Proceedings of the

YSCMR 2022

VIRTUAL INTERNATIONAL CONFERENCE 2022

YOUNG SCIENTISTS' CONFERENCE ON MULTIDISCIPLINARY RESEARCH

November 10, 2022

ORGANIZED BY THE YOUNG SCIENTISTS' ASSOCIATION,
NATIONAL INSTITUTE OF FUNDAMENTAL STUDIES, SRI LANKA

NIFS

NIFS-YSA
YOUNG SCIENTISTS' ASSOCIATION
NATIONAL INSTITUTE OF FUNDAMENTAL STUDIES

BANK OF CEYLON
BOC
Bankers to the Nation

YSCMR-2022

Proceedings of the

Young Scientists' Conference on Multidisciplinary Research - 2022

Virtual International Conference

10th November 2022

"Multidisciplinary Research for Tomorrow's Challenges"

ISSN 2815-0260

Proceedings of the Young Scientists' Conference on Multidisciplinary Research - 2022

10th November 2022

Published by:
Young Scientists' Association (NIFS-YSA),
National Institute of Fundamental Studies,
Hanthana Road, Kandy,
Sri Lanka.
www.nifs.ac.lk
Tel: +94 (0) 812 232 002
Email: ysa@nifs.ac.lk

Cover page design & Page setup

Mahesh Senarathna, Indika Samarakoon, Rasika Gunarathne,
Savani Ulpathakumbura, Jayani Kalinga

TABLE OF CONTENT

EDITORIAL COMMITTEE

REVIEWERS

ORGANIZING COMMITTEE (YSCMR–2022)

Steering Committee: Lasanga Amarasena *(Conference Co-chair, YSCMR-2022)*, Mahesh Senarathne *(Conference Co-chair, YSCMR-2022)*, Anupama Amarasekara *(Conference Secretary, YSCMR-2022)*, Naruwan Dayananda *(Conference Assistant Secretary, YSCMR-2022)*, Malmi Wickramasinghe *(Treasurer, YSCMR-2022)*, Sidath Ekanayake *(Co-chair, NIFS-YSA)*, Jayani Kalinga *(Co-chair, NIFS-YSA)*.

Conference Proceedings Team: Tharangika Bowanage, Thilakshi Paranawithana, Upesha Siriwardhane, Upeka Bandara, Himashee Narampanawa, Roshan Fernando, Chathuranga Wijerathna, Umayangani Weerasinghe, Medhavi Abeysinghe, Harshani Nadeeshani, Asiri Medagedara, Shashini Gunathilaka, Nirasha Atapattu, Jayani Bandara, Dilini Perera, Nimashi Herath, Rasika Gunarathna, Savani Ulpathakumbura, Vindyani Sewwandi, Sanuri Hettiarachchi, Mahesh Premarathna, Kulangana Theivendrarajah, Bhagya Madushani.

Main Event Team: Erandi Herath, Saduni Bandara, Sumana Sivalingam, Ishara Sandamali, Madara Sarachchandra, Maheshika Perera, Mayomi Thilakarathne, Nalesha Mudannayake, Amali Karunarathne, Tharuka Wijesekara, Charuni Herath, Hasini Poornima, Disara De Silva, Yohan Jayawardhane, Dinusha De Silva, Tharushika Nirmani, Thampirasa Kumaresh, Prabhasha Kumarage.

Technical Team: Indika Bandara, Esmond Gunasekaran, Ravindu Pathirana, Dimuthumal Rajakaruna, Kavindya Samarakoon, Anjana Rathnayake, Achintha Sumithraarachchi.

ACKNOWLEDGEMENTS

It is our utmost pleasure to present this volume marking the successful completion of the Young Scientists' Conference on Multidisciplinary Research (YSCMR), 2022 organized by the Young Scientists' Association of the National Institute of Fundamental Studies (NIFS-YSA). We would like to express our sincere gratitude to all those who have been involved in making this event a grand success.

We would like to thank Prof. Athula Sumathipala, the Chairman of the NIFS, Prof. Shaluka Kodituwakku, the Director, Mrs. Sagarika D.K. Mediwaka, the Secretary, Editor-in-chief Prof. Nimal Adikaram, Editorial committee members and Advisory Committee of NIFS-YSA for their valuable guidance, encouragement, and support.

We would like to extend our gratitude to the staff of the Director's office, the Science Education and Dissemination Unit, the Accountant, the Accounts Division, and the Administrative Division of the NIFS for their immense support.

Organizing an event of this scale would not be possible without funding. Therefore, we would like to thank our platinum sponsor, Bank of Ceylon and Mr. Gamini Silva for his generous sponsorship.

We also express our sincere gratitude to all the Reviewers and Session chairs for sharing their experience in evaluating the papers and maintaining the quality of the conference on par with the NIFS standards.

Finally, our heartfelt appreciation goes to all our colleagues who actively participated to make YSCMR-2022 a huge success.

MESSAGE FROM THE CHAIRMAN, NATIONAL INSTITUTE OF FUNDAMENTAL STUDIES

I am delighted to send this message as the Chairman of the National Institute of Fundamental Studies (NIFS), which is a prestigious premier research institution in Sri Lanka.

This is once again an unprecedented event in succession during a complex socio-economic and political crisis. It was a very difficult situation during COVID-19 pandemic to gather face to face. However, the Young Scientists Association (YSA) which is a part of the NIFS did a marvellous job in organising this virtual conference in 2020 & 2021. Now its post COVID-19 recovery stage. YSA has done its duty. They have successfully received 114 abstracts of which, 52 would be oral presentations and 45 presented as speed talks.

Over the last 3 years, we have witnessed the inseparable connection between education and health which is more evident than ever before the pandemic. I emphasise that I refer to both physical and mental health when I refer to health. It has also highlighted the role of research linked to both of these aspect of life. The role of research in vaccine development is a classic example. Similarly, the role of research in technological advances that helped us in the use of information technologies in virtual working culture.

The post-industrial knowledge economy of today clearly displays the close correlation among economic growth, innovation, and indigenous research capacity. University-based research has been the most effective driver of such economically-relevant innovation. As a result, leveraging public investment in Universities to stimulate innovative research and development (R&D) is now a critical need for a country to remain competitive in the global arena. Sri Lanka needs a paradigm shift to make research and innovation core components of undergraduate and postgraduate education, to produce individuals with both a creative vision for innovation and sufficient intellectual breadth and depth to realize that vision. Sri Lanka requires innovative R&D contributions to re-stabilize the economy. However, a strategy is about capturing opportunities arising in a dynamic world, as scientific opportunities cannot always be foreseen. The flexibility to respond to novel ideas with solid potential and new funding opportunities for research is crucial for the success. Research Universities work on basic and applied research for knowledge creation and dissemination. Through collaborations with industry, they can utilize this knowledge effectively for intellectual property generation, and knowledge/technology transfer for commercialization. **The key components for this transformation need to be viewed as a paradigm shift in strategy: to increase resources through investment, spot and harness talent, recruit and retain the best of researchers and make essential structural changes**.

It is crucial to establish quality research centres of excellence and raise funds for research through collaboration, develop the capacity to compete for international grants, and enhance research funding through endowments. There should be more research-based postgraduate programmes around large-scale research projects leading to implementation for meaningful impact. I very much hope the young scientists at NIFS will be capable of giving the leadership needed for such an overarching research culture in Sri Lanka

Prof. Athula Sumathipala
Chairman,
National Institute of Fundamental Studies,
Hanthana Road, Kandy.

MESSAGE FROM THE DIRECTOR, NATIONAL INSTITUTE OF FUNDAMENTAL STUDIES

As the Director of the National Institute of Fundamental Studies (NIFS), I am delighted and honored to bring this message to the YSCMR-2022.

This year has been a significant year, as the young scientists of the NIFS have decided to hold this annual conference. YSCMR-2022 has been structured to address those challenges head-on. Our theme of "Multidisciplinary Research for Tomorrow's Challenges" was created to leverage this amazing gathering of professionals to bridge the gaps in science and to connect the gaps in a new and fresh way. This conference will provide some valuable opportunities on top-notch research in science, showcasing innovative research that are utilizing revolutionary technologies. With a record number of participants expected this year, I hope that this annual conference will become larger and more substantial in the years to come. I hope that this conference will allow the participants a productive discourse not only in aspiring excellence in research, but also in managing scientific research.

As the Director of NIFS, I know that the success of the conference depends ultimately on the many people who have worked in planning and organizing the conference. I'm constantly amazed by the support given by the Scientists, Research Assistants and many others who have a very clear desire to upgrade scientific research in the community in which we live.

In particular, I thank the conference committee for their wise advice and brilliant suggestions on organizing the conference. All recognition should go to the committee members who have all worked extremely hard on the details of important aspects of the conference programs. A note of appreciation to the researchers for their thorough and timely reviewing of the papers.

Most of all, I thank you, the presenters, for enriching the conference by your presence. As is a tradition with the conference, I hope you will enjoy the content, renew old fellowships, make new fellowships, get new ideas, and above all, have a great deliberation.

