentioned pollutants.

Keywords: Biological Oxygen Demand, Chemical Oxygen Demand, Greenhouse, Heavy metals, Phytoremediation

## **TRANSITION TO CLEANER ENERGY: A CASE OF RURAL HOUSEHOLDS' WILLINGNESS TO PAY FOR IMPROVED COOK STOVES**

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### **Abstract**

Traditional cook stoves pose significant negative impacts on both household health and environment due to emissions from solid fuel burnings. Consumer choice to transition into cleaner energy, although a key factor for a sustainable energy management, has not adequately been explored in Sri Lanka. Therefore, this study aims to (1) elicit the user preferences and willingness-to-pay for improved cook stoves (2) investigate the incentives to transition in to clean-energy sources. A choice experiment was conducted with the local community in the Anuradhapura district of Sri Lanka where a considerable number of households use cookstoves. Data were collected from a randomly selected sample of households using a structured questionnaire followed by a choice experiment. A conditional logit model was used to estimate the determinants and willingness to pay. Results highlight that monthly usage cost of fuel was a strong determinant as it showed the highest marginal willingness-to-pay. It was also evident that the respondents were willing to pay more for stoves with less smoke. Households perceived health and convenience to be the two most important incentives driving transition to cleaner energy sources. This study therefore suggests policy interventions to incentivize cleaner cooking technology as it also contributes to reducing greenhouse gas emissions from biomass burning. Results also highlight that households expect a considerable support from the government. Policy makers must therefore ensure adequate investment in infrastructure, energy research and public awareness to expand household's energy portfolio and promote sustainable clean-energy transition.

Keywords: Biomass burning, Cleaner energy, Households, Stoves, Willingness-to-pay

## **ECO-FRIENDLY BIO PRILLS WITH WATER HYACINTH (*Eichhornia crassipes*) TO RAISE NURSERY PLANTS**

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### **Abstract**

Easily affordable nursery substrates are a current need due to the higher costs incurred in coir dust-based medium. Meanwhile, plastic based pots and trays used in commercial nurseries and removed during transplanting that leads root damages and environmental pollution. Therefore, it is very important to develop eco-friendly nursery pots using biodegradable materials. With this objective, the present investigation was carried out at University of Colombo Institute for Agro-technology and Rural Sciences - Weligatta, to produce bio prills using Water Hyacinth (WH), locally known as Japan jabara (*Eichhornia crassipes*) which is a common aquatic plant in reservoirs. The fresh WH plants were chopped, dried and pound into a powder. It was mixed with Untreated Coir Dust (UCD) at different ratios and molded into flat structures termed as prills. Treatments were; WH only, WH: UCD 1:1, WH: UCD 1:3, WH: UCD 3:1, UCD only and Commercial Coir Dust (CCD). Electrical Conductivity (EC), pH and Water Holding Capacity (WHC) of the prills were evaluated. The suitability of the product for raising seedlings was tested by raising brinjal seedlings up to transplanting stage in a completely randomized design with 10 replicates. Germination, seedling height, number of leaves, root length, wet biomass and survival of the seedlings at transplanting were recorded. There was a significant difference in EC, pH and WHC between the treatments. When WH proportion is increased in the treatments, EC and pH also increased recording the highest pH (8.2) in prills prepared only with WH. Seedling performance in that treatment was significantly lower when compared to CCD and UCD. It may be due to the high pH and EC which is not suitable for seedling growth. However, WH: UCD 3:1 treatment showed significantly same seedling performance to CCD and UCD treatments in terms of germination, seedling height, root length, wet biomass and survival at transplanting. Therefore, WH: UCD 3:1 prills were selected as appropriate combination to produce bio prills where the WH can be used to maximum extent. Further improvements are in pipeline to increase the WH proportion in the prills while controlling pH and EC.

**Keywords:** Bio Prills, Eco Friendly, Seedling Nursery, Water Hyacinth

## WATER HYACINTH BASED ORGANIC GROW BAGS FOR URBAN GARDENING

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### Abstract

Urban gardening is limited to few structural arrangements to cultivate crops due to limitations of land and water. Therefore, portable, easy to handle and less space required crop growing structures are essential for urban settings. Topsoil, coir dust and compost are the presently used growing media in urban farming activities. But urban soil is heavily contaminated and may not suitable for growing crops. Since coir-based products are not freely available there is a need to introduce easily available low-cost growing substrates. With that objective, the present study was carried out at University of Colombo Institute for Agro-technology and Rural Sciences - Weligatta, to produce grow bags using Water Hyacinth (WH); *Japan jabara* (*Eichhornia crassipes*) as a growing media. As a parallel study, it has already been identified the growing media of WH: Untreated Coir Dust (UCD) 3:1 as a suitable substrate for growing nursery plants. With the objective of developing grow bag using this identified media combination, the present study was conducted as a further improvement. About 300g of dried and powdered WH and 100g of UCD was mixed and filled into a square shaped (12" x 7") and round shaped (12" height and 8" diameter) black polythene bags and they were inserted into the same sized molds made with wood and steel. These filled bags were compressed using a special device assembled for the purpose to prepare grow bags. Another few grow bags using UCD were also compressed. The suitability of the product for raising seedlings was tested by raising Brinjal seedlings in a completely randomized design with 05 replicates against commercial and UCD grow bags. Germination, seedling height, number of leaves, root length, wet biomass and survival of the seedlings were recorded at 21 days of seed sowing. According to the results, there was no significant difference of the evaluated parameters among the treatments. Therefore, this result implies that, grow bags with WH: UCD 3:1 media have the same capacity to produce seedlings as of commercial coir bags. Adding WH will help to reduce the coir dust utilization which is costly.

Keywords: Grow bags, Low cost, Urban farming, Water hyacinth

## **GROW BAGS FROM BANANA (*Musa spp*) PSEUDO STEM FOR URBAN FARMING**

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### **Abstract**

Improper dispersal of agricultural waste not only pollutes the environment but also waste renewable energy. Recycling and reusing of agricultural waste are regarded as critical steps in environmental conservation in agricultural production. generally, popular urban gardens produce cheap, fresh products which are important for assuring food and nutrient safety of urban dwellers. To promote and popularize this concept within a restricted space in urban areas, introduction of low cost, easily accessible materials are of prime importance. Accordingly, there is a need to introduce possible substitutes for replacing high cost growing media to be used in urban gardens. With that objective, the present study was carried out at University of Colombo Institute for Agro Technology and Rural Sciences (UCIARS) - Weligatta, to produce grow bags using Banana Pseudo Stem (BPS) as the growing media for raising plants. In a parallel study, it has already been identified the growing media of Banana pseudo stems added with 1/3 of coir dust (CD) as one of the best substrates for growing nursery plants. Based on these findings the current study was carried out as a step forward to develop a grow bag as a most appropriate structure especially for vertical farming in a restricted space. About 300g of dried and pounded BPS and 100g of CD was mixed and filled into a square shaped (12" x 7") and round shaped (12" height and 8" diameter) black polythene bags and they were inserted into the same sized molds made with wood and steel. These filled bags were compressed using a special device assembled for the purpose to prepare compacted grow bags in which materials remain as a block. It helps easy handling, transportation in commercial scale production and hanging in vertical farming. The suitability of the product for growing plants was tested by raising Brinjal seedlings in a completely randomized design with 05 replicates against commercially using blocks made up of coconut fiber. Germination, seedling height, number of leaves, root length, wet biomass and survival of the seedlings were recorded at 21 days of seed sowing. There was no significant difference in evaluated parameters among the treatments implying that, grow bags with BPS: CD 3:1 media have the same capability to produce seedlings as of commercial coconut fiber bags.

Keywords: Banana pseudo stems, Grow bags, Low cost, Urban farming

## **TECHNIQUE TO REMOVE THE ASH ADHERED ON BANANA (*Musa spp*) LEAVES BEFORE CURING AS FOOD WRAPPERS**

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### **Abstract**

At present, polythene and lunch sheets are widely used as food wrappers despite that lead an enormous environmental problems. As a solution, different types of biodegradable food wrappers have been introduced since recent past and among them Banana leaves are the most practicable and commonly available material. Being Banana is the major fruit crop grown in Sri Lanka availability of raw material is excessive, and the wrapper production technology is available to be practiced as a cottage level industry. One of the limitations of this technique is presence of ash on the wrapper after curing of the food wrappers which affects not only the attractiveness of the product but also customers misled to believe this ash as a chemical has been applied during processing. This ash is an inherent material adhered on to the lower surface of the leaf as a natural element. Hence, this study intended to identify a technique to remove the ash intact on to banana leaves before subjecting for curing as a pretreatment. Pieces of well expanded 40 banana leaves were subjected for four treatments; warm water; cool water, soap water and just tap water as the control treatment. Also, four soaking durations as just 5 minutes, 6 hours, 12 hours and 24 hours were considered. The treated leaves were wiped with a piece of sponge and washed well using tap water. Then the leaves were cured by dipping them in boiling water for two seconds and allowed them to cure for 3-4 hours under room temperature to be used as food wrappers. The quality of the cured leaves was evaluated using questionnaire with a panel comprised of 20 members. According to the results 98% of the respondents reported soaking in soap water for 24 hours as the best treatment for eliminating ash adhered on to the banana leaves. As a conclusion it could be identified the soaking in soap water for 24 hours as the better and easy practice for removing ash on banana leaves before curing them to be used as food wrappers.

Keywords: Ash layer, Banana, Food wrappers



## **EFFECT OF ORGANIC MANURE ON PERFORMANCES OF PADDY (*Oryza sativa*) CULTIVATION IN AMPARA DISTRICT**

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### **Abstract**

Sri Lanka currently produces 2.7 million tons of rice annually and satisfies around 95% of the domestic requirement. Out of that about 16% is produced by Ampara district which is one of the major paddy cultivating districts in Sri Lanka. The extent of paddy cultivation in Ampara district is around 82, 000 ha and cultivate in both Yala and Maha seasons. Currently their cultivations are mainly dependent on inorganic fertilizers and farmers follow the recent recommendation made by the Department of Agriculture (DOA) on the basis of GS divisions. They never apply organic manure to their paddy cultivations and have no experience about application or its impact on growth and yields. Therefore, it is worth to study the feasibility to apply organic manure for paddy cultivation in this area. Having this objective an experiment was conducted in Pannalgama GS division in Damana area in Ampara district using commonly growing rice variety BG 94/1. Five treatments as T1 – only inorganic fertilizer recommended by the DOA as the control treatment (N-225, P 00, K -20 kg/ha) T2 (Composts 10 mt/ha +DOA recommendation), T3 (Cow dung 10 mt/ha + DOA recommendation), T4 (Poultry manure 5 mt/ha + DOA recommendation), T5 (Gliricidia leaves 10mt/ha + DOA recommendation) were tested in Randomized Complete Block Design with three replicates. Pre germinated seeds were broadcasted and plant height (cm), number of tillers, number of panicles, number of seeds/panicle, 100 seed weight (g), total yield (Mt/ha) and straw yield (Mt/ha) were recorded. The cow dung showed significantly higher results in all growth and yield parameters compared to the other organic manure types and the control. Hence, application of inorganic fertilizer along with organic manure preferably with cow dung could be identified as better combinations for obtaining higher yield from paddy cultivation in Ampara district.

