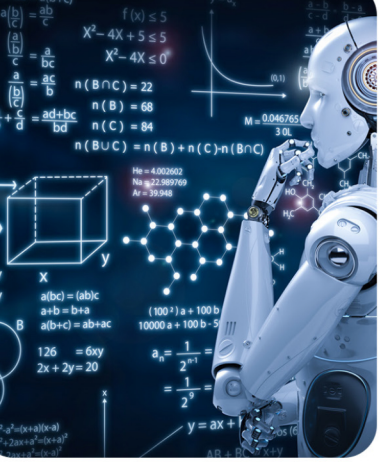

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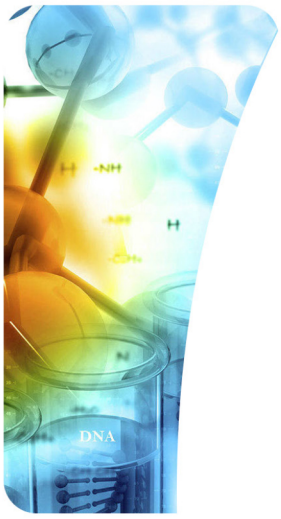

Science Research Projects Competition

Proceedings of the Competition 2020/21

Proceedings
of
Science Research Projects Competition
(SRPC)
2020/21

Organized by

National Science Foundation

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Director General's message

Dr S.R.S.N. Sudasinghe
Director General

I am pleased to write this message to the proceedings of the School Science Research Project Competition (SRPC) 2020/21.

This is an annual event conducted by Science Communication and Outreach Division targeting school children of grade 9-12 to enhance their scientific thinking, creativity and investigative ability. This inculcation of research culture in school community inspires budding researchers. The best performers of this competition will be rewarded with a valuable certificate.

Proceedings of this competition is published to give an opportunity to prospective contenders among the school children to showcase their research findings and to improve their research projects. I was delighted to see a wide range of research projects in the subject areas of Agriculture, Chemistry, Food Science, Health Science, Microbiology, Physics and several others.

I take this opportunity to congratulate all the teachers in-charge of research projects for their hard work towards the success of the projects. The NSF consider them as the steering group of this whole programme. I also extend my greatest thankfulness to all Principal Supervisors and Supervisors who helped to expand the scientific ideas of the students towards completion of a successful project. I wish all the best for a successful competition and a successful future in every innovative endeavor.

Dr S.R.S.N. Sudasinghe
National Science Foundation
Colombo 07

Head's message

Dr P.R.M.P Dilrukshi
Head, Science Communication and
Outreach Division

The National Science Foundation organizes Science Research Project Competition (SRPC) and Training programme since 2008. The main objective of this is to create research culture among school community and give hands on experience for students to conduct their own research project under guidance of senior scientist in the country. The National Science Foundation facilitate and monitor their progress continuously throughout the project period of 5-6 months. The projects successfully completed up to final progress evaluation get opportunity to participate the competition. The competition conducted as two steps. In the STEP I students have to present their projects to judge panel using PowerPoint presentations. The best 20 projects selected at the STEP I get the opportunity to participate the STEP II competition. This competition conducted as a poster presentation and 10 national winners are selected at the end.

In 2020/21, the NSF selected 89 project proposals to participate the training programme and only 35 projects, progressed up to STEP I competition. The proceedings include the abstracts of these 35 projects participated the STEP I competition.

The NSF appreciate all students who send their project proposals, participate in the training program and especially for those who work very hard to get it successful up to STEP I competition. I sincerely acknowledge the contribution made by all the senior scientists who supervised these projects, guided students to conduct research, write reports, and trained them to present at the progress reviews and competitions. All the teachers behind these students given them tremendous support and the NSF gratefully acknowledge their contribution.

The untiring efforts, dedication and hard work put together by the staff of the Science Communication and Outreach Division of the NSF for the success of this programme despite lot of hardships and barriers presented due to pandemic situation, closure of schools, offices etc. immensely appreciated.

Finally, I congratulate all students who participated this programme and successfully completed their projects. We wish them all success in their future.

Dr P.R.M.P Dilrukshi
National Science Foundation
Colombo 07

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Agriculture

Control of the stem weevil of banana (*Odoiporus longicollis*) using plant extracts

Y. P. Imantha
WP/Ng/ Mudalindu David Mendis National School Thimbirigaskatuwa.

Abstract

Banana (*Musa* spp.) is a popular fruit in Sri Lanka and it is being widely cultivated in home gardens to use as a nutritious food and as an income generating crop. Banana production is reduced by various pests including insects that attack the plants during the season of budding. About 10 insect species that damage banana cultivations have been identified in the country. Among them, two insect species; *Odoiporus longicollis* (banana stem weevil) and *Cosmopolites* sordidus (banana root borer) are common. This study was carried out to identify the possibility of using plant extracts to control *O. longicollis*, commonly found in banana cultivations in Negombo, Sri Lanka. Banana plants (*Musa acuminata* AAA - embun) growing in a home garden in Negombo and infested with *O. longicollis* were used in this study. Adults of *O. longicollis* and symptoms of infestation such as exudation of plant sap from leaves, rectangular holes on pseudo stems and weakening of the pseudo stems were observed in these plants. Equal amounts (50 g) of *Azadirachta indica* (neem) leaves, *Plectranthus amboinicus* (Sinhala name Kapparawalliya) leaves, *Curcuma longa* (turmeric) leaves, *Allium sativum* (garlic) bulbs, *Piper nigrum* (pepper) seeds and *Capsicum frutescens* (Sinhala name Heenkochchi) fruits were crushed together and steamed for 30 minutes. The extract was squeezed out and injected into the pseudostems of the three infested banana plants just above the soil level, daily on three consecutive days. The plants were observed daily for three weeks. During the study period, two of the three plants injected with the plant extract developed uninfected new pseudostems. The life stages of the insect could not be observed in the two plants at the end of the study period. The third plant was heavily infested with the insect. Even though the infested plant parts were removed, new pseudostems did not develop. After the third day of injection of the plant extract, the insects were found dead at the cut surfaces of the plant. Throughout the study period insects could be observed on the control plants that were not treated with the plant extract and those plants did not develop new pseudostems. The observations of this study revealed that the extract made from the above plants can be successfully used to control *O. longicollis* and recover banana plants, especially at the early stages of infestation.

Keywords: banana, banana stem weevil, insecticides, *Odoiporus longicollis*

Teacher-in-Charge : Mrs N.D. Jayani, WP/Ng/ Mudalindu David Mendis National School Thimbirigaskatuwa.
Principal Supervisor : Dr H. Herath, Department of Plant and Molecular Biology, University of Kelaniya.

Agriculture

Propagation of *Dracaena sanderiana* using cuttings under different conditions

U.G.B.L. Abekoon
Delta Gemunupura Maha Vidyalaya, Pussellawa.