On behalf of the NIFS, we're looking forward to seeing you at NIFS.

Prof. Saluka R. Kodituwakku
Director and CEO,
National Institute of Fundamental Studies,
Hanthana Road,
Kandy.

MESSAGE FROM THE ADVISORY COMMITTEE, NIFS - YOUNG SCIENTISTS' ASSOCIATION

It's a great pleasure to write this message on behalf of the advisory committee of the Young Scientists Association (YSA) of the National Institute of Fundamental Studies (NIFS). It is a very proud moment for the advisory committee as, the Young Scientists Association of NIFS, organizes its fourth consecutive research conference; "Young Scientists' Conference on Multidisciplinary Research (YSCMR) 2022".

YSCMR-2022, is held as a virtual conference. Just like the previous year, this year also, the conference has attracted a large number of abstracts of research conducted in different parts of the world under the themes of Biological Sciences, Chemical Sciences, Physical Sciences and Social Sciences.

As you carry the theme, "Multi-disciplinary research for tomorrow's challenges" YSCMR-2022, has given the opportunity, for local and international early career researchers and postgraduate students to present their research, and also a chance for the organizing committee who are the young scientists of the National Institute of Fundamental Studies, to sharpen up their leadership skills.

As the advisors to the YSA, working with the young scientists of the NIFS has been an immense joy, to experience the enthusiasm, leadership qualities and determination of the organizers of the YSCMR-2022. With the commitment and dedication of the organizing committee, the event has now come to a reality and, we would like to congratulate the organizing committee and all the presenters of YSCMR-2022.

As the advisors of the YSA we would like to thank our invited speakers, for accepting our invitations and delivering the speeches. We hope that the young scientists will get inspired by their talks and we hope that this event will create new collaborations among the participants and will be an unforgettable experience.

Dr. Lakmal Jayarathne

Advisor
Young Scientists' Association
National Institute of Fundamental Studies,
Hanthana Road,
Kandy.

Dr. Shalini Rajakaruna

Advisor
Young Scientists' Association
National Institute of Fundamental Studies,
Hanthana Road,
Kandy.

MESSAGE FROM THE EDITOR-IN-CHIEF, YSCMR-2022

The "Young Scientists' Conference on Multidisciplinary Research (YSCMR) 2022" is being organized by the Young Scientists' Association (YSA) at the National Institute of Fundamental Studies (NIFS) to be held on 10th November 2022 for the fourth time. Postgraduate students and early career researchers from Universities and Research Institutions, within and outside Sri Lanka, are expected to participate in the Conference. Multidisciplinary research is quite relevant to the present day challenges.

Building on the success of previous conferences, the YSCMR-2022 will be conducted under four themes, Biological, Chemical, Physical and Social Sciences. Webinars, relevant to the preparation of Abstracts and presentation, were conducted timely for the benefit of Abstract writers and presenters.

YSCMR-2022 features 10-minute oral presentations, 5-minute speed talks and inspirational keynote speeches that will significantly benefit and inspire the young scientists. Over one hundred Abstracts were received this year from young scientists engaged in multidisciplinary research. Each Abstract was reviewed by expert-reviewers selected from a range of disciplines within the four conference themes. Around 100 of them would be in-line for oral presentations and speed talks. YSCMR-2022 has provided an opportunity for everyone to network with fellow young scientists, and attend the valuable conference sessions.

The Proceedings book, an assemblage of submissions made by the participants, will be an important resource book for anyone involved in scientific research. It gives me immense pleasure, as the Editor-in-Chief, to write this message on the occasion of the 4th YSCMR-2022.

I wish the Young Scientists' Conference every success!

Prof. N. K. B. Adikaram
Editor-in-chief,
Young Scientists' Conference on Multidisciplinary Research-2022,
National Institute of Fundamental Studies,
Hanthana Road,
Kandy.

MESSAGE FROM THE CONFERENCE ORGANIZERS, YSCMR-2022

It brings us great pleasure to write this message on behalf of the organizing committee of the Young Scientists' Conference on Multidisciplinary Research (YSCMR), 2022 organized by the Young Scientists' Association of the National Institute of Fundamental Studies (NIFS-YSA).

The NIFS-YSA was established in 2018 to encourage young scientists to enhance their knowledge and skills in the field of research while maintaining a friendly working environment within the institute. This is a scientific community of Research Assistants, Undergraduates, and Volunteers engaged in research at the NIFS.

YSCMR is the annual research conference of the NIFS. It started at an institutional level and was elevated to the national level in 2020 and the international level in 2021. YSCMR-2022 is the 4th consecutive research conference organized by the NIFS-YSA. This year we have taken a step further by calling for extended abstracts from local and international postgraduates and early career researchers.

With the theme of 'Multidisciplinary Research for Tomorrow's Challenges', the conference was organized under four themes; Biological Sciences, Chemical Sciences, Physical Sciences and Social Sciences, for which we received over a hundred abstracts. All the abstracts were reviewed by a comprehensive panel of reviewers and 45 were accepted for oral presentations and 54 for speed talks. The presenting authors presented their research findings virtually in 5 parallel sessions which surely contributed to the improvement of research in Sri Lanka.

Organizing an event of this scale, especially as a virtual event in a post-pandemic era was truly a challenge for the organizing committee. This event would not have been a success without the immense support given by our fellow Research Assistants at NIFS. Their dedication and contribution gave true meaning to what teamwork is.

We take this opportunity to thank the Chairman- NIFS, Director-NIFS, Editor-in-Chief, Editorial Committee and Advisors of YSA, for their guidance throughout the process. Also, our heartfelt gratitude goes to the expert panel of Reviewers, Chairpersons of technical sessions, Scientists and Administrative staff of NIFS for their support to make this event a reality. We would also like to thank the Science Education and Dissemination Unit (SEDU) of NIFS for their immense support in organizing the sessions and their valuable guidance.

We extend our heartfelt appreciation to our Keynote Speakers, Prof. I.M. Dharmadasa and Prof. Samantha C. Karunarathna for accepting our invitation and delivering their valuable and timely speeches at the conference. We would like to congratulate all the presenters of YSCMR-2022 and hope this virtual conference will give you the opportunity to network and share your knowledge with the research community from around the world.

Mahesh Senarathne & Lasanga Amarasena
Co-chairs, YSCMR-2022

Sidath Ekanayake & Jayani Kalinga
Co-chairs, YSA-2022

Keynote Speakers, YSCMR-2022

A Brief Biography of Professor I.M. Dharmadasa

I.M. Dharmadasa**,** is an Emeritus Professor at Sheffield Hallam University in the United Kingdom. He has four decades of research experience in both industry (BP Solar) and in academia. His research focuses on the development of next generation, low-cost and high-efficiency solar cells using electroplated semiconductors. Current efforts are focused on developing graded bandgap multi-layer solar cells. Prof. Dharmadasa has published over 260 articles, six patents, and two books on “Advances in Thin Film Solar Cells” and “Graded Bandgap Multi-Layer Solar Cells”. In this process, he has successfully supervised 30 PhDs, 14 years of postdoctoral research and examined 32 doctoral candidates. He is also actively involved in the promotion of clean energy for sustainable development and reduction of poverty. He has designed, piloted in 2008, monitored for several years and is now replicating the “Solar Village” project. Five large solar villages have been established, and the replication is in progress.

Prof. Dharmadasa delivered his keynote address on ‘Use of readily available renewable energy in Sri Lanka to solve the energy crisis in the country’.

A Brief Biography of Professor Samantha C. Karunarathne

Samantha C. Karunarathna, is a Professor at the Center for Yunnan Plateau Biological Resources Protection and Utilization, Qujing Normal University, Qujing City, Yunnan Province, P.R. China. Prof. Karunarathna completed his B.Sc. special degree in Botany at the Faculty of Science, the University of Peradeniya in 2006. After completing his bachelor’s degree, he served as a lecturer at the Faculty of Applied Sciences, the Rajarata University of Sri Lanka from 2007-2009. He joined Mae Fah Luang University, Thailand as a Ph.D. student in 2010 and completed his degree in 2016. To date, Prof. Karunarathna has published approximately 200 SCI publications with an H-index of 35 and 6600 citations and is a co-author of three books. His research interests are taxonomy, phylogeny, and domestication of mushrooms.

Prof. Karunarathne delivered his keynote address on "The remarkable potential of fungi".