Keywords: Ampara, High yield, Organic manure, Paddy

# **AGRICULTURAL INNOVATIONS FOR FOOD SECURITY**

## **EFFECTIVENESS OF MORINGA (*Moringa olifera*) LEAVES AGAINST COWPEA WEEVIL (*Callosobruchus maculatus*)**

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### **Abstract**

Cowpea weevil (*Callosobruchus maculatus*) is a destructive pest of stored cowpea grains. The loss may sometimes be 90 % as the favorable conditions prevailing at storage. As the control applied synthetic insecticides against this pest cause detrimental effects to humans and the environment, it is time to search for ecofriendly management practices. The laboratory experiment was conducted to evaluate the efficacy of moringa leaf extracts such as leaf powder, water extract, ethanol extract and methanol extract against cowpea weevil on the parameters viz., mortality percentage, number of damaged grains and weight loss at room temperature (28-30°C) and 74-80% RH. Though the cowpea seeds treated with ethanol extract of moringa leaves showed the highest mortality percentage of 90%, lowest damaged grains (9.5) and least weight loss (0.18 g) at the F1 generation emergence. The statistical analysis evidenced the no significant difference between ethanol and methanol extracts of moringa leaves. Therefore, ethanol and methanol extracts of moringa leaves confirmed their superiority in controlling the cowpea weevil with good characteristics on cowpea seeds during storage than the other tested treatments, namely, cowpea seeds treated with moringa leaf powder and water extract of moringa leaves.

**Keywords:** Cowpea seeds, Cowpea weevil, Ethanol, Methanol, Moringa

## **EFFICACY OF LEMONGRASS (*Cymbopogon citratus*) AND WATER HYACINTH (*Eichhornia crassipes*) AGAINST COWPEA BEETLE (*Callosobruchus maculatus*) IN STORED COWPEA**

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### **Abstract**

Cowpea (*Vigna unguiculata* L.) seeds are vulnerable to the infection by Cowpea beetle (*Callosobruchus maculatus* L.) in storage. The application of synthetic insecticide to control such insect pests leads to numerous hazardous effects on the environment and humans. Thus aim to research botanical products to manage the *C. maculatus*. Water hyacinth (*Eichhornia crassipes* L.) is most problematic invasive aquatic weed. Therefore, the study has been conducted to confirm the presence of insecticidal properties in this weed and in order to use the weed in a beneficial manner rather destructing without any benefits. Further the study was aimed to check the efficiency of Lemon grass (*Cymbopogon citratus* L.). Because of their strong lemon like smell. The laboratory experiment was conducted to evaluate the efficacy of selected both plants extracts such as powder form and methanol extract against cowpea beetle on the parameters viz., mortality percentage, number of damaged seeds and weight loss at laboratory conditions. The experiment was set up in a completely randomized design, using five treatments and four replicates. Lemongrass methanol extract produced the highest mortality (100%), followed by Water hyacinth methanol extract (85%), Lemongrass powder form (65%), and Water hyacinth powder form (65%). The study showed that the lemongrass methanol extract was significantly efficient in controlling the *C. maculatus* than the other treatments tested. Further the lemongrass methanol extract provided maximum protection with less damaged cowpea seeds (9.3) and minimum seed weight loss (5.72%), which was significantly greater than the other treatments. The present study's finding indicated that botanical products, especially lemongrass methanol extract, could provide effective control against *C. maculatus* on cowpea seeds.

Keywords: Cowpea beetle, Lemongrass, Methanol, Powder form, Water hyacinth

## **ISOLATION, IDENTIFICATION AND CHARACTERIZATION OF POTENTIAL PROBIOTIC BACTERIA FROM COW COLOSTRUM FROM SRI LANKAN DAIRY CATTLE FARMS**

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### **Abstract**

Development of functional foods that contain probiotics are popular in the world due to their health benefits. Instead of consumption of medicinal drugs, many people tend to use those functional foods for the prevention of the diseases. There are many sources of probiotics that are used in food industry. Rather using traditional sources of probiotics scientists tend to identify novel source of probiotics. The current study was conducted with the aim of identifying lactobacilli species present in cow colostrum collected from Sri Lankan dairy cattle farms as a source of probiotics. Cow colostrum samples were collected from ten different selected dairy cattle farms while practicing sterile conditions in order to isolate lactobacilli species and their identity was confirmed by cultural, biochemical and physiological tests. Grouping of lactobacilli isolates was carried out using five biochemical tests and two physiological tests. Evaluation of probiotic properties were studied by bile tolerance, acid tolerance and antibiotic sensitivity tests. The main findings suggested that the confirmed lactobacilli isolates were 43% from the total isolates, 93% of the isolates were able to vigorously grow at 45°C and 47.5% of the isolates tolerated to NaCl up to 6.5% (w/v), All the lactobacilli isolates showed acid (pH <3.00 for 3 hours) and bile (0.3% for 4 hours) tolerance and none of the isolates showed resistance against selected antibiotics amoxicillin, chloramphenicol, gentamicin, tetracycline and erythromycin (P<0.05). Therefore, it can be concluded that lactobacilli isolated from cow colostrum from Sri Lankan dairy cattle farms are a good source of probiotic bacteria and further studies should be carried out to identify the ability to exert clinically documented health benefits and conducting the experiments in-vivo for confirmation is necessary for those identified isolates in order to generalize the findings.

**Keywords:** Cow colostrum, Lactobacilli, Probiotics, Sri Lankan dairy cattle

## EFFECT OF SELECTED MEDICINAL PLANTS ON THE QUALITY OF GREEN GRAM SEEDS TREATED FOR *Callosobruchus maculatus* UNDER LABORATORY CONDITION

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### Abstract

The present study was conducted to evaluate the efficacy of 1% *Acorus calamus* rhizome powder, 1% *Piper longum* fruit powder, 1% *Aloe vera* aqueous extract, and 1% *A. vera* methanol extract against *Callosobruchus maculatus* infesting green gram seeds under laboratory condition ( $30 \pm 2^\circ\text{C}$  and  $70 \pm 5\%$ ) based on quality characters of treated green gram seeds such as seed damage, weight loss, and germination in the Agricultural Biology laboratory, Faculty of Agriculture, Eastern University, Sri Lanka during July to September 2020. The experiment was laid out in a complete randomized design consisting of five treatments with four replications. Data were subjected to the analysis of variance aided by SAS 9.4 version, and means were separated by using DMRT. No any seed damage and weight loss were recorded significantly in the green gram seeds treated with *A. calamus*, and *P. longum* powders. Significantly highest seed germination was recorded in *P. longum* (100%) and *A. calamus* (98.75%) treated seeds among the treatments. Furthermore, aqueous extract of *A. vera* showed significantly least efficient for protecting seeds from the infestation of *C. maculatus*. Among the treatments *P. longum* and *A. calamus* powders confirmed the superiority in protecting from *C. maculatus* infestation and safeguarding the viability of the green gram seeds. Though none of the studies has been conducted related to the efficacy of *P. longum* against *C. maculatus*, the efficiency of *A. calamus* has been confirmed by previous studies. The study further recommended evaluating the consumer acceptability of the green gram seeds, as it is treated with these plant materials.

Keywords: *Acorus calamus*, *Aloe vera*, *Piper longum*, Seed damage inhibition, Weight loss

## BIOACTIVE CONTENT, *IN VITRO* ANTIOXIDANT AND ANTI-INFLAMMATORY POTENTIAL OF SELECTED SRI LANKAN EDIBLE FLOWERS

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### Abstract

As evidenced by epidemiological studies oxidative stress has been identified as the major cause for the development of chronic diseases. Bioactives from edible flowers have been reported to combat oxidative stress through their antioxidant activity and exert various bioactivities within human body. In Sri Lanka though edible flowers have been used for a long time, there is no much scientific evidence regarding their health potential. Thus the present study investigates the total phenolic, flavonoid and anthocyanin content of eight different species of edible flowers (*Ocimum sanctum*, *Vinca rosea*, *Calendula officinalis*, *Azadirachta indica*, *Carrica pappaya*, *Clitorea ternatea*, *Cassia fistula* and *Allium cepa*) along with their antioxidant and anti-inflammatory properties. Antioxidant activity was measured using DPPH radical scavenging assay and inhibition of lipid peroxidation assay. Anti-inflammatory activity was measured using assay for inhibition of egg albumin denaturation and inhibition of hypotonicity induced hemolysis. Based on the outcomes, highest phenolic and anthocyanin content was noted in *Vinca rosea* flower extracts whereas highest flavonoid content was noted in *Calendula officinalis* extracts. There were no significant ( $p>0.05$ ) differences among the phenolic content of *A. cepa*, *A. indica* and *C. fistula* flower extracts. The DPPH radical scavenging activity of the flower extracts were within the range of 41.06%-80.39%. The highest and lowest percentage of lipid peroxidation inhibition was noted in *Calendula officinalis* (72.20%) and *Vinca rosea* (17.59%) extracts respectively. Considering the anti-inflammatory activity *Calendula officinalis* expressed the highest activity in inhibiting egg albumin denaturation (57.58%) whereas *Clitorea ternatea* (25.53%) expressed the highest activity in inhibiting hypotonicity induced hemolysis. Through this study it can be concluded that the investigated flowers contain considerable amount of bioactives which exert antioxidant and anti-inflammatory activity.

Keywords: Anti-inflammatory, Antioxidants, Bioactives, Edible flowers

## **IDENTIFICATION OF THE ASSOCIATION OF PHYTOPLASMA WITH LEAF SCORCH DECLINE IN WELIGAMA COCONUT LEAF WILT DISEASE AFFECTED AREA THROUGH MOLECULAR DETECTION**

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### **Abstract**

Leaf Scorch Decline (LSD) of coconut was first identified from the Goonapinuwala area in the Southern province of Sri Lanka in 1955 and by now it has been recorded from major coconut cultivating areas of the country. Although several research studies have been conducted in the past, the exact cause for this disorder is still not known. Scorching or withering of the tips of leaflets of lower fronds with slight downward bending is the characteristic visual symptom of the disorder. Twelve LSD symptomatic coconut palms from Weligama area in the Matara district were selected. The current study was conducted to determine whether the coconut palms having LSD symptoms are associated with phytoplasma. Bud leaves, young inflorescence and roots were sampled in February and August, 2020 and brought to the Coconut Research Institute, Sri Lanka. Total genomic DNA was isolated from every sample using the modified CTAB method and Nested Polymerase Chain Reaction (Nested PCR) was performed using phytoplasma specific universal primers targeting 16s rRNA region. The samples subjected for PCR test was positive for 83%, 08% and 25% of the bud leaf tissues, inflorescence, and root tissues respectively. Selected PCR products were subjected to Sanger sequencing and BLAST results confirmed that the pathogen isolated were 99-100% similar to sequences of Sugarcane White Leaf or Grassy Shoot Disease Phytoplasma in the GenBank. It should be noted that the Weligama Coconut Leaf Wilt Disease (WCLWD), which is also caused by a similar kind of phytoplasma, infected palms co-occur in the LSD sampling area. Therefore, it is not clear whether LSD is so a direct result of phytoplasma infection or if it is due to the secondary infection. Further investigations of tissue samples taken from WCLWD free areas is needed to confirm the etiology of LSD. However, detection of phytoplasma in LSD palms also should be considered when implementing WCLWD control strategies in the area.