Abstract

Dracaena sanderiana plants are propagated by vegetative means that consider as slow rate multiplication. Several factors, including growth regulators and the different portions of stem cuttings, are known to affect the effective rooting of *D. sanderiana* cuttings. The objective of this study was to determine the effects of the different portions of stem cuttings under different growth conditions on the rooting of *D. sanderiana* 'White' cuttings for successful propagation. The present study was carried out under three different experimental studies. In experiment-1, cuttings with leaves were tested for the rooting ability under simulated dark conditions and provided with a rooting hormone [indole-3-butyric acid (IBA)]. In experiment-2, cuttings without leaves were tested for the rooting ability under simulated dark conditions and provided with IBA. In experiment-3, cuttings without leaves were tested for the rooting ability on two different growth media (sand and coir dust) and provided with IBA. In experiment-1, the number of short roots, number of long roots, dry weight of short roots, and dry weight of long roots were recorded. In experiments-2 and 3, the length of the newly emerged shoots were recorded. The number of long roots was higher than the number of short roots. Both short (18.33 cm) and long root (35.66 cm) lengths were greater and the potential of emerging the new roots is comparatively higher for the cuttings under simulated dark conditions and provided with a rooting hormone. The highest dry weight was recorded for the long roots than the short roots. Very poor rooting was observed in cuttings used in experiments 2 and 3. However, the new shoots have emerged in cuttings in experiments 2 and 3. Consequently, the rooting of *D. sanderiana* 'White' cuttings can be enhanced within a short period of time by using cuttings with leaves and provided them with the dark environment and rooting hormone such as IBA.

Keywords: cutting type, *Dracaena sanderiana*, IBA, propagation, rooting

Teacher-in-Charge	: Mrs N.D.C. Sagarika Gunathilake, Delta Gemunupura Maha Vidyalaya, Pussellawa.
Principal Supervisor	: Prof. Chalinda K. Beneragama, Department of Crop Science, Faculty of Agriculture, University of Peradeniya.
Supervisor	: Dr H.M. Prathibhani Chamidha Kumarihami, Department of Crop Science, Faculty of Agriculture, University of Peradeniya.

Agriculture

Investigation of pest control effects of wathupalu (*Mikania micrantha*) leaves

A.Y.B. Weerakoon
Dharmaraja College, Kandy.

Abstract

Mikania micrantha is an invasive plant that has become a weed pest, grows aggressively, spreads and displaces agricultural plants. The study on the pest control effect of the plant is rather scanty. Despite having negative characteristics as a weed, the uses of this plant particularly on effect of insect repulsion, anti-tumor, anti-inflammatory, etc. have been studied in limited manner. The objective of the study was to investigate the pest control effect of *M. micrantha* on aphids (*Myzus presicae*) on cabbage and Brinjal. In this study, aphids were collected from field grown cabbage plants and reared on potted cabbage and brinjal plants in insect rearing cages under room temperature. Laboratory bioassays and pot tests were conducted against *M. presicae* using dry powder water extract and fresh leave water extract of *M. micrantha*. Mortality assessment of aphids were performed by leaf dip method and topical application methods. The mortality data of the laboratory bioassays were analysed using the Probit analytical method in Sigma Plot software. Log concentration against the % Mortality was graphed and the lethal concentration 50 (LC50) and lethal concentration 90 (LC90) were obtained from the regression lines. The pot test mortality data were analysed using ANOVA. Data analysis showed that both formulation types have phyto-toxicity effect against *M. presicae* while the dry powder water extract performed better in bioassays. Topical applications were more effective than the leaf dip method. Both formulation types were significantly effective in pot experiments with fresh leaf extracts performed far mere better. The best results were obtained after 72 h of the treatments. Further experiments are required with a higher number of plants or with other field experiment to confirm the observations of this study. It is suggested to repeat this study with solvent extracts of *M. micrantha* to get more effective results. Then it can be used for field investigations of pest control effect of *M. micrantha*.

Keywords: aphids, botanical pesticide, brinjal and cabbage plant, leaf extract, *Mikania micrantha, Myzus persicae*

Teacher In charge: Mrs W.M.T.S. Wijesundara, Dharmaraja College, Kandy.
Principal Supervisor: Mrs J.P. Marasinghe, Principal Agriculture Scientist (Toxicology), Office of the Registrar of Pesticide, Peradeniya.

Agriculture

Effectiveness of banana peel-based liquid organic fertilizers for Green Pepper *(Capsicum annuum)* growth and yield

S. Sukilan, K. Dinukshan and S. Pithurshan
Paddiruppu Madya Maha Vidyalayam, National School, Kaluwanchikudy.

Abstract

Fruit peels are very rich in macro and micro nutrients that are beneficial for plant growth. By using fruit peel as organic fertilizer we can reduce load of wastes and can get more benefits than inorganic fertilizer. Banana peel and household fish wastages are among organic waste, which has nutrients that are useful for plants. This study was aimed to determine the effectiveness of liquid organic fertilizer using banana peel and fish wastage for pepper plant (*Capsicum annum*) growth for eight weeks. The study was conducted using a Completely Randomized Design (CRD), which consisted of three treatments namely (1) (T1) banana peel + liquid (H_2O) fertilizer (3:1 mass ratio); (2) (T2) banana peel + fish wastage + liquid (H_2O) fertilizer (3:1:1 mass ratio); (3) 100% liquid (H_2O) as control. The results revealed that application of T2 in pepper plant had significant differences on plant height and number of leaves obtained compared to other treatments. Application of household organic waste such as banana peel and fish into the soil leads to improve growth and yield of pepper plant in regosol sandy soil compared to recommended inorganic fertilizer.

Keywords: *Capsicum annum*, growth, organic fertilizer, regosol

Teacher-in-Charge : Mr S.Thevakumar, Paddiruppu MMV, National School, Kaluwanchikudy.
Supervisor : Prof. M. Sithambaresan, Department of Chemistry, Faculty of Science, Eastern University of Sri Lanka.

Agriculture

Applicability of using selected household organic waste as a substrate for small scale cultivation and their potential to developing in commercial scale

R.D. Gunasena
Prince of Wales' College, Moratuwa.

Abstract

In the past years chemical fertilizers played a major role in cultivation. Currently, Sri Lankan government restricted importing chemical fertilizers. Therefore, there is a timely need on making organic fertilizers popular. However, people are hesitant to produce organic fertilizers due to the lack of space and bad odour. As a solution, this study was designed to popularize the organic fertilizers by looking into certain amounts and ratios of daily organic waste as an effective substrate for the crops in household cultivation. The aim of the study is to reduce the underestimation of society, towards organic waste as a fertilizer and develop their potential to grow into commercial scale. The objectives are, to identify the best organic waste combination as an effective planting substrate, identify the maximum number of plants that each combination can bear with the same results and identify the amount of time that these combinations can be stored without being used. In the study, three sets of pots were used, and each set contains ten pots. Potions of soil, compost, tea ground and eggshells were collected as substrates. Pots were arranged with the ratios of soil: compost (A): tea ground; (B): tea ground+eggshells; (C): tea ground+ egg shells+ soil; (D): tea ground+ egg shells+ soil: compost. D with each ratio in two pots for each set. Three different plants were used to measure the efficiency of the substrates. The heights of the plants were obtained under the given time. Without changing the substrate, new plants were planted to obtain the maximum number of plants that substrate can bear with similar results. Each substrate was used after being stored in a given period of time to obtain same results. As the results, combination D and tea ground shows the highest growth rate. Each substrate can bear 3-4 plants without changing the substrate depending on the plant. Each substrate especially, tea ground can be stored 3-4 months. In conclusion, tea ground alone can act as an efficient substrate with high storage time and can be improved by mixing with combination use in treatment D.

Keywords: fertilizer, storability, substrate

Teacher-in-charge : Ms J.T.P. Jayasinghe, Prince of Wales' College, Moratuwa.
Principal Supervisor : Dr Dewanmini Halwathura, Department of Zoology, Faculty of Science, University of Colombo.

Chemistry

Converting sea water into drinkable pure water by using a simple method

H.K.S. Senethma, L.H.N. Gihansa and L.H.G.U. Inupama
H/ Tangalle Balika Vidyalaya, Tangalle.