List of Abstracts

BIOLOGICAL SCIENCES

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-005

Preliminary assessment of biodegradation of waste material by microbial consortia and sequential fermentation by *Saccharomyces cerevisiae*

A.H.D. Alahakoon[1], E.M.J.M. Rizvi[1*]

[1]*Department of Biological Sciences, Faculty of Applied Sciences, South Eastern University, Sammanthurei, Sri Lanka*

[*]*rizvijam@seu.ac.lk*

The most promising near/long-term fuel candidate is lignocellulosic biomass. Bioethanol derived from such sources could be used as a precursor to other fuels and chemicals that are currently derived from unsustainable sources. Here, it was hypothesized that organic wastes can effectively be converted to biofuel by applying enriched microbial consortia associated with the wastes. The present study was aimed at comparing the extent of biodegradation of three different lignocellulosic substrates (factory refuse tea, palmyra husk, and grass clippings) by enriched microbial consortia included in cow dung, compost, coir retting water, and assessing sequential fermentation by *Saccharomyces cerevisiae* in ethanol production. Ground and NaOH-pretreated lignocellulosic substrates were inoculated with the thrice enriched microbial consortia in a basal medium of peptone and yeast extract, incubated at room temperature in static conditions in a completely randomized design with eight replicates. On the 5th day, biodegradation was analyzed in four replicates and the rest were inoculated with 1 g each of *S. cerevisiae*. Subsequently, the ethanol content was measured using solvent extraction & dichromate oxidation spectrophotometry at 595 nm. The data were subjected to one-way ANOVA followed by Tukey's test ($p < 0.05$). Both degradation and ethanol yield differed significantly among substrates and microbial consortia. The highest biodegradation (80.95%) was shown in grass clippings with cow dung consortium, while palmyra with compost consortium showed the lowest biodegradation (19.46%). The ethanol yield ranged from 1.0048-1.4679 g/g which is higher than the maximum possible theoretical values, probably due to the impact of medium contents i.e., peptone and yeast extract. There was no significant correlation between degradation and ethanol yield ($r = 0.0378$ and $P = 0.923$). Further studies in determining the sugar content of hydrolysates and the precise ethanol content are necessary for arriving at conclusions on the efficacy of bioethanol production of the tested substrates and microbial consortia.

Keywords: *Biodegradation, bioethanol, enriched microbial consortia, fermentation, lignocellulose substrates*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-007

Progress towards searching candidate genes for synchronization of *Mungbean* flowering using bioinformatics techniques

H.U. Abhayarathne[1], I.V. Hadungoda[1], N.S. Kottearachchi[1*], V. Herath[2], D.S. Liyanage[1]

[1]Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), 60170, Sri Lanka
[2]Department of Agricultural Biology, Faculty of Agriculture, University of Peradeniya, 20400, Peradeniya, Sri Lanka

[*]kottearachchins@yahoo.com

Mungbean (*Vigna radiata*) is an economically important, nutritious leguminous crop that is grown widely around the world, especially in Asian countries. One of the major issues that prevail within this crop is the asynchronous pod maturity. It has led to a low harvesting index and many other problems during cultivating and harvesting mungbean. These reasons led to analyzing flowering-related genes in mungbean using *in silico* comparative analysis with sequenced plant genomes. In this study flowering-related genes in *Arabidopsis thaliana*, the model plant was compared with the mungbean genome to identify new possible homologous genes. Also, the protein domain structures of flowering genes of mungbean and six other plant species were retrieved and compared with the help of the Simple Modular Architecture Research Tool (SMART) Main Page. The protein domains of each flowering gene of mungbean were compared with those of other selected plant species to identify any missing domains. Next, a Multiple Sequence Alignment (MSA) was conducted using the MUSCLE tool of UGene software to identify indels in the regions where the absence of protein domains was observed in mungbean. The results showed nine novel candidate flowering-related genes in mungbean that are homologous to *A. thaliana*, namely; DCL1, CUL3A, VIP5, PUB12, RGL2, PHYD, GA20O·3, RGL3, and GA20O·2. Protein domain comparison between mungbean and other plant varieties revealed the absence of important flowering-related domains in mungbean in the genes; *APRR9, MSI2, PHYA, SEC, COP1, PEP, AGL6*, and *AT5G42910*. The areas that were supposed to present these missing domains in mungbean showed indels according to the Multiple Sequence Alignment (MSA) results. The analysis further depicted the absence of some protein domains in mungbean and this can have a positive impact on asynchronous pod maturity as the missing domains are responsible for many flowering-related functions.

Keywords: *Flowering genes, multiple sequence alignment, Vigna radiata*

Acknowledgement: *The authors acknowledge the research grant (SRHDC/RP/04/16-15) of Wayamba University of Sri Lanka for providing financial assistance*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-011

Conversion of farmers to integrated-nutrient management practices of rice-based cropping systems in Kilinochchi district of Sri Lanka: Findings of a farmer survey

E.D.C.T. Chandrasekara[1], N.A.S.A. Neththasinghe[1], D.M.S.B. Dissanayaka[1], M. Ariyarathne[1], W.M.U.K. Rathnayake[2], D.N. Sirisena[2], L.D.B. Suriyagoda[1*]

[1]*Department of Crop Science, Faculty of Agriculture, University of Peradeniya, Sri Lanka.*
[2]*Rice Research and Development Institute, Department of Agriculture, Batalagoda, Sri Lanka*

[*]*lalith.suriyagoda@gmail.com*

Kilinochchi is the major rice-growing district in the Northern Province which is located in the Low country's Dry zone of Sri Lanka and contributes to 2.0% and 2.8% of total paddy production in the country during *the Yala* and *Maha* seasons, respectively. The objective of this study was to assess different agronomic practices adopted by the farmers in the Kilinochchi district. For that, a questionnaire survey was conducted at the end of the *Maha* season 2021/2022. Data were collected from 355 farmers selected from major paddy tracks in the district through the Agriculture Instructors attached to the Department of Agriculture. From each track, one randomly picked farmer was selected. Widely cultivated rice varieties in the Kilinochchi district were Bg 300 (35.5%), At 362 (15.7%), At 308 (9.6%) and Bg 360 (9.0%). When considering the fertilizer management practices adopted, urea, triple super phosphate, and muriate of potash were applied by 78%, 49%, and 61%, respectively for paddy cultivation. Out of the total farmers surveyed, 10% applied only inorganic fertilizers, 15% applied only organic fertilizers, and the rest 75% applied both organic and inorganic fertilizers. In addition, nano-fertilizers and commercially produced organic fertilizers were applied by 40% of the farmers. Out of the fields surveyed, 44% were under major irrigation and 53% were under rainfed paddy cultivation during the *Maha* season. The majority of the farmers (87%) cultivated paddy in the previous *Yala* season and 4% kept their fields to lie fallow. Moreover, 7% and 0.4% of paddy lands were occupied by other field crops and vegetables, respectively. These findings reveal that paddy farmers in the Kilinochchi district, who largely depended on inorganic fertilizers, have now moved to use both inorganic and organic fertilizers, and hence there is a possibility of converting to integrated-nutrient and crop-management systems in rice-based cropping systems in the district.

Keywords: *Crop rotation, fertilizer, irrigation, paddy*

Acknowledgement: *Financial assistance from the World Bank, under the Accelerating Higher Education Expansion and Development (AHEAD) (Grant No AHEAD/RA3/DOR/AGRI/PERA-No16)*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-012

Variation of soil pH and electric conductivity in paddy-cultivated soils in Sri Lanka

K.H.B.H. Delgoda[1], N.A.S.A. Neththasinghe[1], E.D.C.T. Chandrasekara[1], D.M.S.B. Dissanayaka[1], M. Ariyarathne[1], L.D.B. Suriyagoda[1*]

[1]*Department of Crop Science, Faculty of Agriculture, University of Peradeniya, Sri Lanka*

[*]*lalith.suriyagoda@gmail.com*

Rice (*Oryza sativa* L.) is the most important cereal crop grown in Sri Lanka. Soil reaction (pH) and electrical conductivity (EC) are two important chemical properties that determine the growth, productivity, and long-term sustainability of rice. However, the variation of soil pH and EC in rice-cultivated soils in Sri Lanka has not been systematically explored. Therefore, 1300 soil samples representing rice-cultivated soils in Sri Lanka (six soil orders) were collected through a stratified random sampling approach. In the laboratory, 10 g of air-dried and sieved soil sample was mixed with 50 ml of distilled water. Then the samples were shaken for two hours on an orbital shaker at room temperature. Finally, soil pH and EC were measured using pH and EC meters. Soil EC values varied between 20 to 6336 µS cm^{-1}, and those EC values were similar among the six soil types ($P > 0.05$). Soil pH values varied between 3.0 and 7.6. Vertisols (5.57 ± 0.094), Inceptisols (5.33 ± 0.072), and Alfisols (5.24 ± 0.028) had higher pH values than Entisols (4.99 ± 0.044), Ultisols (4.81 ± 0.066) and Histisols (4.09 ± 0.21). Moreover, 4% of the soil samples reported pH values less than 4, and less than 1% of the soil samples reported pH values higher than 7.0. The observed variation in soil pH may be due to climatic conditions such as the amount and intensity of rainfall and temperature. It would also be affected by the parental materials forming the soil, and agronomic factors such as the fertilization history. Knowledge of the variation in pH and EC among soils would be important in managing different soils and increasing the productivity of paddy soils in Sri Lanka.