Keywords: Coconut, LSD, Nested PCR, Phytoplasma



## **EVALUATION OF NUTRIENT COMPOSITION FOR NOVEL LOW-COST MEDIA (LCM) FOR ISOLATION OF ACTINOMYCETES**

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### **Abstract**

Mass volume of keratinous waste, chicken feathers demands technical applications than dumping. This present study focuses on converting keratinous waste to soluble keratin for the novel low-cost media (LCM) formulation. Bakery wastages constitute major fractions of food dumping and municipal solid waste. Actinomycetes species offer an array of life saving antimicrobials. With the increasing bacterial pathogens, there is a high need to produce antibiotics that show potential effectivity against the resistant species. Actinomycetes isolation agar (AIA) is an expensive commercial medium which will not be economic to be used at all scales. The necessity of a novel alternative medium can minimize the cost of the commercial media. Chicken feathers and waste bread were selected as the raw materials in the LCM. As a novel medium an ideal composition of the raw materials of the LCM needs to be accurately quantified. The aim of this study was to analyze the nutrient composition of the novel LCM against the commercially available Actinomycetes Isolation agar. In order to achieve the optimized media, the nitrogen, carbon & total dissolved solids were quantified in feathers, waste bread and sea water respectively. The nutritional data was statistically analyzed for the evaluation of nutrient composition in the novel LCM. By producing replicas in broths and solids media the growth of actinomycetes species was observed. The final pH of the media was balanced at  $7 \pm 0.2$ . The results showed the statistical significance where the optimized media had 50% more nutrient level than the standard media. Based on the results obtained, it is suggestive that the optimized LCM facilitated a maximum growth of actinomycetes species. It could be recommended to improve the shelf life of this media. However, further molecular and microbiological validation is required to utilize the LCM for commercial purposes.

Keywords: Actinomycetes, Chicken feathers, Low cost media (LCM), Sea water, Waste bread

## **VEGETATIVE PROPAGATION OF *Antidesma alexiteria* L. (HINEMBILLA), AN UNDERUTILIZED FRUIT SPECIES: EFFECT OF STEM CUTTING TYPES, POTTING MEDIA AND AUXIN APPLICATION**

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### **Abstract**

*Antidesma alexiteria* L. (Hinembilla) is a tropical fruit plant in family Phyllanthaceae, found in wild habitats of South India and Sri Lanka. Scarcity of this fruit in the market and unawareness of urban people about the nutritional value of the fruits could be the reasons for its underutilization. In order to bring these underutilized fruit species back into cultivation, establishment of a suitable propagation system for mass propagation is important. Therefore, this research was designed to identify a suitable potting medium, a stem cutting type and the requirement of auxin to establish a successful vegetative propagation system for *A. alexiteria*. As planting materials soft wood, semi hard wood and hard wood cuttings of *A. alexiteria* were planted in three different potting media (M<sub>1</sub> - top soil, sand 1:1, M<sub>2</sub> - top soil, sand, compost 1:1:1 and M<sub>3</sub> - top soil, sand, coir dust 1:1:1) with two treatments; T<sub>1</sub>- with the application of the rooting hormone indole-3-acetic acid (IAA) and T<sub>0</sub>- controls without IAA. Each experiment was conducted with 15 replicates. The cuttings were planted in individual propagators and were kept in a net house of 50% shading under room temperature. Growth performance of the stem cuttings was monitored in regular intervals (every 28 days) for a period of six months. According to sprouting, survival, and growth performance, both soft wood and semi hard wood cuttings were suitable for propagation of *A. alexiteria*. Sprouting and survival of soft wood cuttings were 100% in M<sub>3</sub> under T<sub>0</sub> treatment. Generally, most of the recorded growth parameters of the cuttings in M<sub>1</sub> under T<sub>0</sub> exhibited the highest values. Sprouting and survival of semi hard wood cuttings were 100% with high growth parameters in M<sub>3</sub> under T<sub>1</sub> treatment whereas, hard wood cuttings were not successful in vegetative propagation of *A. alexiteria*. Even though M<sub>3</sub> potting medium showed 100% sprouting and survival, with respect to the overall performance the potting medium of topsoil and sand 1:1 can be considered as the most suitable potting mixture for soft woods of *A. alexiteria* without IAA. The potting medium of topsoil, sand and coir dust 1:1:1 with the IAA application could be considered as the best medium for propagation of semi hard wood cuttings of *A. alexiteria*.

**Keywords:** *Antidesma alexiteria*, Growth performance, Potting media, Stem cuttings, Vegetative propagation

## POTENTIAL OF BOTANICALS AS BIOPESTICIDES IN INSECT PEST MANAGEMENT

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### Abstract

Insect pest management (IPM) is a necessary process of crop growth and development. It achieves through mechanical, chemical, biological, and integrated measures, but chemical forms are inevitable and go beyond the unbearable loss to the ecosystems. Insect pests are resurgent, and they are well-evolved. IPM becomes more economically expensive at present. To compact this issue and form the indeed eco-friendly way of pest eradication, Botanicals would be the best option, mainly from plant origin. Botanicals are less toxic to humans and are non-pollutants. There are numerous plants documented for their pesticidal properties and widely adopted as bio-pesticides worldwide. Plants such as Neem (*Azadirachta indica*), Pyrethrum (*Tanacetum cinerariifolium*), Garlic (*Allium sativum*), Turmeric (*Curcuma longa*), Rosemary (*Rosmarinus officinalis*), Ginger (*Zingiber officinale*) and Thyme (*Thymus vulgaris*) are predominantly utilized to extract the botanicals to compact several insect pests belongs to Lepidoptera, Coleoptera and Diptera. The mode of action of Phyto extracts namely Azadirachtin, Pyrethrum, Rotenone and Eucalyptus essential oil, varies based on the chemical composition of the extract and the target insect pest. The actions are repellence, inhibition, denaturation of proteins, abnormalities in nerve and reproductive systems. The Azadirachtin based botanicals induce moulting abnormalities, destruct oviposition, and disrupt the endocrine system. Further, the pyrethrin can cause paralysis in nerve cells, making the insect pest rest in peace. Botanicals do not have the same knock-down effect as synthetic pesticides. Their implications take longer to manifest and need several days to achieve a healthy state in which the pest's damage is at an optimal amount. That is, they must have enough residual action to protect the crop. At the same time, botanical insecticides are specific in action, leaving no trace of food or earth. As a result, we recommend using botanicals as part of an overall IPM measure to reduce the usage of conventional insecticides. It also cuts down the agrochemicals and the cost of natural regeneration from the loss of naturally occurring biodiversity.

Keywords: Azadirachtin, Botanicals, Insect pest management, Mode of action, Pyrethrin

## **YIELD AND PEELING PERFORMANCES OF CLONAL-CUTTINGS AND SEEDLINGS OF CINNAMON (*Cinnamomum zeylanicum*)**

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### **Abstract**

Cinnamon plantations in Sri Lanka are predominantly established by the seedlings since British era. The heterogeneous plantations resulted through seedlings raised by cross-pollinated seeds is a major constraint in maintaining the uniformity of harvest. However, cinnamon growers still prefer seedlings due to some issues related to traditional processing methods and crop management practices compared to clonal cuttings. The present study was conducted to evaluate the seedling and clonal cutting populations of cinnamon on performances of bark yield, stem-erectness, branching habit, the ratio of harvestable shoots to total shoots, stem diameter, and stem height. Qualitative traits such as stem-erectness, branching habit and the ratio of harvestable shoots to total shoots were analyzed based on descriptive statistics while quantitative traits were analyzed using a t-test. The results showed that significant differences in all studied characters. Seedlings showed a significantly higher peeling efficiency in traditional processing methods whereas, population of clonal cuttings showed significantly higher ( $p < 0.05$ ) bark yield with a lower peeling efficiency. Seedling plants had over 90 % of erect and slightly curve stems and showed very less branches in the bottom part of the stem. Both these traits were positively affected on to the traditional peeling efficiency of seedling plants. Nevertheless, maintaining of high number of total stems (average number of stems is 7.4) per seedling bush could be the reason for the yield reduction in seedling plants compare to the clonal cutting plants. Further, the observations suggested that the plants raised with clonal cuttings were required more training and pruning practices to obtain erect stems which need to increase the peeling efficiency. Accordingly, it could be concluded that the seedling raised plantations are superior to clonal cuttings derived plantations for traditional peeling techniques despite the lower yields. Therefore, further investigations are planned to improve the yield performances of clonal cuttings.

Keywords: Bark yield, Cinnamon, Clonal cuttings, Peel-ability, Seedlings

## DEVELOPMENT OF STERILIZATION PROTOCOL FOR *IN-VITRO* PROPAGATION OF *Cleistanthus collinus* Roxb.

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### Abstract

*Cleistanthus collinus* Roxb. is considered as a vulnerable tree species in globally, rarely found in Sri Lanka. Seeds are extremely toxic, but they have anticancer property. Extracts of leaves, fruits, and roots use to treat for gastrointestinal disorders. This plant is mainly multiplied by seeds but seed has long dormancy period, low viability and low germination rate. No information available on conventional vegetative propagation methods. Therefore, development of reliable mass scale propagation technique is timely important to conserve the germplasm and mass scale production of planting materials. The current study is focused to develop a proper sterilization protocol to get healthy *in vitro* seedlings to excise *ex-plants* for regeneration. Matured seeds were used as *ex-plant* in this experiment. Seeds were cleaned and washed with soap solution for 10 minutes, followed by treating with 0.4% (w/v) Carbendazim (fungicide) solution for 10 minutes and 70% ethanol for 2 minutes. Two separate experiments were carried out by using seeds with and without seed coats. Each experiment was conducted as two-factor factorial completely randomized design (CRD) with 6 replicates and each replicate had 18 *ex-plants*. Seeds with and without seed coat were treated with 20, 30, 40 and 50% commercial Clorox for 10 and 20 minutes. They were established on MS (Murashige and Skoog) medium. Data were collected after one month. Seeds with seed coat were not germinated. No interaction effect was observed between two factors of different concentrations of Clorox and exposure time on non-contaminated percentage of seeds. Seeds without seed coat treated with 40% Clorox showed significantly highest non-contaminated percentage (92.3%) and 20 minutes exposure time recorded the highest non-contaminated percentage of seeds (73.1%). Interaction effect was observed on seed germination rate. The highest germination rate (95.9%) was recorded in seeds treated with 40% Clorox for 20 minutes exposure time. Therefore, it can be concluded that *Cleistanthus collinus* seeds without seed coat can be successfully sterilized by 40% Clorox for 20 minutes exposure time.

Keywords: *Cleistanthus collinus* Roxb, *In vitro*, Medicinal plant, Propagation

## REVIEW ON EFFECTS OF AFLATOXIN

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### Abstract

Food contamination with mycotoxins significantly loss the yield which is used on human consumptions and food industry. *Aspergillus parasiticus* and *Aspergillus flavus* are types of fungus that produces most harmful secondary metabolites with carcinogenic, teratogenic, and mutagenic effect. Then, it has greater potential to create serious risk on human health. *A. parasiticus*, *A. flavus* are can be often found in the storage grains, oil crops and processed feed stuffs other than dietary staples such as maize, groundnuts, rice and cassava. *Aspergillus flavus*, which produces both aflatoxin B1 (AFB1) and B2 (AFB2), while *Aspergillus parasiticus*, produces aflatoxin G1 (AFG1). AFB2 is more carcinogenic to both humans and animals. *Aspergillus* induce economic consequences over the bored subject areas; Agriculture, Food Security, Health and Tread. Aflatoxin contamination is greatly effect on the quality and the quantity of outputs in the agriculture sector other than impact on food availability, stability and utilization. Prolong consumption of the AFs, contain foods will induce damage on hepatocytes in immunity system and have probability to production of cancer cells in liver other than defect in digestive, nerve, blood circulatory systems and heart. When livestock consuming feeds with aflatoxin ultimately by products (meat, egg, milk, milk products) also contaminated with the mycotoxin and impair the livestock productivity. Indirectly aflatoxin impact on the income derived through the domestic and international trade in the world. In the current situation more than 25% of food stock per year destroy due to the aflatoxin damage. Malfunctions during the Pre harvest and post-harvest practices directs for the aflatoxin damage. In the past few decades the detoxification of AFs has continued via biological, chemical, physical methods and recently developed nanotechnology based methods. Multi-sectoral approaches should be addressed to mitigate the aflatoxin issue in the world to confirm the healthiness of the community through safe food production, enhance the quality of livestock products and improve the income of peoples. This paper provides an overview of an aflatoxin effect on the agriculture sector, food security, related economic consequences and potential solution for reduces and prevalence of exposure to the aflatoxin.