Abstract

Water means life. Water is the basic necessity for the functioning of all life forms that exist on Earth. It makes for almost 71% of the Earth surface and the oceans hold about 96.5% of all Earth's water. However, despite its vast abundance, pure water is very much limited. Although most of the countries have found several methods to purify the sea water, a countries like Sri Lanka cannot offer for such techniques due to high cost involve. Therefore, main objective of this study was to introduce a very simple and low-cost method for purification of sea water.

The experiment set up contained two metal containers filled with sand and covered in foiled papers, stove, wooden stand and two glass bottles. One glass bottle was placed in a container filled with sand and placed on the stove while the other bottle was placed in the other container on the wooden stand and was kept little distance away from the stove. The mouths of two bottles were kept closely touching each other without allowing much room for water vapour to escape. The bottle on the stove was filled with sea water and clean water was poured on to the surface of the other bottle dip in sand so the sides of this bottle get wet and cool. The stove was lighted and purified water was collected. The theory of this procedure is very simple and low cost. When the sea water in the glass bottle boils or get heated. By supplying a constant heat, the sea water completely gets heated up to its boiling point and vaporization occurs, and the salts remain at the bottom of the glass bottle. The water vapours get accumulated in the other glass bottle which was rested on the wet sand get cooled. After the process of evaporative water get cooled, it was tested to measure the amount of sodium present by using an atomic absorption spectrometer. After about 10 minutes time, 1/3 of sea water in bottle were evaporated and purified water was obtained.

Keywords: atomic absorption spectrometer, boiling point, sea water, sodium purification, vaporization

Teacher-in-Charge : Ms K.A. Ishari Udeshika, H/ Tangalle Balika Vidyalaya, Tangalle.
Principal Supervisor : Dr Nishantha Kalutharage, Department of Chemistry, Faculty of Science, University of Ruhuna.

Chemistry

Incorporation of *carbon capture and storage* and *carbon capture and utilisation* in Sri Lanka for CO_2 mitigation

A.P. Karnik and S.D. Udugama
Colombo International School, Colombo 7.

Abstract

The effects of climate change pose a universal threat and will soon begin to present high economic costs to governments as well. The effects of this in Sri Lanka are also observable through increased sea levels causing more frequent flooding and higher temperatures resulting in ocean acidification. A major cause of this phenomenon is the continuously rising emissions of carbon dioxide. The main industries causing emissions in Sri Lanka (which include cement, transport etc.) are examined in much greater detail in the review. This literature review aims to contemplate the feasibility of incorporating carbon capture and storage (CCS) and carbon capture and utilization (CCU) in Sri Lanka. To achieve this, a thorough understanding of all relevant processes was procured using reliable material such as published content and government websites. The processes of oxyfuel, pre-combustion and post-combustion capture for carbon capturing were examined. Following this, transportation, and storage techniques appropriate for Sri Lanka were examined, which encompassed both pipeline and ship transportation along with geological storage and carbon mineralisation. Furthermore, 9 utilisation applications suitable for Sri Lanka were investigated, including enhanced oil recovery, which is employable in the Mannar basin, to recover approximately 1 million barrels of oil available. Another utilization included the use of CO_2 as a heating system [developed by (Ecole Polytechnique Federale de Lausanne)] which can be implemented in Nuwara Eliya and Kandy and used as a substitute for coal, for net reduction in energy consumption. Comparing storage and utilisation, the review determined that CCU demonstrates the greatest potential in Sri Lanka by recycling captured CO_2 and harnessing it as a resource to gain advancements in several industries. A few examples include the fertilizer industry, valued at 36 billion rupees in 2020 and paints & varnish industry, valued at 15 billion rupees. Utilisation also holds more value due to limited geological storage sites in Sri Lanka (mainly present in Cauvery Basin). With this, we were able to achieve our objective of examining the processes of CCS along with CCU and discussing their usage in Sri Lanka, producing a 54 page document with 207 references.

Keywords: applications, carbon capture and storage, carbon capture and utilisation, climate change, storage, transportation

Teacher-in-Charge : Ms Nanduni Wickramatunga, Colombo International School, Colombo 7.
Principal Supervisor : Dr Mahinsasa Rathnayaka, Department of Chemicle and Process Engineering, Faculty of Engineering, University of Moratuwa.

Preliminary study of effective fluoride adsorption by aluminium oxide modified clay

P. Kowarthanan, M. Rathukesh and T. Manojkara
Paddiruppu Madya Maha Vidyalayam, National School, Kaluwanchikudy.

Abstract

In recent years, green route of local clay materials has gained much interest from chemists and researchers. Therefore, this study was designed to investigate the feasibility of fluoride adsorption from water using naturally available local clay in both aluminum oxides modified and unmodified forms. X-ray diffraction (XRD) and Fourier-transform infrared spectroscopy (FTIR) analysis was applied to describe the structure and nature of raw clay and modified clay. The physicochemical characteristics of the adsorbent were also investigated for pH, adsorbent mass, initial fluoride concentration and contact time in room temperature 28°C. XRD and FTIR analyses revealed that the raw clay contained minerals such as allophane, feldspar, gibbsite, kaolinite, montmorillonite, alumina, and silica. The adsorption of fluoride by the synthesized sample was analysed using ion selective electrode fluoride meter. The effect of pH and temperature on the adsorption of fluoride by modified clay particles was studied. In addition, the time allowed for the adsorption and the shaking speed of the solution also was analysed to get the optimum adsorption of fluoride ions by these particles. The results showed that the optimum adsorption of fluoride was achieved at the pH 5.0 with the room temperature of 28°C. Further, the shaking speed and the equilibrium time should allow for the optimum adsorption were 200.0 rpm and 60 minutes respectively. The kinetic study on the adsorption of fluoride by modified clay particles was performed and the results showed that modified clay particles removed 78% of fluoride ion in 60 minutes from fluoride contaminated water. The study on adsorption isotherms of fluoride on modified clay particles was also tested. Moreover, this research revealed that the modified clay particles could be very promising materials to remove fluoride ions from the water.

Keywords: adsorption, fluoride, kinetic study, optimum

Teacher-in-Charge : Mr S.Thevakumar, Paddiruppu MMV, National School, Kaluwanchikudy.
Supervisor : Dr M. Koneswaran, Department of Chemistry, Faculty of Science, Eastern University of Sri Lanka.

Chemistry

Identification and characterization of Batticaloa *Manihot esculent* crantz granulated sugar: Alternative for brown sugar

M. Vedaansana, G. Romiya and T. Lithursha
Paddiruppu Madya Maha Vidyalayam, National School, Kaluwanchikudy.

Abstract

An experiment was conducted to study the feasibility of preparation of sugar from *Manihot esulenta Crantz* juice by simple drying and solidification process. The drying temperature was controlled at 105°C and the drying time was 7 hour to form the solid precipitant. The synthesized granules were evaluated for various chemical and physical qualities. The titrable acidity, pH, total soluble solids (TSS), total sugar, reducing sugar, non-reducing sugar and sucrose were examined using standard analytical method. Results of the synthesized precipitant in yellowish-brown colour indicated properties such as 99.23% water solubility, 0.42% titrable acidity, 4.5 pH, 82.20 Brix TSS, 7.05% total sugar, 1.45% reducing sugar, 5.60% non-reducing sugar, and 5.32% sucrose. This study revealed that *Manihot esculenta* granulated sugar prepared can have a better product quality with their mineral contents and chemical activity as an alternative to brown sugar in Sri Lanka.