Keywords: *Electrical conductivity, paddy, pH, soil types*

Acknowledgement: *Financial assistance from the World Bank, under the Accelerating Higher Education Expansion and Development (AHEAD) (Grant No AHEAD/RA3/DOR/AGRI/PERA-No16)*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-013

Determination of sugar adulterations in high-grown orthodox black tea (*Camellia sinensis*) using high-performance liquid chromatography technique

K.T.G.D. Darshika[1], L.B. Dunsford[1*], B. Gajanayake[1], K.R.W. Abeywickrama[2], W.M.T.C. Weerakoon[3]

[1]*Department of Plantation Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gunwale (NWP), Sri Lanka*
[2]*Analytical Laboratory, Sri Lanka Tea Board, Colombo, Sri Lanka*
[3]*Horana Plantations PLC, Colombo, Sri Lanka*

[*]*dunsfordlb@wyb.ac.lk*

Black tea is a type of tea manufactured by withering, rolling, roll breaking, and aeration followed by drying of freshly plucked young shoots of the tea plant, *Camellia sinensis* (L.). Among the major three elevation zones in Sri Lanka, teas from the high-grown zone are cultivated in four agro-ecological regions *viz*. 'Dimbula', 'Nuwara-Eliya', 'Udupussellawa' and 'Uva'. Malpractices were reported in tea factories with externally added sugar solutions aimed to improve blackness and increase the weight of the manufactured tea. This improvement happens due to the caramelization of sugar through the Millard reaction. Therefore, adulteration of made tea using sugar solutions was one of the serious problems emerging frequently in the tea industry which hinders the quality of Ceylon tea. This study was carried out at Sri Lanka Tea Board to investigate the sugar contents in terms of fructose, glucose, and sucrose available in manufactured black tea. This experiment was conducted focusing on different grades produced in different agro-ecological regions of high-grown elevation. Sugar contents were analyzed for the intermediate products produced during the orthodox black tea manufacturing process and for the final product of black tea. Tea samples were collected from randomly selected factories in each region and sugar content was estimated chromatographically using the high-performance liquid chromatography (HPLC) method. After analyzing a series of samples and triangulation with experienced tea tasters, the sugar content of tea exceeding 16.42 mg g^{-1}, can be determined as adulterated. The concentration level obtained from the experiment could be used as a baseline for high-grown black tea to determine the sugar adulteration level.

Keywords: *Adulteration, black tea, liquid chromatography, sugar content*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-021

Physicochemical and bacteriological quality of domestic drinking water stored in clay pots in Birnin Kebbi, Nigeria

M.M. Shamsudeen[1*], B.G. Jega[1], I. Muawuya[2]

[1]*Department of Microbiology, Kebbi State University of Science and Technology Aliero, Nigeria*
[2]*Department of Animal and Environmental Biology, Kebbi State University of Science and Technology Aliero, Nigeria*

[*]*deenshams2000@gmail.com*

Drinking water can become contaminated after being collected from communal sources such as wells, tap stands, and boreholes, as well as stored at home. The physicochemical and bacteriological examination of drinking water stored in clay pots in Birnin Kebbi town was carried out to determine the extent of the contamination. A total of twelve (12) water samples were randomly collected from various households. These water samples were tested for physicochemical properties and Bacteriological tests were performed. The spread plate technique was used to determine the total viable count, while the multiple tube fermentation technique was used to determine the Most Probable Number (MPN) of coliforms. All the sampled water was clear in appearance, the colour was less than 1.0, the mean temperature ranged from 19.25 °C to 20.26 °C, the mean pH ranged from 7.80 to 6.71, the mean turbidity ranged from 10.7 NTU - 4.50 NTU and mean Total Dissolve Solids ranged from 62.53 (mg l^{-1}) to 41.66 (mg l^{-1}). When compared to World Health Organization (WHO) standards, pH, temperature, color, and appearance were all lower (below standard), while turbidity was higher (above standard). The mean range for the total coliform count was 150 CFU/100 ml to 35 CFU/100 ml while the mean range for the total viable count is 11.1×10^3 CFU/100 ml -1.4×10^3 CFU/100 ml. Five samples (41.70%) had coliform count above the recommended limit set by WHO whereas, seven samples (58.30%) were below the limits. The isolated organisms were identified as *Escherichia coli, Enterococcus spp., Proteus spp., and Pseudomonas spp*. The study found that coliform counts in some samples were within acceptable limits, while others exceeded them. As a result, precautions should be taken to avoid placing potentially contaminated items such as hands, cups, or ladles into stored water. Additionally, periodic cleaning and disinfection of storage pots are highly recommended to prevent contamination.

Keywords: *Coliform count, contamination, household drinking water, total viable count*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-022

Enzyme-assisted extraction of oleoresin from ginger (*Zingiber officinale*) and its effect on extraction yield and gingerol and shogaol content

S.M.M.C. Sethunga[1*], K.K.D.S. Ranaweera[1], I. Munaweera[2], K.D.P.P. Gunathilake[3]

[1]*Department of Food Science and Technology, Faculty of Applied Sciences, University of Sri Jayewardenepura, Gangodawila, Nugegoda, Sri Lanka*
[2]*Department of Chemistry, Faculty of Applied Sciences, University of Sri Jayewardenepura, Gangodawila, Nugegoda, Sri Lanka*
[3]*Department of Food Science & Technology, Faculty of Livestock, Fisheries & Nutrition, Wayamba University of Sri Lanka, Makandura, Gonawila, Sri Lanka*

[*]*maheshichathuranganee@email.com*

Ginger oleoresin (GOR); the non-volatile essence of ginger is highly significant in the food industry for many applications such as flavours, preservatives and nutraceuticals. The traditional extraction routes are modified using novel technologies such as Enzyme Assisted Extraction (EAE) to enhance the extraction yields and the main chemical compounds. The EAE hydrolyses the cell wall materials and facilitates the easy release of flavour compounds. The present study was done by EAE of GOR using different enzymes and different enzyme concentrations for maximizing the extraction yield and enhancing the extraction of Gingerol and Shogaol (GS) contents. Different aqueous enzyme solutions (0.25%, 0.5%, 1%) of viscozyme and α-amylase were prepared and pH is adjusted to 4.5-5.0 with citric acid. The crushed dried ginger slices were sprayed with prepared enzyme solution and incubated at 45 ± 2 °C for 90 min. The samples which were treated with enzymes and untreated samples (control) were extracted by soxhelet extraction for 18 h using ethyl acetate. The yield of GOR was determined and GS was analysed by HPLC. The enzyme pre-treatment significantly increased the extraction yield and the GS content of GOR ($P < 0.05$ at 95% confidence level). The pre-treated samples with the mixture of viscozyme (composed of Cellulase and Pectinase) and alpha-amylase gave significantly higher extraction yield and GS content at 0.5% (8.5380 ± 0.0631%, 26.3766 ± 0.6254% respectively) and 1% (8.5477 ± 0.0650%, 26.3766 ± 0.7865% respectively). There is no significant difference between 0.5% and 1% concentrations. The present study reveals that EAE is a promising method for the extraction of GOR by maximizing the extraction yield and GS content. Hence, the mixture of viscozyme and alpha-amylase at 0.5% concentration gave the maximum extraction yield and gingerol and shogaol content.

Keywords: *Enzyme-assisted extraction, gingerol, ginger oleoresin, shogaol, yield*

Acknowledgement: *Authors acknowledge the financial support by university research grant from, university of Sri Jayewardenepura (ASP/01/SCI/2021/12)*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-023

Consumer's knowledge regarding genetically modified foods and artificial food additives in a suburban area in Kalutara district, Sri Lanka

M.A. Dhananjani[1], W.T.R. Wickramasinghe[1], E.A.M. Ransika[1], D.C. Pathirage[1], B.A.S. Yuwanthika[1], H. Kulathunga[1*], D.L.N.L. Ubhayawaradana[2]

[1]*Department of Biomedical Science, Faculty of Health Science, KIU, Sri Lanka*
[2]*Department of Basic Sciences and Social Sciences, Faculty of Nursing, University of Colombo, Sri Lanka*

[*]*hiroshani@kiu.ac.lk*

Genetically modified foods (GM) and artificial food additives have become a trend in the modern world due to the increased demand for foods with risen population. Misinterpretations and poor awareness of these foods lead to rising non-communicable diseases such as food allergies, cancers, and diabetes among consumers. It is a timely need to identify the depth of the public knowledge on GM foods and artificial food additives, which would have a direct impact on sustaining the health of consumers through accessing high-quality foods. The study was carried out in Kotigamgoda Grama Niladhari Division, Kalutara due to the presence of people who originated from different backgrounds. A descriptive cross-sectional study was carried out using systematic random sampling among 250 respondents (97 males, and 153 females). Data was collected using a pre-tested self-administered questionnaire which specifically demanded information on socio-demographic data and knowledge. The results showed that 99 (39.6%) participants had insufficient knowledge about GM foods, especially regarding GM components and labelling. Diabetes and cancer-like diseases had a significant relationship with knowledge about GM foods ($p < 0.005$). The number of 98 (39.2%) participants had insufficient knowledge about artificial food additives while the mean total value was 35.45 ± 6.65. Respondents had not known about the types of food additives and causative health risks after prolonged usage of artificial additives. Education level may have played a significant role in the low results of the knowledge of study, as most of the consumers had GCE O/L and GCE A/L qualifications (n = 137, 54.8%). Since there was a lack of knowledge among consumers, it needs to educate people regarding these concepts and further studies are needed to find knowledge about GM foods and artificial food additives in various communities.