Keywords: *Aspergillus flavus*, *Aspergillus parasiticus*, Carcinogenic, Food security  
Mycotoxin

## A REVIEW OF NUTRACEUTICAL HABIT OF TURMERIC

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### Abstract

Turmeric (*Curcuma longa*), herbaceous plant belongs to family *Zingiberaceae*. Apart from its culinary purposes turmeric has been widely used in indigenous medicine in most of the Asian countries. Recently Sri Lankan farmers have started cultivating turmeric extensively and now there is enough supply of turmeric in the local market. So, this review is focused on the medicinal values of turmeric which could be developed as a nutraceutical in the future. The major bioactive constituents of *C. longa* are phenolic compounds and terpenoids. *Curcuminoids* are the major phenolic compounds while *Sesquiterpenes* have been found as the major terpenoids present in *C. longa*. Curcumin is the most active phenolic compound that shows antioxidant, antimicrobial, anti-inflammatory, anti-carcinogenic and anti-diabetic properties. Inhibition of the oxidative stress induced by reactive oxygen species, acting against a wide range of gram negative and positive bacteria, inhibition of the development of several cancer types including colon, pancreas, breast, prostate and lung cancers, suppression of the mutation induction by UV light, and stimulating the insulin secretion to act against diabetes are some of the medicinal properties of curcumin. Among the *sesquiterpenes* studies have shown that *tumerone* will be an effective drug for the treatment of diseases and dermatophytosis. As these are natural products it is much safer to use in medicine than synthetic drugs while having positive effects on health and its low cost will also be a major advantage. However further clinical trials should be conducted to confirm the activity of these chemicals and to develop drugs out of turmeric.

Keywords: Curcumin, Medicinal Properties, Turmeric

## COCONUT OIL INDUSTRY IN SRI LANKA

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### Abstract

In Sri Lanka, coconut oil is the most widely used oil, consuming about 15-20% of the annual fresh coconut harvest in country. Approximately 2600-3000 million nuts/year are produced using 20.6 % of land in country. Coconut oil consumption in Sri Lanka is estimated to be around 180,000 metric tons. Due to the inadequate capacity to produce enough coconut oil to meet the demand, we have to import coconut oil. The problem is that the coconut oil imported by several importers is contaminated with aflatoxins that exceeding the EU maximum permissible limits. Aflatoxins are secondary metabolic toxin produced by fungi such as *Aspergillus flavus* and *Aspergillus niger*. It's carcinogenic, immunosuppressive, teratogenic, hepatotoxic, and resistant to even cooking temperatures, making it dangerous to consume. Inappropriate post-harvest manufacturing practices raise fungal colonization and increasing the risk of aflatoxin contamination in oil. During the oil extraction process, aflatoxins can be transferred from raw materials to edible oil products. Another issue is that aflatoxin difficult to detect in coconut oil; the modern expensive tests such as ELISA and HPLC with fluorescence are required to determine the amount and concentrations of aflatoxins. According to the current situation, consumer safety should be ensured by monitoring aflatoxin contamination and policymakers should concentrate their efforts on implementing legislation to protect the community. In addition, steps should also be taken to refine and detoxify contaminated coconut oil, perform quality tests prior to importing, and blacklist any products that do not meet the necessary criteria. Chemically refined coconut oil should also be tested before the final safety clearance is given. Furthermore, focusing on good manufacturing practices based on scientific knowledge and the production of virgin coconut oil, which is extracted directly from coconut milk. Another key aspect that we have to concern to develop coconut cultivation and industry other than coconut oil imports.

Keywords: Aflatoxin, Careless production, Coconut cultivation, Coconut oil



## **A STUDY ON STORAGE STABILITY OF GLUTEN-REDUCED LEAVENED FLAT BREAD NAAN PRODUCED FROM COMPOSITE BLENDS OF SWEET POTATO AND WHEAT FLOUR**

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### **Abstract**

Sweet potato (*Ipomoea batatas* L.) grows well in the tropical soil and can withstand drought. In Sri Lanka, sweet potato is consumed mainly by the poor people, primarily because it is one of the cheapest sources of food. The use of sweet potato flour for supplementing with wheat flour on the baking could substantially reduce need for wheat, reduction in the usage of sugar on the products. A mixture of wheat flour and sweet potato flour could make a good baking product, which should increase the nutritive values in terms of fiber and carotenoids and the economic value of the final product. A study was conducted to reduce the wastage and improve the utilization of sweet potato through the formulation of sweet potato flour supplemented leavened flat bread naan. The sweet potato flours were used 100, 80, 60, 40, 20 and 0 % by weight to replace the wheat flour in the Naan. The prepared Naans were packed in low density polyethylene (350  $\mu$ ) and stored at the temperature of -10°C in a freezer. The nutritional, microbial and organoleptic characteristics of the sweet potato flour substituted Naan were assessed during storage to evaluate the shelf life. Naans were subjected to quality assessments at two weeks intervals for the entire storage period of three months. Among the treatment the composite superior leavened flat bread supplemented with 40% sweet potato contained 1.42% of mineral, 13.2% of moisture and 2.88% of fibre content at the end of 12 weeks of storage. The nutritional analyses revealed that the mineral of the sweet potato Naan decreased whereas moisture content increased and fibre content remained constant. As revealed by the sensory evaluation, Naan supplemented with 40 % sweet potato flour obtained highest score in terms of colour, taste, texture, aroma and overall acceptability. There were no significant ( $p>0.05$ ) differences between total plate count of all treatments. The mixture of 40 % sweet potato flour and 60 % wheat flour was found to be successful for the production of leavened flat bread Naan with improved physico-chemical and organoleptic qualities within the universally accepted standards. Based on the storage studies, the Naan packed in the low density polyethylene could be frozen stored at -10°C for 90 days without any significant changes in the quality attributes.

Keywords: Frozen storage, Naan, Quality attributes, Shelf life, Sweet potato

## **MORPHOLOGICAL CHARACTERIZATION OF *Terminalia catappa* L. (TROPICAL ALMOND) IN GALLE DISTRICT, SRI LANKA**

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### **Abstract**

Identification of phenotypic variability mainly depends on characterization of morphological traits. Morphological characterization of plants is important in plant improvements and breeding programs. Morphological traits work for essentially in effective utilization of plant germplasm to get economic and breeding gain. This research was aimed to study morphological characters of *Terminalia catappa* L. (Tropical almond) grown in Galle District in Sri Lanka. The data was collected from 70 selected plants in Galle district and locations were identified through literature and information given by government officials of the relevant authorities and general public. Sites for sampling of *T. catappa* was identified through the snowball sampling technique. According to the study, *T. catappa* plants grown in Galle district shown variations in morphological characters including plant characters, leaf characters, floral characters, fruit characters and seeds characters. *T. catappa* plants grown up to 8-40 m height with erect or spreading canopy. Plant bark is varied in colour with light brown, brown, gray, gray black and black and diameter at the breast height around 10-57 cm. The immature leaves are light green and covered with brown hairs and turn into dark green and hairless when mature. The leaves are obovate with acute or obtuse tip and ariculate of subcordate base. The 10-15 leaves with 18-41 cm length and 10-21 cm width arranged together as close spiral. Trees defoliate twice a year and leaves turn in to the red colour before falling. The inflorescence (length: 6-30 cm) consist 50-80 flowers which are white, greenish white or cream and 0.5-1.1 cm length and 0.2-0.6 cm width. The fruit is a drupe 5- 9 cm in length and 3-6 and ovoid to ovate and rarely rounded, green when immature and turn in to yellow to bright red during ripen. The ripen fruit weight varied from 8-35.5 g. This drupe comprised with exocarp (skin), mesocarp, endocarp and seed. Fruit coat is 0.3-1 cm in thickness. The white colour seed is an ovoid to ovate in shape and covered from 0.7-1.5 cm thick seed coat. The seed is 0.4-1.5 g in weight. Thus, there are some morphological variations of *T. catappa* plants grown in Galle District which can be used by breeders for improvement of the plants.

Keywords: Characterization, Galle, Morphology, *Terminalia catappa*, Tropical almond

## EFFICACY OF BOTANICAL EXTRACT AGAINST THE PAPAYA MEALYBUG (*Paracoccus marginatus*) (Williams & Granara de Willink, 1992)

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### Abstract

Papaya mealybug (*Paracoccus marginatus*) is an invasive polyphagous insect pest of Sri Lanka. Brinjal is one of the primary hosts of papaya mealybug and cause severe economic yield losses due to its heavy feeding. Several management tactics such as cultural, physical, biological and chemical have been proposed, but farmers preferred toxic insecticides which have created several health hazards to human and the ecosystem. Botanicals are promising compatible tactic with biocontrol without side effect. An investigation was planned to formulate a botanical mixer from the pure (100 %) extracts of ginger, garlic and chili, and mixed with fermented rice water. This mixer was diluted to make different concentrated solutions of 0.5%, 1.0%, 1.5%, 2.0% and 3.0% by adding double distilled water. The prepared botanical insecticide with different concentrations were tested on the papaya mealybug inoculated on the brinjal plants. All the experiments were conducted in the field using completed randomized design (CRD). Mortality percentage of mealybug was calculated after 12, 24, 48, 72 hours of treatments. The collected data was subjected to statistical analysis using SAS 9.1 student version, and Duncan's Multiple Range Test (DMRT) to identify the best treatment combination at  $P < 0.05$ . The result reveals that mortality was significantly different among the treatment at  $P < 0.05$ . The more than 80% ( $88.67 \pm 3.21$ ) mortality was observed after an exposure of 24 hours at the concentration of 3%, 48 hours at the concentration of 3% (100) and 2.0% ( $90.00 \pm 3.92$ ), 72 hours at the concentration of 3% (100), 2.0% ( $98.00 \pm 3.37$ ) and 1.5 % ( $93.50 \pm 2.38$ ). Therefore, the research suggest that 3% concentration is best to control the papaya mealy bug efficiently, and concentration cannot be increased more than that because the phytotoxic symptoms were observed when increase the concentration in the preliminary trails. Further trails are needed to recommend.

Keywords: Chilli, Eco friendly, Foliar application, Garlic, Papaya mealybug

## EFFECTS OF SEED TREATMENTS AND GROWING MEDIA ON GERMINATION OF VARA (*Calotropis gigantea*) SEEDS

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### Abstract

*Calotropis gigantea* (Vara) is a least concerned plant in Sri Lanka with a great economic importance. But there is no information on sexual propagation or vegetative propagation of this plant. Seeds of *C. gigantea* float freely in the air, fostering natural regeneration however no information on their success. Therefore, it is important to generate information on seed germination of this plant. With the objective of identifying a suitable seed germination method for *C. gigantea*, current experiment was conducted at University of Colombo Institute for Agro-technology and Rural Sciences. Two conditions; maturity of seeds and growing media were tested to observe their effects on germination of seeds. Well matured seeds before and after splitting of pods were separately collected and subjected for three different seed treatments. As hot water (35°C - 40°C/ 30min), fresh water (30min), Gibberellic acid (4000 ppm for 30 min) and untreated seeds as the control treatment. Four types of media; sand, coir dust, sand: coir dust (1:1 v/v), mixture of sand: compost (1:1 v/v) were used as germination media. The media were sterilized by autoclaving at 121°C for 20 minutes. The experiment was laid out in a Complete Randomized Design (FCRD) in factorial arrangement with 4 replicates in seed trays. Germination was recorded after 7 days of the seed sowing. There was no interaction effect in growing media and seed treatment methods. Seed germination of *C. gigantea* was significantly affected by different germination media and seed treatments separately. The highest germination percentage (67.8%) was observed when the seeds were collected from already split pods and sown in coir dust media. The seed germination percentage of the seeds which were collected after splitting and treated with gibberellic acid gave the highest significant germination percentage (71%). Therefore, gibberellic acid treatment could be identified as the best seed treatment and coir dust as the best media for germination of *C. gigantea* seeds.