Keywords: drying, *Manihot esculenta*, solidification

Teacher-in-Charge : Mr S.Thevakumar, Paddiruppu MMV, National School, Kaluwanchikudy.
Supervisor : Prof. S. Arasaretnam, Department of Chemistry, Faculty of Science, Eastern University of Sri Lanka.

Chemistry

Enhancement of kittul (*Caryota urens*) industry through more effective and easy medium of seasoning of flower.

P.M.T. Gunarathna
MR/Kolawenigama Maha Vidyalaya, Deniyaya.

Abstract

Kithul tree (*Caryota urens*) which belongs to palm family flourishes well in countries like Sri Lanka, India, Myanmar and Malaysia. kithul industry, which contributes to the rural economy since ancient times, produces toddy, treacle and jaggery which has pleasing taste. Despite the value of kithul products, the kithul industry has been endangered due to the tappers turning to other less risky and money-making professions. The current production in the kithul industry is not sufficient for the demand in the market. Therefore, the enhancement of the kithul industry has received much attention. One of the main factors which affect the industry is the obtaining of sap yield. Various secret recipes of the medium (seasoning/ treatments) have been used from the ancient time to stimulate the secretion of the sap from kithul flowers. The objective of this research is to enhance and popularize the kithul industry by introducing effective and easy medium for the seasoning of kithul flowers to produce more sap yield.

Properly bloomed inflorescence in similar size and five tappers were selected from Deniyaya area for this study. The sap was collected in traditional way while using three different recipes (describe as Lists) were used (List 4 in singlicate and List 5 and 8 in duplicate) as the medium for seasoning the kithul flowers. The ingredients for the List 4 are carbide (1 tsp) and lime juice (1 tsp). The ingredients lime (1), garlic (1 clove), ginger (similar amount to garlic), pepper (8 seeds), "kochchi" (kind of small size of chilies 50) and coconut milk (5 tbsp) were used for the List 5. The list 8, was a mixture of turmeric (35 g) and chunam (eaten with betel 25 g). In this study it was found that the List 8 was able to give the highest average amount of sap (31.58 and 11.06 L) while the other lists produced average amount of sap (List 5: 7.80 and 5.50 L, List 4: 5.5 L) in a day. Accordingly, the list 8 with cheap and easily available ingredients was found as the most effective medium for higher sap yield and therefore, it is a promising enhancer for the kithul industry.

Keywords: *Caryota urens*, inflorescence, kithul industry, sap, seasoning

Teacher-in-Charge : Ms B.P. Manushi Taniya, MR/Kolawenigama Maha Vidyalaya, Deniyaya.
Principal Supervisor : Dr W.S. Hemalika, Department of Chemistry, Faculty of Science, University of Ruhuna.

Chemistry

Natural dye for different applications

H.K.D.W.M.T.D. Diwarathna
N/ Poramadulla Central Collage, Rikillagaskada, Hanguranketha.

Abstract

Natural dyes are usually better than the synthetic dyes, because natural dyes are mostly biodegradable, eco-friendly, non-toxic and non- allergic in nature. However, uses of natural dyes are not very common today. Hence this research was aimed to identify natural dyes and their applications. Accordingly, latex gained by stem of Gocatu tree (*Tribulus terrestris)* and the latex of Gammalu tree (*Pterocarpus marsupium)* were used as testing materials. In past era gocatu dye solution had been used to paint wall arts in public and religious places. It is yellow in colour and has high coagulation rate, Thus, can add 1/10th amount of water to latex to prepare the dye. The latex of gammalu is used to prepare maroon colour natural dye. These latexes were collected from the trees by cutting a small line and setting a cup under it. The one cup of dye could be collected within 2-3 hours. Methods were developed to apply both these natural dyes in different applications such as a fabric paint, earthenware paint, water colour, paper colorant etc. When the dye is used as fabric paint, three parts of the dye was combined with one part of vinegar and four parts of water. Then the fabric was boiled in the dye mixture for one hour and rinsed with cold water and dried for four days before used. When the dye is used as earthenware paint, they were applied on the outer surface of the pot. Before, application of dye the pot should paint with white colour and dried well. After application of dye on any preferred design it should allowed to dry around 2 hours under sun light. When these dyes use as water colours small amount of water has to be added to get preferred viscosity. When these dyes were used as paper colourant red and yellow coloured papers were obtained. This was done by dipping white colour paper into the mixture of dye prepared by adding an extra amount of water. As a conclusion of this investigation it could be reported that gocatu and gammalu latexes can be used as eco-friendly, and cheaper natural sources that could be successfully used as dyes in different applications and could be an alternative for synthetic dyes.

Keywords: gammalu, gocatu, natural dye, *Pterocarpus marsupium,Tribulus terrestris*

Supervisor : Dr Susanthi Jayasinghe, Department of Chemistry, Faculty of Science, University of Peradeniya.

Food Science

Development of instant vegetable soup cube for Chronic Kidney Disease (CKD) patients

K.B. Nimhara
Harischandra National College, Negambo.

Abstract

Chronic Kidney Disease (CKD) is a major non-communicable disease in Sri Lanka. There are more than 150,000 CKD patients in the country especially in the North Central Province. The diet of a CKD patient is an important thing to reduce the risk of kidney failure or end-stage renal disease (ESRD) requiring dialysis. A CKD patient should consume potassium (K) and sodium (Na) lower than 2000 mg per day and phosphorus (P) lower than 1000 mg per day. In the current scenario of food processing industry, there are very limited number of foods that contain low K, Na, and P. Therefore, the objective of the present study was to develop an instant vegetable soup cube, which has low K, Na, and P to be able to consume by CKD patients.

Organic vegetables including red bell pepper, cabbage, cauliflower, carrot, corn, beans, mushroom, green pea, celery, garlic, onion were used as the main ingredients and cassava flour and Kaluheenati traditional brown rice flour were used as the binding agents. The final product contained 87.91 mg of K, 18.69 mg of Na and 41.96 mg of P per 4 g of soup cube. Further, final soup cube contains 19.84% of protein, 7.28% of fat, and 89.61% of carbohydrate. The observed K, Na, and P were lower than the recommended daily intake of K, Na, P of CKD patients. Therefore, it can be concluded that the instant vegetable soup cube can be a healthy alternative for CKD patients instead of traditional soup cubes in current food market.

Keywords: chronic kidney disease, healthy, minerals, soup

Teacher-in-Charge : Ms N. Munasinghe, Harischandra National College, Negambo.
Principal Supervisor : Prof. C.V.L. Jayasinghe, Department of Food Science and Technology, Faculty of Livestock, Fisheries, and Nutrition, Wayamba University of Sri Lanka.

Food Science

Development of a ready to serve drink using juice of fresh Coconut sprouts *(Cocos nucifera)*

J.A.L.Himansa, W.N. Navodya, R.S. Alawatta
Sirimavo Bandaranaike Vidyalaya, Colombo 7.

Abstract

Sprouted coconuts are the edible sponge-like cotyledons of germinating coconuts rich in vitamin C, Omega-3 and Omega-6 fatty acids, dietary fibre and minerals. However, the nutritional advantage of this has been not utilize since there is no product developed up to now by using coconut sprouts but use only as a fresh product. The main objective of this research is to develop a ready to serve drink (RTS) using fresh coconut sprouts.