Keywords: *Artificial food additives, genetically modified foods, knowledge*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-027

Evaluation of the growth of *Spirulina platensis* in reduced-cost media

H.R.P.T. Padmabandu[1*], P.M. Withanage[2], A.C.M.C.L.K. Coswatte[1], S.C. Jayamanne[1]

[1]*Uva wellassa University, Badulla, Sri Lanka*
[2]*National Aquaculture Development Authority, Rambadagalla, Sri Lanka*

[*]*pavani.thathsarani@gmail.com*

*Spirulina platensis*is a multicellular blue-green alga with higher popularity in the health and food industries. Large-scale production of *Spirulina* in Sri Lanka is limited due to the high cost of production and limited technical knowledge of cultural methods. The present study was conducted to formulate a low-cost culture medium incorporated with only essential nutrients. Accordingly, four culture media were developed with the control (Zorrouk media). [T1 - $NaHCO_3$ (16.8 g l^{-1}), K_3PO_4 (0.5 g l^{-1}), $NaNO_3$ (2.5 g l^{-1}), K_2SO_4 (1.0 g l^{-1}), NaCl (1 g l^{-1}), Urea 3 g l^{-1}] [T2 - $NaHCO_3$ (16.8 g l^{-1}) K_3PO_4 (0.5 g l^{-1}), $NaNO_3$ (2.5 g l^{-1}), K_2SO_4 (1.0 g l^{-1}), Urea 2.5 g l^{-1}, NaCl (1 g l^{-1})] [T3 - $NaHCO_3$ (16.8 g l^{-1}) K_3PO_4 (0.5 g l^{-1}), $NaNO_3$ (2.5 g l^{-1}) , K_2SO_4 (1.0 g l^{-1}), NaCl (1 g l^{-1}) Urea 2.0 g l^{-1})], [T4 - $NaHCO_3$ (16.8 g l^{-1}), K_3PO_4 (0.5 g l^{-1}), $NaNO_3$ (2.5 g l^{-1}), K_2SO_4 (1.0 g l^{-1}) NaCl (1 g l^{-1})]. Isolated pure culture of *Spirulina* was inoculated into four types of media and in to control medium (Zorrouk medium) with three replicates. The population density was measured by counting the number of cells of the algae in each media maintained at 25 °C, pH 10.5 and light intensity of 4000 lux. Data were collected once in three days for 24 days and normally distributed data were analysed by one-way analysis of variance (ANOVA). The population densities of cultures were (T1: $0.732\times10^4 \pm 0.0312\times10^3$, T2: $4.46\times10^4 \pm 0.00851\times10^3$, T3: $1.615\times10^4 \pm 1.147\times10^3$, T4:$6.3333\times10^4 \pm 2.404\times10^3$, control: $1.27000\times10^5 \pm 3.512\times10^3$). Out of all the four newly developed media, no satisfactory growth was observed in any medium compared to the control medium. Results indicate only $NaHCO_3$, K_3PO_4, K_2SO_4, $NaNO_3$ and Urea are not enough for the higher growth of *Spirulina platensis* in commercial-scale production.

Keywords: *Growth, Spirulina platensis, urea, zorrouk medium*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-028

Review on wound-healing potential of *Carica papaya* Linn. (A preliminary study)

B.W.A.S. Gunarathna[1*], H.S. Sakunthala[2], D.M.A.C.E. Dissanayaka[3]

[1]*University College of Kuliyapitiya, Kuliyapitiya, Sri Lanka*
[2]*Gampaha Wickramarachchi University of indigenous medicine, Yakkala, Sri Lanka*
[3]*Gampaha Wickramarachchi Ayurveda institute, Yakkala, Sri Lanka*

[*]*ayesha.sg.11@gmail.com*

Plants or products, derived from herbal plant sources show a pivotal role in both the preventive and curative aspects of diseases since ancient times. *Carica papaya* L. (family Caricaceae) is one of the food crops and important medicinal plant that has been extensively used in traditional medical systems *C. papaya* contains a wide range of valuable phytochemicals in the different parts of the plant and each constituent plays a valuable role in the disease management and health promotion. Especially for the wound-healing process. Wound healing is a complex and dynamic biological process of replacing destroyed and missing cellular structures and tissue layers. The healing action of *Carica papaya* L. was attributed to its several properties like as anti-inflammatory, astringent property, vasodilation activity, antioxidant activity, analgesic, antifungal, and antibacterial properties, and increase collagen synthesis. The objective of this study was to collect literature data about the wound healing activity of this plant and develop a new therapeutic agent by correlating its scientifically validated biological activities, important phytochemicals, and ethnomedicinal uses through authentic traditional texts, scientific journals, and other authentic texts regarding medicinal plants. According to the analysis of literature data, it can be concluded that *Carica papaya* L. was contain a significant wound healing activity as an invaluable herbal plant thus supporting its traditional uses. Further, *Carica papaya* L. may consider as a potent herbal plant that can be developed into herbal medicine to be utilized as an effective therapeutic agent to enhance the wound healing process.

Keywords: *Chronic wounds, ethno medicine, medicinal plant, papaya, wound cure*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT- 029

Identification of optimum concentration of 17-α-methyltestosterone hormone on sex reversal of Guppy (*Poecilia reticulata*)

R.M.S.P. Rajapaksha[1*], W.M.H.K. Wijenayake[2], R.G.S. Wijesekara[2]

[1]*Faculty of Agriculture, University of Peradeniya, Sri Lanka*
[2]*Faculty of Livestock, Fisheries and Nutrition, Wayamba University of Sri Lanka*

[*]*shanirajapaksha95@gmail.com*

This study was conducted to determine the optimum 17-α-Methyltestosterone hormone concentration required to produce phenotypically sex-reversed guppy among different concentrations of 10, 20, 30, and 40 mg kg^{-1} feed used as treatments along with the control. Each treatment and the control had three replicates with 70 fries reared in glass tanks until 75 days of the experimental period. Hormone-incorporated powdered feed was fed to fish which was prepared using Prima naught fish feed (800 g), fish meal (200 g), and vitamin-mineral mixture (10 g) for preparation of 1 kg of experimental feed. The hormone was mixed with feed by using the ethanol spray method. Treatment feeds were given during the first 21 days followed by the control feed for the rest of the period. In the end, morphological features were assessed in each fish. The survival rate showed an inverse relationship with hormone concentration while no significant difference ($p > 0.05$) among different levels of hormone-fed groups. Bodyweight gain and masculinization were increased with the increment of the concentration with significant differences among each other ($p < 0.05$). There was no significant difference in the colour intensity of guppy among different 17-α-Methyltestosterone hormone-fed groups ($p > 0.05$). However, significantly higher colour intensities were observed guppy in treatment groups than in the control ($p < 0.05$) while the fish under 40 mg kg^{-1} treatment showed the highest body weight gain and masculinization than others. There was no significant difference in survival rate between the 30 mg kg^{-1} and 40 mg kg^{-1} hormone-treated groups ($p > 0.05$). The findings of this study concluded that 17-α-Methyltestosterone concentration of 30 mg kg^{-1} can be used as the optimum hormone concentration for sex reversal of the guppy with a minimum cost.

Keywords: *Guppy, 17-α-methyltestosterone, sex reversal*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-030

Physiological responses of *Pseudanabaena* to the cyanolytic *Pseudomonas fluorescens* BG-E

M.M. Wijesooriya[1], K. Masakorala[1*], S.M.K.W. Gamage[1]

[1]*Department of Botany, Faculty of Science, University of Ruhuna, Matara, Sri Lanka*