Key words: *Calotropis gigantea*, Gibberellic acid, Seeds, Split pods

## **DEVELOPMENT OF AN IN-VITRO PROPAGATION PROTOCOL TO INDUCE SUCKERS FROM SOUR BANANA**

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### **Abstract**

Banana is typically propagated vegetatively; thus, tissue culture as a propagation technique provides a robust means to prepare disease-free planting materials that can provide the first line of defense in developing an integrated disease-management program for banana. Generally, it will take 24 weeks to start culture initiation from ex-plant establishment and this could be varying along the mother plant vigor. It majorly effects on increase the cost of production and make barrier to production forecast as well. So, reduction of time gap between ex-plant establishment and proliferation initiation certifies increment of production and productivity with précised forecast. Objective of the study was to determine of the most efficient protocol to induce sucker proliferation at initiation stage for of sour banana. BAP concentrations ranging from 2 – 6 mg/l were tested in split ex-plant in to two segments and non-split methods in standard MS (Murashige and Skoog) basal salt medium. There were altogether ten treatments with ten replicates. The experimental units were arranged in a 5 x 2 factor factorial completely randomized design CRD manner. Number of weeks taken to start the proliferation were observed up to six weeks of time and performances were statistically analyzed using analysis of variance (ANOVA) procedures by SAS 9.1.3 statistical software and mean separation was done using Duncan's Multiple Range Test (DMRT). It was found there were significant interactions between the factors on all the tested parameters. BAP applied at the rate of 5 and 6mg/l with split system showed better performances in all the tested parameters. It could be concluded that, BAP concentrations 5 and 6 mg/l with split system can be used to speed up the proliferation of sour banana suckers.

Keywords: Ex-plant, *In-vitro*, Propagation, Sour banana, Split system

## **EFFECTS OF CINNAMON (*Cinnamomum zeylanicum*) POWDER EXTRACT AGAINST THE PESTS OF RADISH (*Raphanus raphanistrum* Subsp. *Sativus*)**

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### **Abstract**

Radish (*Raphanus sativus*) is an important vegetable of family Brassicaceae which can be grown in all agro-ecological regions of Sri Lanka throughout the year. Cinnamon (*Cinnamomum zeylanicum* Blume) is a spice endemic to Sri Lanka contains essential oils with antibacterial, antifungal, antioxidant and insecticidal properties. Hence, this experiment was conducted with two objectives, to identify the best form of cinnamon extract as a spray on radish plants and identify the optimum dosage of cinnamon extract to control pests in radish. The experiment was carried out at the Institute of Agro Technology and Rural Sciences of the University of Colombo in Weligaththa, Hambanthota. For the first objective, four treatments were used with four replicates respectively with cinnamon powder water filtrate 1%, cinnamon powder suspension 1%, Abamectin 0.6% and Control (without pesticide). For the second objective three treatments were used with four replicates respectively 1%, 1.5% and 2% cinnamon powder water filtrate respectively. All treatments were arranged according to randomized complete block design. Growth parameters, and pest incidence were recorded from two weeks after spraying with four days intervals. Though the study showed no significant difference among the treatments, Cinnamon powder water filtrate 1%, Cinnamon powder suspension 1%, and Abamectin 0.6% those were significantly differ from un-treated control treatment in controlling the pest attack. Therefore, two forms of cinnamon powder can be used as a biopesticide for radish. Further two forms of cinnamon powder had no significant effect on plant growth and pest incidence. However, radish plants treated by cinnamon powder water filtrate showed lower number of damaged leaves compared to cinnamon powder suspension. Hence, cinnamon powder water filtrate was used for second experiment as the best form of application. Different concentrations of cinnamon powder water filtrate had no significant difference on plant growth. However, Cinnamon powder water filtrate 1% concentration significantly reduced the number of pest damaged leaves in radish plant with lowest number pest. Therefore, it can be concluded that 1% cinnamon powder water filtrate was the best biopesticide in radish for the control of pests.

Keywords: Biopesticide, Cinnamon, Pests, Pesticide, Radish

# **CLIMATE RESILIENT AGRICULTURE**

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

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Sri Lanka*

### Abstract

The present study was undertaken to find the time scale variation of some water quality parameters of the Batticaloa Lagoon in Sri Lanka during January 2019 to April 2019. Ten sampling locations in the middle part of the lagoon were identified. Nowadays quality of lagoon water is reducing due to manmade action such as dumping garbage at coastal areas, drain the household outlet towards the lagoon, washing animal like cattle and buffalo near to coastal area, washing the fishing equipment inside the lagoon and chemical from farmland, natural disasters. The study was content to identify water quality parameters within a day at different time interval and identify the relationship between temperature of the water and other water quality parameters. Water quality parameters such as temperature, electrical conductivity (EC), total dissolved solids (TDS), pH, dissolved oxygen (DO) and turbidity were measured at 15-30 cm below the water surface from different location of lagoon from morning 6.00am to evening 6.00pm. The study revealed that the mean values of the lagoon water quality parameters varied from temperature 27.8°- 34.6°C, TDS 2.83 –3.09ppt, EC 5.43 – 5.9 mS/cm, pH 7.55 -8.25, DO 15.47 - 17.74 mg/l, turbidity 12.35 to 18.37 (FTU). High values of EC and TDS were observed in the lagoon water near the bar mouth. The temperature of the water depend on atmospheric temperature while sample were taken. Temperature of the lagoon in some area may also depend on atmospheric temperature, external surrounding factors such as concrete payment and discharge from surroundings etc. There were no any significant variation of EC, TDS and turbidity was observed with time during the day. As far as the pH is concerned, the sampling locations which are far away from the bar mouth area showed lower pH values.

Keywords: Batticaloa lagoon, Electrical conductivity, Temperature, Turbidity



## **DEVELOPMENT OF A LOW COST AUTOMATED DRIP IRRIGATION SYSTEM BY USING INTERNET OF THINGS**

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### **Abstract**

Over the past decade, many countries have witnessed a growing scarcity and competition for water among different users. Agriculture is the primary water user and improving agricultural water management is essential to any irrigation management approach, especially to apply the precise amount of water to the field to meet crop water requirements. The Internet of Things (IOT) has been described as a new generation of developments in information and communication Technology (ICT). Using traditional irrigation methods, sometimes crops may not get the required water amount for their growth, and Crops may be destroyed. Therefore, smart irrigation system overcomes the issues in the conventional irrigation methods. This project aims to establish low-cost solar-powered drip irrigation that can be automated, controlled, and monitored from anywhere. This smart irrigation monitoring system is developed based on the Arduino Uno Microcontroller and sensors to measure accurate soil moisture content in the field. The drip irrigation system with the smart sensing system is used in this study to detect soil moisture content by using solar power. Furthermore, this smart system is used wireless communication modules to track the field's moisture condition while sending field status to the farmer's mobile phone. Finally, this system development is recommended for agricultural farms because it will be saved irrigation water while applying the precise amount of water to crops to automatically and accurately fulfill the crop's water requirement according to the soil moisture content.

Keywords: Drip irrigation, Internet of Things, Sensors, Smart farming, Solar energy

## DEVELOPMENT OF A SMART WEATHER MONITORING AND REAL TIME ALERT SYSTEM

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### Abstract

Weather monitoring is a vital process in the agricultural sector to minimize economic loss while improving productivity. Nowadays, the Internet of Things (IOT) is one of the emerging technologies that offer assistance in many precision agricultural practices. Smart weather monitoring is one of the precision agricultural approaches to monitor accurate weather conditions by using different sensors. The main objective was to develop a smart weather monitoring and real time alert system that solve the problem of monitoring weather conditions in the agricultural farm to make better decisions by farmers. Different sensors were used to detect temperature and humidity (DHT11), pressure (BMP180), rainfall (FC37), light intensity (LDR), CO<sub>2</sub> level (MG811), wind speed (Hall-Effect sensor), and wind direction (Infra-Red sensor) in the agricultural farm. This smart system was used to monitor weather conditions by using an Arduino Uno microcontroller while sending the weather information to the farmer's mobile phone to make better decisions to improve farm profitability to increasing the yield. Furthermore, it acts as an affordable smart weather station for farmers to monitor actual time weather accurately. Finally, this system development is recommended to agricultural farms where poor farmers are doing their farming practices because it is a low-cost system than an ordinary weather monitoring system by using different instruments.

Keywords: Arduino Uno, Internet of Things, Precision agriculture, Sensor, Smart weather station

## IMPLEMENTATION IOT (INTERNET OF THINGS) BASED SMART AGRICULTURE FERTILIZER SYSTEM

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### Abstract

This research focused an Internet of Things (IoT) based smart fertilizer system for green house. The android application was developed using android studio 4.0 by having facility to enter crop variety and suggested Nitrogen (N), Phosphorus (P) and Potassium (K) (NPK) value according to the plant height and width. For this experiment 20-40 days old Tomato (*Solanum lycopersicum* L.) were used. According to the in-vivo experiments done at greenhouse NPK (3: 1.1: 4) g dissolved in 40 ml was identified as the best ratio for one Tomato plant. However, the amount of water was increased according to height of the plant. This data from the greenhouse is collated and stored onto the server. On this available data, analysis was done to calculate the NPK requirement of a Tomato plant. Based on the data the authors developed own algorithm to make the optimum crop production, basically plant height and width. In this project, sensors were used to measure various parameters of the field such as temperature, humidity, soil moisture. Further Raspberry microcontroller takes data from android application, camera, flow measure valve and sensor readings. Plant height and plant width are calculated daily by taking images using Pi-camera. Image processing system is coded using PyCharm Community Edition 2020.2. Using android studio 4.0, developed the easy accessibility user friendly mobile application. It provides the interface to the farmer and microcontroller and enable farmer information monitoring and controlling. Through the mobile application farmer can set fertilizer ratio, crop plantation area and the fertilizing scheduling time. Further mobile application monitors the environmental conditions in real time, such as temperature, humidity, barometric air pressure, soil moisture and lux value. Furthermore, through this mobile application farmers can check the history of data specially the plant growth according to amount of fertilizer used. All the data storage will be done in cloud database. As a result, farmers can easily access to data by using mobile application. This smart agriculture fertilizer system will be implemented on a local scale where local farmers can utilize this IOT based analytics which provides new insights and improves decision making.