Samples were collected from Bulathsinghala, Gonapola and Horana areas in Kaluthara District in Western Province. Height of the shoot of the coconut fruit, weight, length, circumference and brix value of the coconut sprouts were used as maturity indices to determine the suitable maturity level to develop the drink. Selection of the right part of the sprouts for the drink was selected by developing the drinks with the whole sprout and the fleshy part and observing changes of colour, taste and sedimentation under refrigerated conditions. Three RTS drinks were prepared using 15%, 20% and 25% of sprout juice concentrations, three RTS with 6%, 8% and 10% sugar concentrations with 25% sprout juice using sugar, citric acid, salt and sprout juice as ingredients. Two sensory evaluation tests were carried out for all samples using five point hedonic scale such as colour, smell, taste, mouth feel and overall acceptability as sensory characteristics with 30 numbers of untrained panel members. Results were analysed using spider web diagrams. Physical and chemical parameters, Microbiology and mineral contents of the final product with 25% sprout juice and 10% sugar concentrations were analysed.

According to the results the sprouts in coconut fruits with the shoot of 1 – 20 cm had the highest brix value in the range of 10 - 15^{o} brix were selected to develop the drink. The formula with 25% juice content and 10% sugar content were selected for the final product using sensory analysis. The brix and pH value of the final product were 11^{o} brix and 4.41 respectively. Total plate count, was inacceptable range compared with SLS standards for coconut water up to 3 days but yeast and mould count is higher after three days. The RTS drink is rich in potassium, sodium, phosphorous, calcium and magnesium. The colour, taste and appearance were accepted up to 4 days under refrigerated conditions. Coconut sprouts can be used to develop a ready to serve drink successfully.

Keywords: brix value, *Cocus nucifera*, microbioogy, minerals, ready to serve drink, sprouted coconuts

Teacher-in-Charge : Ms Beema Jayasekera, Sirimavo Bandaranaike Vidyalaya, Colombo 7.
Principal Supervisor : Dr Rupika Perera, Department of Food Science and Technology, University of Sri Jayewardenepura.

Food Science

Development of eco-friendly edible tableware using food waste by adding natural flavours and natural colors

J.H.N.T. Hansamali
Poramadulla National School, Rikillagaskada, Hanguranketha.

Abstract

Development of edible tableware is a relatively novel concept in which involves cups, plates, saucers and cutlery which can be consumed with the meal. Post-purchase food loss in Sri Lanka is fairly high. It is observed that tons of food, especially rice and bread go wasted every year. In the past left over rice used to prepare snacks and various other food items, minimizing the loss. However, at present no one is interested in utilizing them. Furthermore, use of plastic in the country is another serious issue. Plastics are highly persistent and as a result they stay without being degraded for hundreds of years. Heavy usage of plastic bags has led to many environmental issues as they clog drain leading to stagnation of water, paving way for mosquito breeding and many environmental issues. In this backdrop the current project was carried out with the aim of developing tableware using household food waste. The tableware was developed using dried rice flour, dried bread flour, small amounts of salt, pepper, curry leaf powder, cinnamon powder and rosemary oil. The mixture was kneaded into a dough sheet and different cutleries were cut out using moulds and added different solutions of colour. The resulted cutleries were dried in an oven for 20 minutes at 200 ^{0}C. The storability of the cutleries was monitored by keeping them at ambient conditions for a period of three months. No mould growth, colour or flavour changes were observed during the three-months storage period. This study concludes that edible tableware such as plates and cutleries can effectively be made using rice and bread that go into waste. Furthermore, it can be concluded that tableware produced using food waste can be stored for nearly three months safely. Production of tableware using food waste can be suggested as an environmentally friendly alternative for the use of plastic cutleries.

Keywords: culture, cutlery, edible, plastic, tableware

Principal Supervisor : Prof. Terrence Madhujith, Department of Food Science and Technology, Faculty of Agriculture, University of Peradeniya.

Effect of music on blood sugar level

N.B. Kaluarachchi
Sangamiththa Balika Maha Vidyalaya, Kirindiwela.

Abstract

At present there is a tendency in increasing non-communicable diseases reported in Sri Lanka. Diabetes is one of them. Diabetes can be caused by a various physical and psychological factors. There are several major treatments for diabetes and many other treatments that can be used in addition to medication. One such well known treatment is music therapy. Accordingly, this study was conducted to investigate whether music has an effect on blood glucose levels in patients with diabetes.

In this study, 10 patients were selected between the ages of 45 and 65 suffering from diabetes for about 5 months period. Then a test report on the blood glucose level of the patients obtained on the first date of the study and they were allocated into study group and controlled group randomly. The study group was given a package with north Indian classical music pieces and the time they were listening to the music gradually increased finally allowing them an opportunity to listen to the music every weekend of a period of month. The controlled group was well informed about this study and their situation was checked once a month. After the study period completed, the blood test reports were taken and compared with the report taken prior to the study. It was observed that the mean value of blood glucose level in study group was lower than the mean value of blood glucose level in controlled group according to their age, gender, number of drugs used. We measured the time of music the therapy and compared with the blood glucose level. The result was same for each case. There were two females and three males in the study group and two males and three females in controlled group. The limitation of this research is the small sample size of the study. If this can be done by increasing the number of people used for research and avoiding those errors the success rate could be greater. This study opens a path to other researchers who are studying music therapy as a concomitant treatment for diabetes to expend and succeed their research work.

Key words: diabetes, Indian music, listening to music, treatments

Teacher-in-charge : Ms A.A.C.R. Amarasinghe, Sangamiththa Balika M.V.,Kirindiwela.
Principal Supervisor : Dr S.S. Siritunga, Diretorate of Non - Communicable Diseases, Ministry of Health.

Knowledge, attitudes, practices and factors associated with knowledge regarding dementia among parents of ordinary level school children in a selected school in Colombo.

J.S.S. Shahiema, S. Faizal and F.S.R. Careem
Muslim Ladies' College, Colombo 04.

Abstract

Dementia is a syndrome, which is usually of a chronic or progressive nature that leads to deterioration in cognitive functions. Sri Lanka being a low-middle income country has nearly half of its older population affected with dementia and this number is expected to rise exponentially. Studies show a lack of knowledge regarding dementia and its causes worldwide and this is shown to contribute to the public health burden already caused by the disease itself.

This study aimed to describe the knowledge, attitudes, practices, and factors associated with knowledge regarding dementia among parents of ordinary level school children in a selected school in Colombo. A descriptive cross sectional study was carried out among 160 parents of ordinary level students in the selected school via using convenient sampling method. A self-administered questionnaire was used to collect data and analysed using SPSS software.

Majority (85.6%) of the study population were females and were residing in Colombo district (95%). Most (53.8%) had at least one parent living with them while 17.5% had an elderly relative living with them. The mean age of the sample was 42.9 years. A majority (70.6%) had not heard of dementia. Of those who had heard of dementia, majority (87.2%) had poor knowledge regarding the disease.

Most (76.6%) identified that forgetfulness was the commonest behavioural change that occurred in the disease and only 53.2% felt that it was a common issue in Sri Lanka. Most had poor attitudes towards dementia. Nearly 34.1% felt it was alright to neglect those with dementia, while nearly 34% felt it was tiering to care for a person with dementia. Only 20% of the study population had cared for a patient with dementia and most of them (37.5%) had looked after the patient themselves. In nearly 50% of the cases the patient were identified in the latter stage of the illness. All those with good knowledge were from the Colombo district. No factors were found to be significantly ($p<0.05$) associated with good knowledge following logistic regression.

In conclusion knowledge, attitudes, and practices regarding dementia in the study population were poor. Hence measures should be taken to improve knowledge and attitudes in the study population to ensure good practices.

Key words: attitudes, dementia, knowledge, practices

Teacher-in-Charge : Ms Pamoda Dassanayake, Muslim Ladies' College. Colombo – 04.
Principle Supervisor : Dr Dushyanthi Jayawardene, Departmant of Cammunity Medicine, Faculty of Medicine, University of Colombo.