[*]*mas@bot.ruh.ac.lk*

Pseudanabaena is a frequently found bloom-forming filamentous cyanobacteria in Sri Lankan freshwater reservoirs. Bacteria-mediated controlling measures are effective approaches to curb these nuisance blooms. During a cyanolytic process, antagonist bacteria lyse cyanobacterial cells and interfere with their normal metabolism. However, detailed studies on cell lysis mechanisms and physiological responses of filamentous cyanobacteria to bacterial attack are lacking. This study investigated the physiological responses of filamentous *Pseudanabaena* species against the cyanolytic bacterium, *Pseudomonas fluorescens* BG-E. Two axenic cultures of *Pseudanabaena* sp. and *Pseudanabaena lonchoides* at a cell density of 0.020 (OD_{730}) were inoculated with 15% (v/v) of the *P. fluorescens* BG-E cell suspension (6×10^7 cells ml^{-1}) and its cell-free supernatant respectively. Bioassays were carried out to determine the changes in intracellular protein, carbohydrate, and proline contents as measures of physiological responses of *Pseudanabaena* towards cyanolytic bacteria at time intervals of 0, 2, 5, 8, and 10 days. There was a significant increase in protein content of both treatments until the fifth day with 20.19 and 18.27 mg g^{-1} in *Pseudanabaena* sp. and *P. lonchoides* respectively, which drastically reduced thereafter. In contrast, carbohydrate contents in *Pseudanabaena* sp. showed a sharp decrease from 0.582 to 0.056 mg g^{-1} towards the fifth day. After that, it started to increase and reached 0.653 mg g^{-1} by 10 days. Although a similar downward trend was observed in the carbohydrate contents of *P. lonchoides*, the level of reduction was comparatively low and the least reduction, 0.326 mg g^{-1} was observed on the eighth day. At the end of 10 days, it reached 1.244 mg g^{-1}, which was higher than the control (1.235 mg g^{-1}). The changes in proteins and carbohydrates between the two treatments of *Pseudanabaena* species were significant ($P < 0.05$) throughout the incubation period. This indicates that two species respond differently to the same antagonist. The proline content in treatments increased and reached a peak on the fifth day and thereafter, decreased gradually. As proline is a stress-responsive metabolite, its accumulation in bacteria-treated *Pseudanabaena* might be a mechanism to alleviate the stress and the subsequent decrease might be due to the inhibition of proline synthesis as a consequence of free-radical overproduction. In conclusion, these physiological assays infer that *P. fluorescens* BG-E and its secreted metabolites have induced stress responses and impeded the normal metabolic functions of *Pseudanabaena* sp. and *P. lonchoides* respectively.

Keywords: *Antagonist, metabolic functions, physiological responses, stress*

Acknowledgement: *The research was supported by the Accelerating Higher Education Expansion and Development Operation of the Ministry of Higher Education funded by the World Bank*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-031

Diversity and antibacterial characteristics of fungal endophytes isolated from *Sonneratia alba* ('Kirilla')

K. Rajan[1], D.M.S.U. Dissanayaka[1,2*]

[1]*School of Science, Business Management School, Colombo, Sri Lanka*
[2]*Edith Cowan University, Australia*

[*]*udeshinis@gmail.com*

Endophytes colonize plants asymptomatically and generate secondary metabolites of pharmaceutical, agricultural and industrial significance. They aid in the adaptability of the hosts such as mangrove plant species to unfavourable habitats. Despite the frequent studies conducted on the unique properties of mangrove fungal endophytes, only a little information is available on their antimicrobial properties. Hence, the current study is aimed at testing the antibacterial properties of fungal endophytes isolated from *Sonneratia alba*, a true mangrove species of the family *Sonneraticeae*. Fungal endophytes were isolated from pneumatophores, leaves and twigs of *S. alba* from Negombo, Sri Lanka using Potato Dextrose Agar and broth media. Ethyl acetate extracts of the isolates were screened using the antimicrobial sensitivity tests against two test organisms: *Escherichia coli* (ATCC 25922) and *Staphylococcus aureus* (ATCC 25923). The tests were repeated twice and the average values were compared to that of Gentamicin and autoclaved distilled water which was used as the positive and negative controls, respectively. Seven endophytic fungal isolates were obtained including five species, namely, *Penicillium citrinum*, *P. brevicompactum*, *P. limosum*, *Aspergillus terreus* and *A. niger*, of which *P. citrinum* was isolated from all three plant parts. According to the zones of inhibition in diameter, *P. citrinum* isolated from the leaves exhibited the highest inhibition against *E. coli* (12 ± 4.92 mm) and *S. aureus* (15 ± 2.68 mm). A Minimum Inhibitory Concentration of 0.12 mg ml^{-1} was exhibited by all the fungal isolates, whereas the highest bactericidal action against both the test organisms was exhibited by *P. citrinum* isolated from pneumatophores. The lowest inhibitory action (*S. aureus*: 7 ± 2.71 mm; *E. coli*: 5 ± 4.80 mm) and bactericidal action (Minimum Bactericidal Concentration: 0.5 mg ml^{-1}) were exhibited by *A. terreus*. Extracts of other fungal isolates possessed low to moderate antibacterial potency. The antimicrobial effects exhibited by the endophytic fungal species in this study depict their potential for generating broad-spectrum drugs against pathogenic infections.

Keywords: *Antimicrobial, endophytes, fungi, mangroves*

Acknowledgement: *The authors thank the National Aquatic Resources Research and Development Agency, Negombo, Sri Lanka for providing the plant samples*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-032

Evaluation of the antimicrobial activity of endophytic fungi isolated from *Avicennia marina* and *Excoecaria agallocha* of Negombo

R. Baskaran[1], D.M.S.U. Dissanayaka[1,2*]

[1]*School of Science, Business Management School, Colombo, Sri Lanka*
[2]*Edith Cowan University, Australia*

[*]*udeshinis@gmail.com*

Endophytes are described as bacteria or fungi that reside within plant species while helping strengthen the plant's defence mechanism. Thus, plant-endophyte relationships are often described to be as symbiotic. Drug resistance of certain microorganisms has been and still is a hurdle in the medicinal industry, thus plant-based drugs are one of the most resourceful ways to overcome this situation. Bioactive metabolites from fungal endophytes are well known for eliciting medicinal properties. This study aims to focus on fungal endophytes selected from two mangroves species: *Avicennia marina* and *Excoecaria agallocha* and to examine their antibacterial properties against a gram-positive (*Staphylococcus aureus*) and gram-negative bacterium (*Escherichia coli*). Undamaged stems, roots, and leaves of both species were collected from Negombo, Sri Lanka. Subsequent to triple sterilization, fungal endophytes were cultured on potato dextrose agar, which were later identified based on different morphological characteristics. The crude extract from these endophytes was subjected to antibacterial activity tests: *viz*; Well diffusion, Minimum inhibitory concentration (MIC), and Minimum bactericidal concentration (MBC). Among the five fungal isolates obtained, four of the isolates belonged to genus *Penicillium* while the other isolate belonged to genus *Aspergillus*. The identified species were *P. citrinum*, *P. chrysogenum* and *A. versicolor*. The crude extract from all five endophytic fungi types had some degree of antibacterial activity. The crude extract of *P. citrinum* (from the leaves of *A. marina*) had the largest mean zone of inhibition (MZI) of 17.5 mm against *S. aureus* and 20 mm against *E. coli*, while *P. chrysogenum* has the lowest MZI against *S. aureus* (14 mm) and *E. coli* (10 mm). Moreover, larger MBC values were seen exerted by crude extracts from *P. chrysogenum* (1.25 mg ml^{-1} - *S. aureus* and 2.5 mg ml^{-1} - *E. coli*), it concludes that these extracts were the least effective. Thus, all three endophytes had an anti-bacterical activity with *P. citrinum* being the most effective.

Keywords: *Antibacterial activity, crude extracts, mangroves, well diffusion*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-034

Detection of the antibacterial activity of Chili *(Capsicum annuum)* fruit and Kappetiya *(Croton aromaticus)* leaf extracts against food-borne pathogens

W.R.E.M. Fernando[1*], U. Bandaranayake[1], H. Mudalige[1]

[1]*School of Science, Business Management School, Colombo, Sri Lanka*

[*]*roshell98fdo@gmail.com*

Discovering alternative therapeutics for bacterial infections has become a global concern due to the increasing antibacterial resistance. Plants endowed with antibacterial phytochemicals have become more promising in these discoveries. Chilli (*Capsicum annuum)* fruits and Kappetiya *(Croton aromaticus)* leaves have been reported to have antimicrobial properties, as evidenced by previous research studies. This study was used to assess the antibacterial properties of the ethanolic extracts of chilli fruit and Kappetiya leaves against *Escherichia coli* (ATCC 25922) and *Staphylococcus aureus* (ATCC 25923) bacterial strains using antibiotic susceptibility testing (ABST). Ethanolic extracts were obtained by maceration of dried powders in aqueous ethanol (ethanol: water, 80:20 v/v). ABST was carried out by agar well diffusion technique, and the zones of inhibition were measured. The highest zones of inhibition were observed in Kappetiya extract of 100 mg ml^{-1} and 50 mg ml^{-1} concentrations against *S. aureus* at 13.66 ± 0.47 mm, and 12.66 ± 0.47 mm, respectively. The zones of inhibition observed for chilli fruit extracts were 11 ± 0.81 mm (100 mg ml^{-1}) against *E. Coli* and 11.66 ± 0.47 mm (100 mg ml^{-1}) against *S. aureus*, and low inhibition zones were observed in 50 mg ml^{-1} extracts. Gentamycin (1 mg ml^{-1}) and DMSO (200 mg ml^{-1}) were used as the positive and negative controls, respectively. The zone of inhibition data was recorded in triplicates and statistically analysed for each sample using two-way ANOVA in Graphpad Prism (9.1.0) software. Chilli extract showed no significant difference between the concentration and antimicrobial activity against different bacterial strains ($P > 0.05$). In the Kappetiya extract, ABST results were observed to be significant ($P < 0.05$). The ability of ethanolic extracts to display relatively good inhibition zones could be attributed to the presence of bioactive compounds in the tested plant parts, which could potentially be a viable source of antibacterial agents.