Keywords: Fertilizer system, Greenhouse cultivations, Internet of Things (IoT), Plant growth, Smart agriculture

## EVALUATION OF THE PERFORMANCE OF POWER TILLER MOUNTED FERTILIZER APPLICATOR ON VARIABLE APPLICATION RATE

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### Abstract

At present different fertilizer recommendations are issued from area to area based on the conditions of each land. Thus, farmers need to frequently change the fertilizer application rate according to the fertilizer recommendations. Therefore, fertilizer application becomes more difficult with unskilled labor. Therefore, Sugarcane Research Institute has introduced a mechanized fertilizer applicator to avoid those difficulties. However, the uniformity of the fertilizer application for various rates is not known when using a mechanized fertilizer applicator. Therefore, the objective of this study was to evaluate the uniformity of mechanized fertilizer application when practicing variable application. A tractive wheel-driven fertilizer dropping mechanism was incorporated with the power tiller mounted fertilizer applicator. Dropping rate and uniformity of fertilizer application were evaluated for four different cavity lengths of the fertilizer applicator. The fertilizer applicator could adjust the fertilizer dropping rate for different fertilizer recommendations by changing the metering cavity length of the fertilizer dropping unit. The metering cavity adjustment of 1mm helps change the fertilizer dropping rate to 0.55 g m<sup>-1</sup>. The uniformity of fertilizer application in each metering cavity length was recorded as greater than 99%.

Keywords: Dropping rate, Fertilizer, Sugarcane

## **EFFECT OF DIFFERENT SOIL AMENDMENTS ON SOIL MOISTURE RETENTION AND BEAN (*Phaseolus vulgaris*) CROP GROWTH**

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### **Abstract**

Common bean (*Phaseolus vulgaris*) is an important and popular vegetable in Sri Lanka. The major issue of bean cultivation is water stress faced due to climate change. So, it is important to find a proper solution which can aid in maintaining the soil moisture level throughout the cultivation. This experiment was designed to identify effectiveness of using Super Absorbent Polymer (SAP) material as water retention mechanism for bean cultivation. The experiment was carried out at the regional agriculture research and development centre, Kahagolla, Bandarawela. Five treatments by combining 1 kg soil mixed with 0.500 g organic matter (T1), 0.500 g coir dust (T2), 0.250 g SAP (T3), 0.500 g SAP (T4) and soil only as control (T5) were replicated five times in a completely randomized design. Plants were watered for the first twenty days for three times a week to the level of field capacity. Then onwards, irrigation was terminated. Daily Water Consumption (DWC), Leaf Relative Water Content (LRWC %), average soil moisture content, Root Weight Loss Ratio (RWLR), chlorophyll content of the leaves was evaluated using SPAD-502 chlorophyll meter one week after termination of water supply. Significantly highest and lowest water consumption was observed T4 and T1 respectively. But significantly higher moisture content was observed in control treatment and in T3. The highest LRWC % was given by T2 and T4 which were not significantly different from the control treatment. Both SAP treatments and control treatment had significantly similar RWLR. The significantly higher chlorophyll content of the plant leaves was observed in T3 and it was significantly higher than T1. According to the results, SAP based media have positively affected in increasing LRWC %, moisture content of the media and chlorophyll content of the plant while increasing RWLR and water consumption. Thus, it can be concluded that depending on this result, Super Absorbent Polymer based media cannot be recommended as a suitable soil amendment for bean cultivation. Further studies are on pipeline to evaluate the effect of this material on yield parameters too.

Keywords: Bean, Soil amendments, Soil moisture, Super Absorbent Polymers

## **DESIGN PARAMETERS TO DEVELOP A CART FOR FIELD TRANSPORTATION OF PINEAPPLE (*Ananas comosus*)**

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### **Abstract**

Pineapple is a tropical fruit which believed origins in Brazil or Paraguay (South America). Pineapple was one of the commercial fruit crop grown in tropical countries. Pineapple growing in hilly areas required to transport to roadside for delivering to market. After harvesting, farmer/labors brought harvested pineapple to the roadside using improper packing in to bags or large size cart pulling by bullock or tractor (mechanically). Therefore, pineapples were heavily damaged (mechanical damage) due to this improper handling and filed transportation. Hence, this study was focused to design and develop a cart suitable for field transportation of pineapple growing in hilly terrains to minimize handling and transportation damage. During rainy season pineapple field paths become heavily muddy hence, especially cart wheel designed for easy moving in the muddy field paths. Cast iron was used to fabricate frame of the cart. Maximum height of the pineapple carrier area in the cart was design and adjusted to 1.0m height to minimize mechanical damage due top layers' load to the bottom layer of pineapple. Length and width of the carrier area of the cart was adjusted 2.0m and 1.0m according to the load and capacity to minimize damages. Carrier area of the cart was fabricated by wire mesh with cushioning material for reducing mechanical damage. Ground clearance (distance between ground and carrier) of the cart was adjusted 0.4m height to facilitate easy loading and unloading. This cart can be pulled either by tractor (mechanically) or bullock.

Keywords: Cart, Design parameters, Field transport, Hilly terrains, Pineapple

## **EFFECTS OF DIFFERENT MEDIA AND NUTRIENT SUPPLEMENTS ON VEGETATIVE GROWTH OF *Abelmoschus esculentus* L**

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### **Abstract**

Adoption of soilless garden should allow to overtake the constrain of unsuitable soil in most peri-urban areas. Coco peat is a coir fibre pith with coconut husk as its base. It is a soil conditioner easily mixed with other growing media. Fertilizers are advanced means to promote and enhance the productivity of crops. Since recent past there is a developing interest on safe food produced through environment friendly agriculture. In this regard a pot experiment was carried out at the Institute for Agro-technology and Rural Sciences (UCIARS) Weligatta, New Town, Hambantota to study the effect of different media and nutrient supplements on growth performances of *Abelmoschus esculentus* L. using the variety Haritha. Eight treatments with ten replicates were arranged in Randomized Complete Block Design (RCBD). The treatment compositions were, T1- Only cocopeat, T2- cocopeat with inorganic fertilizer recommended by Department Of Agriculture (DOA), T3- cocopeat + compost at 10 mt/ha rate, T4- cocopeat + Jeevamirutha organic liquid fertilizer, T5- Only soil, T6- soil + DOA recommendation, T7- soil + compost T8- soil + Jeevamirutha organic liquid fertilizer. Further Jeevamirutha liquid organic fertilizer prepared by cow dung, cow urine, jaggery, pulse powder and living soil. Observations on plant height, number of leaves, and leaf area were recorded. Jeevamirutha had a interaction with different media on plant height, number of leaves and leaf area. The statistical analysis of data proved that application of Jeevamirutha into soil increased the plant height, number of leaves and leaf area compared to the plants in soil with no fertilizer. Therefore, it could be concluded that application of Jeevamirutha to soil increase the growth of *Abelmoschus esculentus* L.

Keywords: Coco peat, Compost, Jeevamirutha, Organic, Soilless

# **EMPOWERING RURAL COMMUNITY THROUGH NOVEL AGRICULTURAL TECHNOLOGY**

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## **REVIEW ON STRATEGIES TO IMPROVE AGRICULTURE SECTOR OF SRI LANKA WITH SPECIAL REFERENCE TO POST COVID 19**

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### **Abstract**

COVID-19 is the ongoing menace to the all over the world, labeled as pandemic and worst economic shock in recent history. Sri Lanka is one of the vulnerable middle-income countries suffer most during this virus outbreak. Sri Lanka's agriculture sector has so far been relatively affected by the COVID19 outbreak. Therefore, this review examines the impact of COVID-19 on the Sri Lankan Agriculture sector and discuss the strategies to improve the agriculture sector special reference to post COVID 19 crisis. This review is based on the published research articles, WHO statements, Sri Lankan reports, blogs, annual reports from the central bank and newspaper articles. The virus is disrupting fundamental systems and industries, including agriculture and food systems, and endangering the livelihoods of workers. Due to this pandemic the country's GDP is estimated to fall to 2.2 percent in 2020. The country has taken early strong suppression measures to prevent the spread by instituting curfew periods ensuring essential services but with government and private sectors working remotely, incoming passenger flights suspended, schools closed, and public gatherings and events suspended. Especially the Sri Lankan agriculture sector faced some issues such as labor shortages and price collapse, disruptions in food supply chains, food security concerns, impact on livestock rearing, import restrictions for agriculture products, issues in input supply and impact on fisheries and aquaculture products due to curfew and social distancing. So, the Government of Sri Lanka, Private Companies, World Bank, Central Bank and Non-Government Agents have suggested some projects and implementation programmes to strengthen the Agriculture sector of Sri Lanka in future. Implementing of the Sauhbagya Family Garden Project, reallocating of funds from the ongoing agricultural modernization project to improve the agricultural sector in Sri Lanka, improve crop monitoring and marketing techniques for post-harvest products, and provide small farmers with loan programs and other strategies to improve their livelihoods. And also upgrade the existing storage facilities of agricultural products near the economic centers and share the experiences of other countries on agriculture in post COVID-19 in Sri Lanka to improve the agricultural sector.

Keywords: Agriculture sector, COVID 19, Impacts, Sri Lanka, Strategies

## **IMPACT OF WORKPLACE RELATIONSHIPS ON JOB SATISFACTION AMONG AGRICULTURE EXTENSION WORKERS: A CASE STUDY IN KANDY DISTRICT**

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### **Abstract**

Agriculture Extension activities are primarily handled by authorized government bodies in Sri Lanka. The effectiveness of Extension activities depends on the job satisfaction of the extension officers of which directly has an impact on work performance of officers and consequently on client satisfaction. Their job satisfaction is known to be depending with formal procedures and outcomes with perceived unfair treatment by managers and co-workers. As Sri Lankan literature has not been compiled with sufficient investigations on the relationship between job satisfaction and workplace relationships among Agriculture Extension Workers, this study attempted to gather primary data from randomly selected 400 Extension workers in *Kandy* District. Using pre-tested survey questionnaire information were gathered to reveal the situation and circumstance involve with extension officers during their working hours. As the tool, Brayfield and Rothe Job Satisfaction Index was used to measure the level of job satisfaction. The index comprised of eight statements in five-point Likert scale and it was enclosed to reveal the relationship with immediate supervisor (4) and the co-workers (4). The data was analyzed using mean, SD, percentages, and multiple regression method by SPSS statistical software. Results obtained showed that most of the respondents (51.9%, 189) were in 'High Job Satisfaction' category. Next, the study revealed that the respondents have a satisfactory relationship with their immediate supervisors and the co-workers. Multiple regression analysis applied to estimate the impact of workplace relationship with immediate supervisors and coworkers on job satisfaction resulted a good relationship among workplace relationship, coworkers and job satisfaction producing a full model having an Adjusted R<sup>2</sup>=0.492. Therefore, observations of this study conclude that the workplace relationships with immediate supervisor and the co-workers have a positive influence on job satisfaction of Agriculture Extension workers in Sri Lanka. Hence, the present study implicates maintaining fair workplace relationship is a key factor to improve job satisfaction leads better work performances of Agriculture Extension workers and the client satisfaction too.