Isolation of polythene degrading microorganism

W.R.M.U.A.K. Wickramasinghe, G.D.Kanathegedara and T.M.P.R.V. Tennakoon
Mahamaya Girls College, Kandy.

Abstract

Polythene is a polymer of ethylene that is used to make polythene bags, food containers, textiles, etc. It is a cause of many negative impacts on the environment. Polythene can take 12 - 32 years to break down also it produces toxic chemicals into the soil. When this polymer is burned, they release toxic fumes and pollute to the air. Therefore, the aim of this study was to find a microorganism that can degrade polythene.

Degraded polythene pieces were collected. A microbial suspension was prepared by washing them with sterile saline. Tenfold dilution series in sterile saline was prepared using this suspension. From the suspensions 10-4 and 10-5, 100 µl were inoculated on Sabouraud agar, MacConkey agar, and Blood agar using the spread plate method. The plates were incubated at room temperature and at 37°C for 24hrs.

Organisms responsible for morphologically different colonies were isolated and 20ml of microbial suspensions were prepared using each organism in sterile brain heart infusion broth. Polythene was cut into pieces & sterilized using 70% isopropyl alcohol. They were allowed to dry inside the clean bench and 100mg (± 0.3 mg) polythene pieces were selected. A polythene piece was introduced to each bottle of suspension and the bottles were incubated at room temperature and 37°C with a control (pure broth + polythene piece). After 3 months, the final weight of the polythene pieces was measured after washing the remaining piece with soap and water. Finally, the percentages of degraded amounts of polythene were calculated.

Due to the COVID 19 pandemic, the research work had to be paused. Therefore, the culture plates were over dried and the only organism among the gram-positive bacilli and gram negative bacilli that degraded polythene that could be retrieved was identified as *Pseudomonas aeruginosa*.

Keywords: degradation, polythene, *Pseudomonas aeruginosa*

Teacher-in-Charge	: Ms R.P.P. Randeni, Mahamaya Girls' College, Kandy.
Supervisor	: Prof. G.J. Panagoda, Department of Oral Medicine and Periodontology, Faculty of Dental Sciences, University of Peradeniya.
Principal Supervisor	: Ms M.R.D.M. Senanayake, Division of Microbiology, Faculty of Dental Sciences, University of Peradeniya.

Physics

Analyzing the heat variations inside the building atmospheredue to the installation of solar panels at the roof top of particular building in urban areas

A.R.F.R. Shaiffa, M.M.Z.A. Murshid
Mahmud Ladies College (National School), Kalmunai.

Abstract

The installation of solar panel has become quite popular in Sri Lanka. The primary purpose of solar panel is generation of electricity. However, there could be other potential positive benefits of solar panel. This research in particular is woven around the hypothesis, that there is a significant effect on reduction of the temperature in houses installed with solar panel. Control experiment with prototypes were conducted in two selected regions of Kalmunai and Sammanthurai. The experiment yielded a set of 67 data points for further analysis. The analysis found that 69% of the data were in support of the hypothesis. The negative variations were also witnessed which might be due to the other environmental factors. The density of the population had also caused significant effect on the outcome of the research. Thus, this empirical study concluded that the installation of solar panel does have a profound impact on the reduction of heat within a building. The validity of the research can further be strengthened by conducting the experiment in real buildings in place of our prototypes.

Keywords: lightning flash data, lightning risk, satellite observations

Teacher-in-Charge : Ms A.R.F. Shifana, Mahmud Ladies College (National School), Kalmunai.
Principal Supervisor : Mr S.M. Safnas, Nawaloka Construction Company (Pvt) Ltd.

Plant Sciences

Effect of different potting mixtures on vegetative growth of Dendrobium Orchidec

W.M.D.K. Wasala
Palle Julampitiya Maha Vidyalaya, Julampitiya.

Abstract

Orchid is an economically important flowering plant that belongs to the family Orchidaceae. Most of the orchid species are cultivated in tropical and subtropical regions. The growth and development of orchid plants are largely affected by potting mixtures used. The present study was conducted to identify the most suitable potting mixture for vegetative growth of Dendrobium orchid. A completely randomized design was used in the experiment with fifteen replicates. Three potting mixtures were used as treatments [roof tile pieces: wood charcoal (1:1), roof tile pieces: coconut husk pieces (1:1) and wood charcoal: coconut husk pieces (1:1)]. All experimental units were kept under 50% shade and 70% relative humidity. Recommended fertilizer mixtures for orchids were applied. Five months after establishment, the number suckers, the number of leaves, leaf length, length of the sucker and vigorous score of the plant were recorded. SAS statistical software was used to analyse the data. There was no significant difference between potting mixtures for the number of suckers per pot. However, the number of leaves per plant, length of the leaf, sucker length and vigorous score of the plant was significantly different between potting mixtures. The greatest values, except the number of suckers were recorded in the potting mixture prepared by wood charcoal: coconut husk pieces (1:1). However, those values were not significantly different from the values observed in roof tile pieces: wood charcoal (1:1) potting mixture. All measured parameters, except the number of suckers, were significantly lower in the potting mixture prepared using by roof tile pieces: coconut husk pieces (1:1). According to the results of the present study, it can be concluded that the optimum vegetative growth of *Dendrobium* orchids can be achieved by using potting mixtures prepared by wood charcoal: coconut husk pieces (1:1) and/or roof tile pieces: wood charcoal (1:1). This may be due to good aeration and water drainage ability of the media used to prepare the potting mixtures.

Keywords: coconut husk pieces, orchid, potting mixture, roof tile pieces, vegetative growth, wood charcoal

Principal Supervisor : Dr Menaka Fernando, Department of Crop Science, Faculty of Agriculture, University of Ruhuna.

Study on the impact of present competitive educational system on the behavioural patterns and the personality development of students in Sri Lanka.

G.P.H.N. Poojani, A.W.S. Nisandara and R.M.M. Piumini
St. Mary's College, Hambantota.

Abstract

Despite the high literacy rate in Sri Lanka, the competitiveness and the nature of the current education system and the examination pattern has been identified various problems that have impacts on the social, attitudinal and personal-wellbeing of the student community. This research reviews the impact of the competitiveness of the present education system on the behavioural patterns and the personality development of the student community in Sri Lanka.

A sample of students was selected according to the location of their schools within the Hambantota district as urban, semi-urban and rural. Based on the three main examinations namely, grade five scholarship examination, G.C.E. Ordinary Level examination and G.C.E. Advanced Level examination, students were selected according to their grades as 4 and 5, 10 and 11, 12 and 13. Moreover, the samples of teachers and parents of Hambantota district were also chosen. Separate questionnaires were prepared under relevant criteria and were given to each sample. Face to face interviews and telephone interviews were conducted with few selected students. Basically, each questionnaire consisted questions about the recommended syllabi for the students, their extra-curricular activities at school, their family backgrounds and their interpersonal relationships. The prepared questionnaires for the teachers were specifically based on identifying the prevailing educational system. This research paved the way to identify the present educational system and the examination pattern as obviously competitive. The study revealed that the G.C.E. Advanced Level examination is the most competitive examination. It affirmed that there are some shortcomings in the existing curriculum which have adversely affected the behavioural patterns and the personality development of student community irrespective of the age of students and the geographical location. Furthermore, study revealed that students in rural areas were troubled more with this competitiveness as lack of teachers has become a significant problem.