Keywords: *Antibacterial activity, antibiotic susceptibility testing, Capsicum annuum, Croton aromaticus, zone of inhibition,*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT 039

Biochemical analysis of different samples from Cassava (*Manihot esculenta*) pomace

C.C. Akmeemana[1*], M.A.D. Somendrika[1], I. Wickramasinghe[1], I. Wijesekara[1]

[1]*Department of Food Science and Technology, Faculty of Applied Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka*

[*]*chathurangichalani@sci.sjp.ac.lk*

Cassava is considered as a low-risk crop due to the ability of adaptability to various agrochemical constituents. The postharvest shelf life of cassava is reduced due to the accumulation of cyanogenic glucosides and microbial actions. Cassava starch production is one of the major industrial utilization of cassava. A solid residual called cassava pomace is generated as a by-product during the cassava starch processing. Here analysed cassava pomace's functional properties. A knowledge of cassava pomace's characteristics is important in value-added product development. Cassava starch extraction processes were conducted using three variables of cassava root; without whole peel, with sclerenchyma, and without sclerenchyma. After straining, the remaining residue on the muslin cloth was collected and dried in a dehydrator at 60 ℃ for 12 h. The moisture, pH, oil holding capacity, water holding capacity, and colour values were recorded in each sample. The moisture values (%) as 10.71 ± 0.09, 10.24 ± 0.37, 10.31 ± 0.19 pH values as 6.57 ± 0.06, 5.06 ± 0.06, 6.08 ± 0.05 oil holding capacities as 1.58 ± 0.07, 1.43 ± 0.08, 1.54 ± 0.06 water holding capacities as 1.82 ± 0.01, 1.81 ± 0.08, 2.09 ± 0.06 were obtained for samples of cassava pomace without whole peel, Cassava pomace without sclerenchyma, cassava pomace with sclerenchyma respectively. colour values obtained with corresponding to the L* values as 95.00 ± 0.46, 94.72 ± 1.13, 82.72 ± 0.58 a* values as 0.50 ± 0.29, -0.82 ± 0.77, 2.78 ± 0.13 b* values as 6.74 ± 2.05, 2.08 ± 0.62, 10.00 ± 0.35, respectively. A significant difference ($p < 0.05$) was observed concerning pH, water holding capacities, and colour values between the three samples while no such effects ($p > 0.05$) were observed for moisture content and oil holding capacity. The colour of the samples tends to brown with the addition of sclerenchyma. The obtained results showed a remarkable increase of water holding capacity in cassava pomace with sclerenchyma sample. Results showed the promising application potential of three samples of cassava pomace in different food and packaging applications.

Keywords: *Cassava pomace, colour value, moisture, pH, water and oil holding capacities*

Acknowledgement: *The authors thank the University of Sri Jayewardenepura, Sri Lanka for providing the financial assistance for this study (Grant Number: ASP/01/RE/SCI/2022/23)*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-048

Determination of Arrowroot (*Maranta arundinacea*) flour colour from five different provinces in Sri Lanka as a potential alternative for wheat flour

M.K.S. Malki[1*], J.A.A.C. Wijesinghe[1], R.H.M.K. Ratnayake[2], G.C. Thilakarathna[3]

[1]*Department of Bio-systems Engineering, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila, 60170, Sri Lanka*
[2]*Department of Horticulture and Landscape Gardening, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila, 60170, Sri Lanka*
[3]*Department of Animal and Food Sciences, Faculty of Agriculture, Rajarata University of Sri Lanka, Puliyankulama Jaffna Road, Anuradhapura, 50000, Sri Lanka*

[*]*malkisuz@gmail.com*

As a key ingredient in the bakery industry, wheat flour has become one of the most commonly imported agricultural products in Sri Lanka. Due to its functional and nutritional properties as well as its odourless, white, and gluten-free characteristics, arrowroot is one of the best alternatives to wheat flour while its utilization is quite little in Sri Lanka. The objective of this study was to evaluate the possibility of replacing wheat flour with arrowroot flour by taking into account the colour of the flour, which is an important organoleptic component in the production of food products. Colourimeter was used for instrumental colour determination (PCE-CSM 2, United States). Five distinct provinces (Western, North Western, Southern, Uva, and Sabaragamuwa) were sampled for arrowroot flour. Three colour attributes, L* (lightness), a* (redness or greenness), and b* (blueness or yellowness) were used to determine the colour. The deviation in the colour of arrowroot flour was calculated as ΔE using the colour of wheat flour as the standard. The lightness and redness of the arrowroot flour samples collected were not statistically different, but yellowness was. The colour deviation from wheat flour ranged from 3.17 to 4.46, indicating a smaller variance. For all of the arrowroot flour samples, the colour deviation from wheat flour was not significantly different. Strong negative correlations between L* and a* (-0.791; $P < 0.05$) and L* and b* (-0.831; $P < 0.05$) were observed, and the cluster analysis revealed that colour attributes for arrowroot flour samples from five different provinces exhibited a significant degree of familiarity. The colour features of the three arrowroot flour samples varied slightly, although they were all fairly close to the colour of wheat flour.

Keywords: *Colourimeter, correlation, deviation, L* a* b* values, substitute*

Acknowledgement: *National Research Council grant 20-074 is acknowledged for providing financial assistance*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-049

Analysis of cytotoxicity of some hepatoprotective herbs and their combination as finding a remedy for non-alcoholic fatty liver disease

A.M.A.U. Abeykoon[1], M.P. Paranagama[2*], K.K. Wijesundera[1], R.P.V.J. Rajapakse[1]

[1]*Department of Veterinary Pathobiology, Faculty of Veterinary Medicine & Animal Science, University of Peradeniya, Peradeniya 20400, Sri Lanka*
[2]*Department of Basic Sciences, Faculty of Dental Sciences, University of Peradeniya, Peradeniya 20400, Sri Lanka*

[*]*madhaviparanagama@gmail.com*

Non-alcoholic fatty liver disease (NAFLD) is identified as the most common chronic liver disease worldwide. Since ancient times, medicinal herbs have been used in traditional medicine to manage liver diseases. However, their toxic effects must be comprehensive studies before using them as remedies for NAFLD. The objective of this study was to evaluate the *in vitro* cytotoxicity of a polyherbal formula prepared from traditionally used hepatoprotective herbs in Sri Lanka; *Vernonia cinerea* (Monarakudumbiya) (whole plant), *Atalantia ceylanica* (Yaki Naran) (leaves) and *Osbeckia octandra* (Heenbowitiya) (leaves). The herbs were authenticated, washed, air-dried and ground into a fine powder. They were mixed in a 1:1:1 ratio and extracted in hot water. Individual plants were also extracted for the purpose of comparison. The cytotoxicity of the freeze-dried hot water extracts was determined by MTT assay. Vero 76 cells (ATCCCRL-1587) were treated for 48 h with serial dilutions of extracts (10 mg ml^{-1} to 0.078 mg ml^{-1}). The results were expressed as the mean cell viability ± SD (n = 8). The IC_{50} values of the samples were compared using one-way ANOVA followed by *post hoc* Tuckey's test. $P<0.05$ was considered statistically significant. The lowest IC_{50} value was shown by *V. cinerea* (1.57 ± 0.39 mg ml^{-1}) which was significantly lower than that of *A. ceylanica* (4.32 ± 0.47 mg ml^{-1}), *O. octandra* (9.9 ± 0.31 mg ml^{-1}) and the polyherbal mixture (2.99 ± 0.43 mg ml^{-1}). Among the tested herbal extracts, *O. octandra* has the lowest cytotoxicity and *V. cinerea* has the highest cytotoxicity on Vero 76 cells. The cytotoxicity of the polyherbal formula was significantly higher than that of *O. octandra* and *A. ceylanica*, but lower than that of *V. cinerea*. Future studies are directed to analyse the direct cytotoxic effect of the herbal extracts using trypan blue dye exclusion assay on human fibroblast cell line and hepatic cell line *in-vitro* and subsequently using an animal model *in vivo.*

Keywords: *Atalantia ceylanica, Osbeckia octandra, poly herbal mixture, Vernonia cinerea*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-051

Establishment of a polymerase chain reaction assay for detection of fungal species in clinical samples

B.G.E.B. Mudalige[1], T. Denipitiya[1*]

[1]Department of Molecular Diagnostics, Lanka Hospital Diagnostics, Colombo 05, Sri Lanka

[*]*erangaamudalige@gmail.com*

The pathogenic fungal infection has been increasing in recent years due to elevating of the population of immune-compromised patients, and the widespread use of broad-spectrum antibiotics. The conventional and standard methods for the diagnosis of fungal infections in the clinical laboratory include culture and histopathology which are based on morphological and physiological tests. These methods often require three or more days for reporting the results and indicate less sensitivity and specificity. A PCR assay based on molecular techniques for the detection of fungal DNA may be the optimal diagnostic tool because it offers highly sensitive and specific results than culture-based methods and can be applied to a variety of specimens with rapid diagnosis. By designing primers that are able to identify fungi at the species or genus level, particular sequences from purified fungal DNA are amplified. The internal transcribed spacer (ITS) 1, 5.8S and ITS_2, 28S sections are all found in the rRNA gene cluster, a well-liked target. The small and big ribosomal RNA subunits are produced from this cluster of genes. The test becomes more sensitive because fungal cells have numerous copies of this cluster. This PCR assay can be used to diagnose a wide range of fungi, but six commonly available fungi were used as reference samples for the diagnosis of patients. Six reference samples with resulted band sizes are *Candida tropocalis* (720-800 bp), *C. glabrata* (520-600 bp), *C. albicans* (520-600 bp), *Trichosporon* (520-600 bp), *Beauveria* (600-720 bp), *Aspergillus niger* (720-800 bp). Therefore, ITS genes from the different types of fungi species were well-amplified by using universal ITS_1/ITS_4 primers. Optimized and established PCR assay might focus on novel diagnosis assay for fungal infections. It is rapid and more sensitive than conventional methods which are currently available for the diagnosis of fungal infections.