Keywords: Agriculture, Extension workers, Job satisfaction, Workplace relationships

## **PRESENT SITUATION OF EMPOWERMENT OF WOMEN FARMERS: A CASE OF IMBULPE DS DIVISION IN SRI LANKA**

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### **Abstract**

Many countries have proved that, there is a positive relationship between the empowerment of farmers and agricultural production. In many developing countries, there are farmers especially women farmers with a lower level of empowerment. However, women's contribution to the growth and development of agriculture has been increasing considerably. Present situation of women farmers and their constraints for agricultural production haven't been studied in Imbulpe DS division yet. Therefore, this research was conducted to assess the present situation of these women farmers and the constraints of them in agricultural production. Out of all the women farmers, 238 were selected for the study using simple random sampling method. Necessary primary data was collected using a pre-tested, self-administered questionnaire survey from March to July 2019. Data analyses were conducted using descriptive statistics and multiple linear regression analysis. The results of the descriptive statistics showed that, majority (59.7 %) of the respondents were within the middle ages (40-59 years), married, and belongs to the family with 4-5 members. Most of the respondents (64.3 %) have studied up to secondary education level. The average land size is 0.84 acres and they have farming experience of about 15 years. Moreover, findings reported that 82.2% of respondents knew about the meaning of empowerment and they have received this knowledge through Training programs and workshops (70.6%), village organizations and meetings (35.3%) and government extension officers (31.9%). When considering about the constraints regarding the agricultural production of the women farmers, according to the result of the multiple linear regression lack of initial capital, poor access to resources, difficulties in marketing facilities, and storage facilities were statistically significant. Therefore, provision of initial capital, storage facilities, access to other resources and marketing facilities for them will create significant impact on empowerment of women farmers in the study area. Therefore, government and developing practitioners should empower women through access to agricultural production resources such as land ownership rights and other strategies for active involvement in agriculture.

Keywords: Agriculture, Food production, Imbulpe, Sri Lanka, Women empowerment

## **EXPORT PERFORMANCE OF ORNAMENTAL FISH INDUSTRY IN SRI LANKA: ESPECIALLY UNDER COVID-19 PANDEMIC SITUATION**

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### **Abstract**

Ornamental fish production is a multibillion-dollar industry in the world. Over the past few years, ornamental fish production has become a source of foreign exchange in Sri Lanka. However, the COVID-19 pandemic has explored worldwide and has affected all the world trade and economy from different perspectives. This study was mainly aimed to explore the ornamental fish export performance in Sri Lanka with the Outbreak of COVID-19 and examine the exporters' problems during the COVID-19 pandemic situation in Colombo district in Sri Lanka. Whole population of ornamental fish farmers were considered in selected DS divisions of the district and also whole the exporters in the Colombo district were chosen for the study. Data collection was carried out with interviewer-administered questionnaires using a field survey from August to October 2020. Moreover, secondary data was collected from the Sri Lanka Export Development Board and World Trade Organization (WTO). Data were analyzed using descriptive statistical methods and Wilcoxon signed-rank test. Research findings revealed that the majority of ornamental fish farmers sell their products for the supply exporters as the market opportunity. Dominantly they have being producing Guppy for export purpose. The most important finding was that the demand for ornamental fish in Sri Lanka has unexpectedly increased during the COVID-19 period, as the other countries have banned their export process. Sri Lanka export ornamental fish mainly for United States, United Kingdom, and Germany. During the COVID-19 period, Sri Lankan exporters couldn't fulfill the demand from those countries due to limited flight facilities, lack of adequate production capacities for meeting the excess demand, quality problem of the products, and existing laws and regulations. Suitable solutions for those problems have been suggested to protect ornamental fish exporters and enhance the export performance of the ornamental fish sector in Sri Lanka.

**Keywords:** Colombo district, COVID-19 pandemic, Exporters, Export performance, Ornamental fish

## **PERCEPTION AND PURCHASING BEHAVIOUR OF HOUSEHOLDS TOWARDS FRUIT AND VEGETABLES IN SRI LANKA**

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### **Abstract**

Fruits and vegetables (F&V) are an important part of a healthy diet and variety is as important as quantity. However, the patterns and decisions in purchasing F&V may vary from household (HHs) to another and understanding this behavior is important in decision making along the F&V supply chain. The study is carried out to determine HH behaviour and diversity of F&V purchasing. Multistage random sampling method was employed and 443 HHs representing urban, rural and estate sector was surveyed using a structured questionnaire. Results showed that, urban HHs spend more than two fold for F&V when compared to rural and estate. Budget share of F&V varies (urban-0.42, rural-0.32, estate-0.29) across three sectors and vegetable budget share is higher than the fruit budget share in all three sectors. Quality and freshness were the two most important attributes which affect purchasing of F&V, followed by price and safety. Simpson Index analysis revealed that diversity of F&V intake varies among HHs. Consumption of vegetables is more diversified than consumption of fruits. Majority of the urban (69%), estate (69%) and rural (56%) HHs fully depend on outsources for F&V. Majority of the urban HHs prefer supermarkets and rural HHs use home gardens and local market for obtaining F&V. Estate HHs mostly prefer local market and roadside vendors. However, there was a keen concern of buying fresh F&V rather than packaged or processed ones. Majority of the respondents (97%) perceived that the F&V they are purchasing are contaminated with pesticide residues and this belief negatively affected the HHs (74%) F&V consumption and purchasing decision. Most of the respondents (60%) knew about organic F&V. However, non-availability, lack of promotion and unclear declarations of the organic status were the major barriers which reduced purchasing of organic F&V. Hence, F&V research aimed at reducing production costs and enhancing food safety could greatly benefit population health by helping to lower the price of F&V and make them more accessible to the populations that need them. Further, nutrition policies should lay more emphasis on promoting F&V consumption, making people aware on diversified F&V intake and attitudes towards healthy diets.

Keywords: Diversity, Fruits and vegetables, Household behaviour, Perception

## **HERBICIDE USAGE AND PADDY PRODUCTIVITY IN THE PERI-URBAN AREAS: A STUDY IN THE GAMPAHA DISTRICT**

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### **Abstract**

Since the ancient eras, rice plays a significant role in the agriculture of Sri Lanka. Productivity and food security in peri-urban agriculture is essential with the rapid emergence of urbanization in the country. This study investigates the herbicide productivity and the farmer awareness level to ensure food security in the peri-urban districts. A stratified random sampling technique was employed to select 100 farmers in the Gampaha district. The Cobb-Douglas stochastic frontier production function was employed to estimate the productivity of herbicide usage and the farmer awareness level on health and environmental implications to ensure food security. Farmer awareness level was measured through a Likert scale questionnaire and developed an awareness index by categorizing the responses in to three awareness levels low awareness, moderate awareness, and high awareness. The Yala season data encompassing the period from May to August in 2020 was recorded. According to the maximum likelihood estimation, herbicide amount is not statistically significant to the productivity of the paddy cultivation. All the farmers belong to the high awareness level category in the awareness index. Most of the farmers have completed secondary education and well experienced in peri-urban districts. Farmer awareness level on health and environmental implications of herbicide usage is not statistically significant in the inefficiency model. So, there is no impact of farmer awareness level on paddy productivity in the peri-urban districts. Mean technical efficiency is 77%, concluding farmers are still away from their technological frontier by 23%. The least efficient farmers can increase the production by 35% (0.99-0.64/0.99) to achieve the required technical efficiency of the most efficient farmers. The gamma value of the study is 0.00107 representing 99% of the total variation in paddy revenue among the farmers could be attributed to a difference in their technical efficiencies. Since all the farmers have a high awareness level and still 23% away from their technological frontier, innovative and sustainable farming practices need to be introduced to ensure food security and sustainability of paddy farming in peri-urban district.

**Keywords:** Awareness index, Peri-urban agriculture, Production function, Sustainability, Technical efficiency

## **WOMEN EMPOWERMENT IN RURAL DEVELOPMENT BY USING ICT**

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### **Abstract**

This paper examines empirically the prevailing situation, challenges, and future prospects with respect to the women's usage of ICT in farming. As a comparison with men farmers, women farmers depict a lack of access to productive resources, and there are a lot of opportunities ahead with the usage of ICT in their daily farming activities. The agricultural sector has a great history though its contribution has declined over the recent years, it can be developed through women's empowerment and increasing the usage of ICT. Data was collected using convenient sampling method. Qualitative research methods were employed to collect data from farmers and agricultural extension officers under 5 different themes by focusing on their usage of ICT for their agricultural activities, and its pros and cons. The study aims to promote ICT as an effective tool for empowering women in agriculture, by explaining the opportunities and challenges women undergo in accessing and using ICT. The findings showed that the women farmers in this study were making deficient usage of mobile phones and radios, TVs, computer-related ICT, such as the Internet, due to either associated with high costs, not finding it relevant or useful for their survival needs and into some extent unaware of the possibilities. Moreover, the women in this study have been shown interest, self-empowerment to considerable extent through the use of ICT by expanding on their assets and capabilities. But ICT single-handedly do not empower and are inadequate for significant benefits to emerge, since they do not find them as useful, but rather because they are dedicatedly fighting on a daily basis for their families' survival. The study highlights the importance of capacity development through enhancing digital literacy of the women's community. Because it has a greater potential to develop the rural sector, but also it has come up to a position where it can stand right with a "little help" along with an effective and efficient policy framework.

Keywords: Agriculture, ICT, Rural development, Women empowerment

## **PRESENT STATUS AND CHALLENGES FOR ACHIEVING FOOD AND NUTRITION SECURITY: STUDY ON GONAPINUWALA DS DIVISION**

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### **Abstract**

Alarmed by a potential rise in food security during the present uncertain situation, many countries are mounting special efforts to keep agriculture safely running as an essential, markets well supplied with affordable and nutritious foods and consumers able to access and purchase food. This study attempts to assess the present status and challenges for achieving food and nutrition security in the Gonapinuwala Ds Division of Galle District. Purposive sampling and simple random sampling techniques were used to select 100 households. Twenty-five (25) households were chosen from the Gonapinuwala Central and Hikkaduwa East GN Divisions, while 50 households were chosen from the Banwelgodella GN Division, based on the household population ratio. The data was collected using an interview-administered questionnaire and evaluated using descriptive statistics and the Chi-square test. As per the (HDDS) Household Dietary Diversity Score method, the results revealed that 68% of households were food secured. The study listed the following challenges to achieving food and nutrition security; the high price of food commodities (32.2%), the religious affiliation of households (19.5 %), lack of access to finance (14.4%), unavailability of time to prepare a nutritious diet (busy lifestyle) (9.1%), lack of enough land (8.7%), health conditions (diseases) (6.7 %), climatic changes (5.0 %), lack of awareness about Food and Nutrition Security (FNS) (2.3%), food waste and losses (2.0%). The maintenance of home gardening had a significant relationship with food and nutrition security in households ( $P > 0.008$ ). The education level of households, income, awareness about food and nutrition security, occupation of households, socioeconomic factors were found significant for food and nutrition security and age of household head, the gender of households, number of household members, socio-economic factors did not show a significant association with food and nutrition security.

**Keywords:** Challenges, Food and Nutrition Security, Household, Present Status, Underutilized Crops.



## PRODUCTIVITY ISSUES IN PADDY FARMING: COMPARISON UNDER IRRIGATED AND RAIN-FED CONDITIONS

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### Abstract

As a developing country, we are underway in self-sufficient of rice. Though, since the year of 2005, the productivity of paddy has been growing at a higher rate in Sri Lanka, it remains crucial to reach the national and international levels. Hence, the study attempts to explore the issues of factors affecting productivity in paddy farming compared to irrigated and rain-fed conditions in the *Hambanthota* District. The study involved quantitative and multi-stage cluster sampling techniques to collect the primary data throughout the questionnaire survey from 160 paddy farmers who cultivated paddy. The study conceptualized agro-economic, economic, technical and institutional factors as independent variables while productivity as the dependent variable. Descriptive statistics describe socio-economic characteristics of farmers while OLS-Multiple regressions were employed to test the hypothesis that was performed to identify the established research objectives. The results demonstrated that Agro-economic and technical factors negatively impact productivity in both irrigation and rain-fed paddy farming throughout the two cropping seasons. Meanwhile, economic factors positively and insignificantly impact the productivity of paddy farming in the *Maha* (wet) season of irrigation and rain-fed, while economic factors positively and significantly impact the *Yala* (dry) season of irrigation and rain-fed. Further, institutional factors negatively and insignificantly impact productivity of paddy farming in both irrigation and rain-fed conditions throughout the two cropping seasons. Consequently, it reveals that Agro economic and technical factors affect the productivity among irrigation and rain-fed paddy farming a higher rate than the other factors. As the practical implications, this study highlights the prime constraint to the variation of productivity between two water regimes that directed towards policy implications and a platform on which future research can be built.