Keywords: behavioural patterns, competitive examination, curriculum, education, personality development

Teacher- in-Charge : Ms S. Amarawickrama, St. Mary's College, Hambantota.
Principal Supervisor : Dr Dushmanthi Silva, Department of Sociology, Faculty of Humanities and Social Sciences, University of Ruhuna, Matara.

Social Sciences

Effect of an e-educational poster on improving the knowledge, attitude and practice on proper use of face masks among school students.

T.M.S.R. Thunpaththu
Rathnavali Balika Vidyalaya, Gampaha.

Abstract

Two spread methods of Covid 19, namely air borne and respiratory droplets can be prevented by proper use of face masks. However, it has been reported an inadequate knowledge attitude and practice of proper use of face masks among school students. Therefore, knowledge, attitude and practice of school students should be improved. Different approaches are used but e-posters are rare and their effect on proper use of face masks has not been studied. The objective of this study was to determine the effect of e-educational poster on knowledge, attitude and practice on proper use of face masks among school students. This study was conducted as pre-test and post-test design. Sample included 364 grade 11 students of Gampaha educational division, Sri Lanka. Data were collected by self-administered questionnaires distributed pre and post to the interventional e- education poster. Data analyses was conducted by using SPSS Software. Results shows that there was no significant demographic difference ($p=0.446$) between the pre and post-test groups. A significant increase was observed between the pre and post-test mean scores of knowledge ($p \leq 0.05$), attitude ($p \leq 0.05$) and practice ($p \leq 0.05$) on proper use of face masks. In pre group knowledge ($p=0.155$), attitude ($p=0.258$) and practice ($p= 0.211$) shows no significant difference due to gender. Also post group knowledge ($p=0.079$), attitude ($p=0.835$) and practice ($p= 0.435$). The results suggest that e-educational poster may be useful to improve the knowledge, attitude and practice on proper use of face masks among school students. The improvement of knowledge, attitude, and practice on proper use of face masks by e-educational poster among school students occurs irrespective of gender.

Keywords: Covid 19, e-educational poster, face mask, prevention, school students

Teacher-in-Charge	: Ms Lakmalee Kanivila, Rathnavali Balika Vidyalaya, Gampaha.
Principal Supervisor	: Dr Sujeewa Weerasinghe, Physio Life Care (Sri Lanka), University of Colombo.
Supervisor	: Ms H.M.K.B. Herath, National Hospital of Sri Lanka, Colombo.

Effect of an e-educational poster on improving knowledge, attitude and practice on proper use of hand hygiene among advanced level students in Dehiowita educational zone

W.M.S.T. Weerasinghe
SP/RU Rajasinghe College, Ruvanwella.

Abstract

Hand hygiene is important to prevent the spread of the COVID-19 virus by contact. It also interrupts transmission of other viruses and bacteria causing common colds, flu and pneumonia, thus useful in reducing the general burden of disease. Therefore, knowledge, attitude and practice on hand hygiene of school students should be improved. At present different approaches are used to but Sinhala medium e-posters are less. Also, the effect of Sinhala e-posters is not studied. To determine the effect of an e-educational poster on improving the knowledge, attitude, and practice on proper use of hand hygiene among advanced level students in Dehiowita educational zone. This study was conducted as a one group pre-test post-test design. A significant difference has been observed between the pre and post test scores for knowledge ($p \leq 0.05$), attitude ($p \leq 0.05$) and practices ($p \leq 0.05$) on proper hand hygiene. The results suggested that e-educational poster may be useful to improve the knowledge, attitude and practice on proper use of hand hygiene among advanced level students.

Keywords: Covid 19, e-educational poster, hand hygiene, students

Teacher-in-Charge : Mr A. P. N. M. Wickramasinghe, SP/RU Rajasinghe College, Ruvanwella.
Principal Supervisor : Mr T.M.U.S. Thunpaththu, National Hospital of Sri Lanka, University of Colombo.
Supervisor : Ms D.M.T.P. Dissanayake, National Secretariat for Early Childhood Development.

Zoology

An observation of the butterflies and moths in Periyapandivirichchan, Madhu

M. Yanani
Mn/Periyapandivirichchan Mahaidyalayam, Madhu.

Abstract

Butterflies are a good example of how living being that are perfectly non-aggressive can survive in nature. In Sri Lanka, 248 species of butterflies were identified. Out of which about 31 species are endemic. The present study was an observation of butterflies and moths in Periyapandivirichchan, Madhu. Transect count method was used to identify the butterflies and moths. The position of each sample point on the transect and its sample area identification number was written onto the fading tape. Ten minutes was spent at each identified position to count and identify the butterflies seen and entered in the field notebook. Butterflies and moths observed in four different locations such as home garden, bush land, field area and pond area. Forty-three butterflies and five moths were identified in Periyapandivirichchan. We must save the butterflies in our environment and its habitat also. We will create the active garden in the home, school and our village for the butterflies. In this way, we can educate children, and it will encourage them to save our nature in future.

Keywords: biodiversity, butterfly, conservation, ecosystem, transect count method

Teacher-in-charge : Ms R. Sivapraba, Mn/Periyapandivirichchan M.V., Madhu.
Principal Supervisor : Dr Wijeyamohan, Department of Biological Sciences, Vavunya Campus, University of Jaffna.

Zoology

Evaluation of local plant species for development of potential larvicidal agents against the *Aedes aegypti* L. (Diptera: Culicidae) mosquito larvae.

R.K.S.N. Ramanayaka and M.P. Wijayawardana
Rathnavali Balika Vidyalaya, Gampaha.

Abstract

Currently, there is a huge concern about the damage course to the environment using chemical insecticides. Therefore, the Sri Lankan government encouraging citizen for minimal use of chemical fertilizers and pesticides. Owing to that the better alternative will be the use of natural plant extracts as a larvicide against synthetic insecticides. Sri Lanka is considered a major biodiversity hotspot that comprises many promising plant species. However, in-depth scientific studies related to larvicidal effects of plant extracts against the dengue vector *Aedes aegypti* are rare. Therefore, this study was conducted to identify the local plant species that can be used for the development of larvicide against the *Ae. aegypti* mosquito larvae. In this study, 32 plant species were collected from the Gampaha district. Pre-screening of the 32 plant species were carried out for using their crude extracts. After 24 hours, the mortalities of *Aedes* larvae were determined. Larvae with a total absence of movement, even after touch, were considered as dead. Selected plants having promising larvicidal effects were used for the follow-up studies after preparing storable dried powder. A series of larvicidal bioassays were conducted to determine the effectiveness using these powders. Eight different concentrations of dried powder have given most encouraging results. They were used to determine the effective concentration for controlling the natural breeding site. The egg hatching and survival rate of *Aedes* second instar larvae were measured against each concentration. Of this experiment, fifteen samples were identified as potential larvicides against *Aedes* and out of that 13 were leaf crude extracts. The time taken for the 100% mortality ranged from 5 to 138 minutes. Retesting with larvicidal bioassay was conducted for selected 9 plant leaves crude extracts having less than 60 minutes mortality time. Overall results showed clove leaves powder as the most promising treatment for dengue mosquito breeding control. It reduced larvae development by more than 80% at a concentration of 0.01g/ml. Therefore, can be recommended for application to potential *Aedes* mosquito breeding water-holding containers. This study opens a path to reduce the *Aedes* mosquito breeding in an eco-friendly way because clove leaves are nontoxic for humans or other vertebrates.

Keywords: *Aedes aegypti*, bioassay, clove, efficacy, larvicide, plants

Teacher-in-Charge : Ms G.C. Weerakkody, Rathnavali Balika Vidyalaya, Gampaha.
Principal supervisor : Dr N.D.A.D. Wijegunawardana, Department of Bioprocess Technology, Faculty of Technology, Rajarata University.

Zoology

Evaluation of stocking density on growth performance and survival of mono-sex Tilapia (*Oreochromis niloticus*) fingerlings under aquaponic culture system

B.W.H.P. Perera, M.B. Deldeniya and P.A.D.T. Savindini
Rathnavali Balika Vidyalaya, Gampaha.

Abstract

Fish waste and uneaten food in aquaculture tanks pollute water frequently, produce toxic substances in the system, and cause stress to fish, leading to their poor growth resulting a longer duration to reach the harvesting stage. Therefore, farmers need to exchange water very frequently, increasing water utilization for the culture, resulting increased labour cost, production cost and low profit.

Aquaponic techniques (aquaculture + hydroponic techniques) where aquatic plants are grown in fishponds using tank wastewater, can filter and purify water by absorbing nitrates from the ponds. If this contributes to the rapid growth of fish, the farmer can get an increased harvest and a good income from the same tank volume. Using this theory and hypothesis, two culture experiments to compare the growth performance of mono-sex Tilapia (*Oreochromis niloticus*) fingerlings cum edible plants, *Hydrocotile verticillata* and *Ipomoea aquatica* were carried out with special attention to increase the stocking density and reduce water usage in culture systems. Each experiment consisted of four treatments with three replicates under completely randomized design.

In study 1, the percentage weight gain (171.71±61.48) and average specific growth rate (1.63±0.39) in T3 (aquaponic system with normal stocking density) were not significantly different from the control treatment, with their values being (178.17±37.00) and (1.70±0.22) respectively. In study 2 also, the highest average percentage weight gain (89.12±37.75) and specific growth rate (1.04±0.32a) were observed in T3. Both study results indicated that the lowest percent average weight gain, average specific growth rate and lowest survival was in T4; aquaponic with high density stocked treatment. The volume of reduced water usage without affecting fish growth was 78 cubic feet. Calculated extra income from a single harvest of plants per square meter in T3 and T4, rupees 120.00, 140.00 (study 1) and 332. 00 and 440.00 (study 2) clearly indicated that the aquaponic system is more benefited for fish farmers. Study results indicated that the fish growth and survival is best in aquaponic system under optimum stocking density and water usage and can be reduced without affecting fish growth, with an extra income from the culture cycle.

Keywords: aquaponic, *Hydrocotile verticillata*, monosex Tilapia

Teacher- in- charge : Ms Chathurika Weerakkody, Rathnavali Balika Vidyalaya, Gampaha.
Principal supervisor : Dr M.G.I.S. Parakrama, Senior Scientist, National Aquatic Resources Research and Development Agency, Colombo 15.

Incidental by-catch of sea turtles in coastal and offshore fishery in Kalpitiya Peninsula, Sri Lanka: Assessment of fisher knowledge, practices and attitudes

T. Ekanayake and S. Abeywarna
Hillwood College, Kandy.

Abstract

Of the seven sea turtle species in the world, five, namely, olive ridley, green, leatherback, loggerhead and hawksbill, come ashore to nest in Sri Lanka. Despite their protected status, sea turtles are still under threat. The most serious threat faced by the turtle population inhabiting and migrating through the Kalpitiya Peninsula is incidental by-catch in fishing gears. This study investigated fishers' knowledge, practices, and attitudes towards incidental sea turtle by-catch in the Kalpitiya Peninsula through fisherman interviews. Eighty-two fishers from 10 villages were interviewed through phone and in-person using a pre-tested, structured questionnaire comprising 40 questions after obtaining verbal consent. Data were entered into a database, and the responses of the fishers were analysed. The main income source of all participants was fishing. All the interviewees stated that they had seen turtles; olive ridley (48%) and green turtle (37%) were seen more frequently. The majority (88%) of the fishers claimed that having turtles was important. Most of the respondents (77%) stated turtles do get entangled in their fishing gears; and all claimed that they release turtles without harming. Some fishers (34%) said that 10-50 turtles get accidentally entangled in their fishing gear and 38% admitted that ray nets catch the most number of turtles while 37% said all the types of nets catch sea turtles. More than half of the fishers (63%) claimed that they had consumed turtle meat, and few (15%) had consumed it recently. Some (62%) said that still there was a demand for turtle meat. Ninety percent of the respondents admitted that it was necessary to conserve turtles. The survey results show that although the turtle entanglement rate was high, the fishers were well aware of the legislation and therefore claimed that they release turtles without harming. Only a few fishers claimed that they had consumed turtle meat recently. The survey shows that fishers have sufficient knowledge about sea turtle legislation and positive attitudes towards the conservation of sea turtles but claimed that their fishing practices lead to turtle entanglement and damage. This indicates incidental by-catch in fishing gear still exists in the Kalpitiya Peninsula.

Keywords: attitudes, by-catch, knowledge, practices, sea turtle, Sri Lanka

Teacher-in-Charge : Ms R.K. Subasinghe, Hillwood College, Kandy.
Principal Supervisor : Prof. R.S. Rajakaruna, Department of Zoology, Faculty of Science, University of Peradeniya.

Population dynamics of barking deer (*Muntiacus muntjak malabaricus*) at Udawattekele reserve forest, Kandy, Sri Lanka

R.P.N. Dharmawardhane, S.T.E.M. Rajakaruna, H.U. De Silva
Trinity College, Kandy.

Abstract

The population analysis of barking deer (*Muntiacus muntjak malabaricus*) was carried out at the Udawattekele Reserve Forest, Kandy Sri Lanka (URF) (7°17'55.41"N, 80°38'40.04"E) for eight months from 1st of October 2020 to 30th of June 2021. Counting was conducted for three days every month. Sighting times were recorded in the evening between 5.00- 6.00 p.m. along seven linear transects. During the field visits, fecal samples were collected from velvet antlered and hard antlered bucks separately. The population of barking deer was estimated by DISTANCE 7.3 computer application and the fecal testosterone concentration (ng $^{g-1}$) was analysed by *radioimmunoassay* (RIA) kit. The peak number of barking deer was estimated as 80 ± 18.82 in April-June which could be considered as the highest number of barking deer in URF. The lowest number of individuals was recorded in January-March as 49 ± 16.71. The ratio for the doe to bucks was 1: 0.54 in October-December and the fawns were encountered only in the period between April- June and the doe to fawn ratio was 1:0.46. The maximum mean fecal testosterone concentrations (10.70 ± 0.62 ng $^{g-1}$) were recorded in the hard antler stage of barking deer bucks and the minimum mean fecal testosterone level of 6.17 ± 0.52 ng $^{g-1}$ was in the velvet antler stage. Collectively, our results suggested that barking deer have adapted to their urbanized environment in URF. In the URF, barking deer show seasonality in fawning an d they have pair formation related to the antler rutting stage. On a broader scale, species continue to face challenges of a changing environment as human population growth and urbanization continues to increase. The future impacts of urbanization on the barking deer population in URF cannot be predicted. The damage done by barking deer to the understory of URF and its consequent impacts is often irreversible. Therefore, the barking deer population in URF needs constant monitoring and methods to maintain a healthy population while preserving URF.

Keywords: barking deer, population, testosterone, udawattekele

Teacher-in-Charge : Mr Danushka S. Weerasekera , Faculty of Agriculture and Technology, Trinity College, Kandy, Sri Lanka.
Principal Supervisor : Prof. K.B.Ranawana, Department of Zoology, Faculty of Science, University of Peradeniya.

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