Keywords: Dry-Zone, Irrigated, Paddy farming, Productivity, Rain-fed

## THE IMPACT OF TECHNICAL TRANSFORMATION OF PADDY FARMING ON RURAL UNEMPLOYMENT

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### Abstract

Rice is the staple food in Sri Lanka which is still considered as a pillar of food security in the region. Over the past decades, there have been a number of significant structural changes in paddy farming. The main objective of this study is to seek the impact of structural changes of cost of production in paddy farming on rural employment. Technological developments, Labour cost changes, Fertilizer usage, Investment in irrigation, Changes of weed management, Introducing modern seed varieties are some of the structural changes that identified by the use of literature. The study was conducted based on Gonagamuwa and Uduwila colonies which are engaged in paddy farming by supplying water from Weerawila tank in Tissamaharama area. This quantitative study based on primary data which included 150 paddy farmers, randomly selected based on multistage cluster sampling method. A Multiple Linear Regression was performed in order to examine the above aspects. Key findings from this study indicate that most of the farmers who engaged paddy farming in this area are over 60 years of age and most of them cultivate paddy in an acre of land as well as they use more hired labour for paddy cultivation. In addition to that, now the production cost for paddy farming is very high. At the same time, the use of labour for paddy farming has decreased and the use of machinery for this purpose has increased. However, they are satisfied with the current price that they are getting for paddy. This study found that Technological developments, Fertilizer usage, Changes of weed management, introducing modern seed varieties had a significant impact on rural employment. Reduction of rent of agricultural equipment, introduction of new paddy varieties resistant to pests are some recommendations for further strengthening paddy farming as a rural occupation.

Keywords: Paddy farm, Paddy farmers, Rural employment, Structural changes of cost of production, Tissamaharama

## FORMULATION, EVALUATION AND ANTIBACTERIAL EFFICIENCY OF *ALOE VERA*-BASED HERBAL HAND SANITIZER

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### Abstract

Hand sanitizer is an easy and effective alternative for hand washing with soap and water. With the pandemic of Corona Virus Disease in 2019, regular use of hand sanitizers has been drawn the public attention. However, hand sanitizers are not affordable to everyone due to high prices. Therefore, this study aimed to produce a low-cost herbal sanitizer with *Aloe vera* (Komarika). This sanitizer was prepared according to the standards given by World Health Organization. Glycerol and distilled/cold water in common formulations of sanitizers was replaced by *Aloe vera* gel, which is the only humectants agent available in this sanitizer. The inner gel of *Aloe vera* leaf was extracted and prepared a pulp and mixed with 375.5 ml of 99.8% isopropyl alcohol, 20.85ml of 3% H<sub>2</sub>O<sub>2</sub> with 103.65 ml of *Aloe vera* extract to make 500ml of the solution. Two other samples were prepared by replacing 2ml of *Aloe vera* extract with 2 ml of turmeric extract and clove oil separately. The alcohol content and pH of the sanitizer was 73% and 6.1 respectively when tested at  $27 \pm 2$  °C at the accredited laboratory of Industrial Technology Institute. Microbiological efficacy of the sanitizer was performed using few bacterial strains as given by the specifications for hand sanitizer (Alcohol Base) SLS 1657:2020. A selected volume of the prepared sanitizer was mixed with a specific volume of inoculum suspensions of each bacterial cultures and after 30 seconds of contact time, it was plated on Soybean casein digests agar plates and incubated at  $30 \pm 1$ °C for  $72 \pm 3$  hrs to determine the surviving microorganisms at 30s. By comparing initial microbial concentration with surviving microbial concentration, microorganism reduction was estimated. According to the results, the sanitizer was 99.99% effective against the tested bacterial strains. These results suggest that using of *Aloe vera* gel as a humectant agent and as a major ingredient in hand sanitizer formulations helps to get a quality product that is effective for sanitizing of hands which provide smooth and comfortable sense to the user. The estimated production cost of 100 ml of sanitizer was 71 rupees. Almost 100% of the users were highly satisfied with the smell and the feeling after applying the sanitizer on the hand. The mass production of this sanitizer could be very effective for regular use of sanitizers by the public.

Keywords: *Aloe vera* gel, Antimicrobial activity, Herbal hand sanitizer, Low cost,

## **REVIEW: ASSOCIATION IN-BETWEEN FOOD ADDITIVES AND NON-COMMUNICABLE DISEASES IN MODERN WORLD**

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### **Abstract**

Non-communicable diseases is one of the challenging health problems of great public health significance. These deadly diseases are associated with higher mortality and morbidity influencing the human resources and the global economy. Prevalence of obesity, coronary heart diseases, diabetes mellitus, cancers and kidney diseases are in increasing in trend in developing countries. The prominent factor for this trend is due to unhealthy food habits and modern types of foods. Modified dietary patterns and diverse food choices or preferences have been resulted because of the various processing, preparation and cooking methods, influence of social media and advertising, economic changes, technological innovations, and modern marketing techniques. Overall effect is, changes in major food constituents and food additives in the diet. Presently around 2500 food additives have been invented and used worldwide. Food additives is one of the key components used in almost all the processed and instant foods and they play a significant role in modern diets with promising sensory attributes they provide to the foods. Although the regulatory bodies recommend the food additives after conducting the safety tests, various health issues associated with additives have been reported at many instances. Hence, this review elaborates the association in-between food additives and non-communicable diseases in modern society.

**Keywords:** Food additives, Modern food habits, Non-communicable diseases

## **FARMER AWARENESS ON AGRO-CHEMICAL'S APPLICATION IN SOORIYAWEWA OF HAMBANTOTA DISTRICT IN SRI LANKA – A CASE STUDY**

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### **Abstract**

The southern region of Sri Lanka also plays a key role in the national agricultural production of the country. To maintain the economic levels of agricultural production, farmers are using agrochemicals. When considering the current situation still the farmers are not completely aware of the agrochemicals used for their cultivations. Hence the objective of this study is to investigate the general awareness of agrochemical usage by the farmers. Sooriyawewa DS division in the Hambantota district of Southern Province was selected as the study location. All farmers were listed and only 100 farmers were selected for the study by following random sampling. All respondents in the sample were subjected to data collection through the primary survey by a pre-tested structured survey questionnaire. Collected data were analyzed by using SPSS statistical software (26) and different methods were used to interpret the data. Majority of the farmers, 38% were aware of the agrochemicals through the chemical shop owners ( $p$  value $<0.05$ ). Farmers (100%) are applying agrochemicals according to the requirements of their cultivations and were always considering the climatic conditions well (96%) and 86% of farmers are believe the cost and benefits from agrochemicals ( $p$  value $<0.05$ ). They, 90% of farmers never use the same agrochemicals for different crops hence they used specific agrochemicals with recommended ingredients to specific crops ( $p$  value $<0.05$ ). Further, they are not following the correct dosage instructed by specialists (80%) and, 60% of farmers are not read the label carefully before the application of agrochemicals ( $p$  value $<0.05$ ). Farmers are well aware of the agrochemicals and their applications in terms of profit but they are not following the correct dosage regarding the information in the containers. Therefore, the extension services should highlight these areas to increase the efficiency in agricultural production.

Keywords: Agrochemicals, Awareness, Cultivation, Farmers, Knowledge

## **A STUDY ON PERCEPTION OF SRI LANKAN SOCIETY ON CULTURED MEAT**

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### **Abstract**

Production of cultured meat involves synthesizing meat from animal tissue samples in a controlled environment using biotechnology. This technology is supposed to offer enormous benefits in terms of food security, animal welfare, human health and environmental impact. Although the cultured meat concept is popular in developed countries, it remains unknown to Sri Lankans. Due to its high degree of novelty, it remains unclear how consumers view this type of food product, mainly in terms of beliefs regarding its intrinsic attributes such as safety, nutrients and sensory properties. The current study aims at unveiling the perception of Sri Lankans on cultured meat and their willingness to try and buy if it becomes available in Sri Lankan context. A questionnaire-based survey commenced using a sample of 80 people selected with stratified sampling method. The study revealed that 75% of the tested population is interested on acceptance of cultured meat although the statistical evaluation of the probability of respondents purchasing lab-grown meat suggested that there is no satisfactory evidence to predict that consumers would purchase lab-grown meat (Wilcoxon Signed Rank Test,  $p > 0.05$ ). Statistical evaluation of factors considered by the respondents when purchasing cultured meat revealed that the impact on health is the highest considered factor followed by nutritional properties, sensory properties and price (Kruskal Wallis Test). The level of agreement of the tested sample regarding the facts that cultured meat production contributes to preserve natural resources, handle better animal welfare and alleviate starvation was statistically satisfied ( $p < 0.05$ ) whereas the expectancy of having same or better sensory and nutritional properties and safety of consumption of cultured meat were not statistically satisfied ( $p > 0.05$ ) when Wilcoxon Signed Rank Test was conducted for the each statement individually. Hence, information on intrinsic qualities and positive externalities of the cultured meat would have to be combined with different approaches for further improvement of consumers' perception and acceptance. Furthermore, the regression analysis conducted to test the co-relationship between education level and the desire on purchasing laboratory grown meat statistically confirmed that the acceptance level of the laboratory grown meat increases with the education level.

Keywords: Animal welfare, Cultured meat, Food security, Lab-grown meat

## CONSUMER AND PRODUCER CONCERNS ON QUALITY OF DRIED FISH IN HAMBANTOTA DISTRICT

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### Abstract

The study was conducted in the Hambantota district focusing on the consumer and producer concerns of dried fish quality. Thirty-six dry fish producers and 92 consumers from all the 12 divisional secretariat divisions in Hambantota district were evaluated using a structured questionnaire. According to the survey, around 60% of the respondents consume dried fish. Yellow fin tuna (*Kelawalla*) is the most preferred among consumers (27%) followed by sprats (*Hal messa*) and skipjack tuna (*balaya*). But according to the dried fish producers, mackerel fish (*linna*) (47%) to be the most preferred by consumers, followed by *balaya* (32%) and *kelawalla* (10%). Almost all the consumers expect the quality products for the price paid. On this basis, quality parameters assessed by consumers include appearance (31%), hardness (24%), smell (18%), color (22%) and freshness (5%). Mold growth is the main reason for quality deterioration as observed by the consumers. Approximately 52.2% of consumers have noticed mold in dried fish products. Almost all the respondents were satisfied with the dried fish in the markets. In the case of producers, 81.8% process dried fish at their homes, while 11.11% produce through coast dried fish. 82% of them add salt when process dried fish. 30.3% of producers were concerned about the product's hardness as the major quality parameter, while 28.7% concerned on the finishing and moisture while moisture content and the expiry date are the factors expected by most of the consumers. In the present study, producers identify fluctuating weather conditions (81%), higher raw fish prices and importation, social issues (16%), resource-based problems (2.3%) as major constraints for production and quality maintenance. Also 59% claimed that COVID 19 pandemic created marketing problems, while 20.5% had no effect due to the pandemic. There is a huge gap between the expected and concerned parameters in the production and quality of dried fish in the Hambantota district. Producers should make aware of the need and concerns of the consumers regarding dried fish which is essential in developing the sector.

Keywords: Consumer, Dried fish, Hambantota, Producer, Quality products



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