Keywords: *Molecular assay, optimization, sensitivity, specificity, universal primers*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-052

Physicochemical properties of collagen from a non-commercial sea cucumber species: *Holothuria atra*

N.D. Wimalagunarathna[1], J.M.N.J. Jayathilake[1], K.V.K. Gunathilake[1*]

[1]*Department of Zoology, Faculty of Applied Sciences, University of Sri Jayewardenepura, Gangodawila, Nugegoda, Sri Lanka*

[*] *varunig@sjp.ac.lk*

Amongst a large number of sea cucumber species, most remained non-commercial and thus neglected without bioprospecting. Sea cucumbers can be considered as one of the potential marine sources of high collagen content, thus serving as a promising source of marine collagen. The current study aims at extracting collagen from a non-commercial sea cucumber species; *Holothuria atra* and investigating its physicochemical properties. Fresh sea cucumber samples were collected from Mannar, Sri Lanka and collagen was extracted by Acid-Solubilized Collagen (ASC) extraction. Collagen yield was calculated while moisture content and pH value of the extracted collagen were measured. Attenuate Total Reflectance-Fourier Transform Infrared Spectroscopy (ATR-FTIR), UV–Vis absorption spectroscopy and Scanning Electron Microscopy (SEM) analyses were carried out to investigate the physical properties of extracted collagen. The results indicated 0.95% of collagen yield (w/w) based on the dry weight while moisture content and pH were measured as 7.246% and 3.95 respectively. The ATR-FTIR analysis confirmed amide A (3282.60 cm^{-1}), amide B (2900-3080 cm^{-1}), amide I (1631.75 cm^{-1}), amide II (1330-1545 cm^{-1}), amide III (1075-1240 cm^{-1}) functional groups having preserved triple helix structure with amide III/II ratio (0.85). According to the UV-Vis spectrum, maximum absorbance was reported at 232 nm indicating the presence of collagen type I in the ASC. Moreover, the ultrastructure of the collagen; bundles of fibrils with similar circumference, irregular and dense in appearance, and loosely arranged porous structure was observed by SEM. Thus, the present study for the first time reported *Holothuria atra*, as a source of type I collagen. Further research is underway to evaluate the bioactivities and toxicity of the extracted collagen from *Holothuria atra*.

Keywords: *Acid-solubilized collagen, marine collagen, moisture content, pH, physical properties*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-054

Determination of lycopene content in selected locally grown tomato cultivars (*Solanum lycopersicon* L.)

M. Sukanya[1*], K.B. Wijesekara[1], K.G.C. Senarathna[1]

[1]*Department of Biosystems Technological Studies, Faculty of Technological Studies*
Uva Wellassa University, Badulla, Sri Lanka

[*]*msukanya92@gmail.com*

Lycopene is an important carotenoid present in tomatoes. The antioxidant activity of lycopene is linked with many health benefits including reducing the risk of certain chronic diseases including cancer. The daily intake of lycopene for an adult is between 8-12 mg. There are many locally grown tomato cultivars yet no detailed report is available on their lycopene content. This study determines the lycopene content of five tomato cultivars 'Ravi', 'Rajitha', 'Thilina', 'Lanka sour', and 'Maheshi' cultivated extensively in Sri Lanka. Both fresh and sundried forms of tomatoes were analysed for their lycopene content. Certified seeds were obtained from the Plant Genetic Resources Centre (PGRC) at Gannoruwa. Firstly, the seeds were raised separately and after three weeks vigorous seedlings were transferred into the plastic pots. This plastic pot each has a capacity of 0.01 m^3. The pots were filled using top red soil, and compost at a ratio of 1:1. This experiment was laid out in a Complete Randomized Design with ten replications and a number of fifty pots were enrolled for this study. Tomato plants of all five cultivars were grown to maturity in a protected house. Lycopene content was measured in each cultivar in the harvesting stage. There were significant differences ($p < 0.05$) between the lycopene contents of the selected tomato cultivars. The highest fresh and sundried lycopene contents were obtained in Lanka sour (fresh 112.8 kg mg^{-1} and sundried 431 mg kg^{-1}). The lowest lycopene contents were found in Ravi (fresh 54.08 mg kg^{-1} and sundried 119.2 mg kg^{-1}). Hence, the present study has proved that the 'Lanka Sour' tomato cultivar has given a high lycopene content on fresh and sundried among the five cultivars.

Keywords: F*resh tomato, lycopene, local cultivars, sun-dried tomato*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-055

Effect of soil application different concentrations of chitosan on the vegetative growth of tomato (*Solanum lycopersicum* L.) cultivar *Thilina*

S.W.S.A. Amarasekara[1], M. Sukanya[1*], K.H.L.K. Hewavitharana[1]

[1]*Department of Biosystems Technology Faculty of Technological Studies, Uva Wellassa University, Badulla, Sri Lanka*

[*]*msukanya92@gmail.com*

Proper nutrients and fertilizer are mandatory for the growth and development of plants. There is a need to use alternative fertilizers effectively and efficiently due to the scarcity of chemical fertilizers in Sri Lanka. Considering the current situation. This experiment was conducted at Uva Wellassa University Sri Lanka during the 2022 '*Yala'* season to determine the effect of soil application of different concentrations of chitosan on the growth of tomato cultivar (Thilina) during the vegetative stage. Seeds were sown in a nursery tray and after 3 weeks healthy seedlings were transferred to the 128 polythene pots (42 cm in height and 36 cm in width) filled with a potting mixture of red soil and compost in a ratio of 1:2 respectively. An experiment was laid out in Randomized Complete Block Design (RCBD) with four treatments and four replications. Chitosan was applied in liquid form to soil with three different concentrations of 70 mg l^{-1}, 80 mg l^{-1}, and 120 mg l^{-1}, and deionized water was used as the control treatment. There were significant differences between the treatments for the measured growth attributes of the 'Thilina' cultivar during the vegetative stage. The 120 mg l^{-1} of chitosan had a significant effect on plant leaf area (10 cm^2), plant height (31 cm), and dry weight (3.15 g) compared to the control. Hence, this study revealed that 120 mg l^{-1} of chitosan as soil application showed better performance in the '*Thilina*' cultivar during the vegetative stage.

Keywords: *Chitosan, dry weight, leaf area, plant height, tomato*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-059

Study on the risk factors associated with human leptospirosis in the District of Gampaha, Sri Lanka

U.M.H.U. Uduwawala[1], A. Manamperi[1], L. Karunanayake[3], G.P.S. Gunaratna[2], M. Hapugoda[1*]

[1]*Molecular Medicine Unit, Faculty of Medicine University of Kelaniya, Sri Lanka*
[2]*Department of Parasitology, Faculty of Medicine University of Kelaniya, Sri Lanka*
[3]*National Reference Laboratory for Leptospirosis, Medical Research Institute, Sri Lanka*

[*]*menakaha@kln.ac.lk*

Leptospirosis is one of the widespread zoonosis with a high incidence of cases in most of the districts in Sri Lanka influenced by ecological factors recognized to affect the transmission of leptospirosis. The retrospective study was focused to identify the socio-economic, occupational, and environmental risk factors involved in the transmission of leptospirosis in the District of Gampaha. Data collection was performed at the household level using a descriptive interviewer-administrated questionnaire. Laboratory-confirmed patients infected with leptospirosis in the hospital-based study represented the index group (n = 97) and non-leptospirosis as the control group (n = 97) during the period of June 2018 to December 2019. Categorical risk factor data were compared using the chi-square test (SAS software). Surrounding cleanliness (χ^2 = 41.5, P = 0.00), type of sanitary facilities (χ^2 = 25.7, P = 0.00), waste disposable method (χ^2 = 32.5, P = 0.00), and proximity to garbage place (χ^2 = 3.2, P = 0.00) were identified as significant associated environmental factors. There was no significant difference between the index group and control group for the animal contact extended with rodent/domestic animal presence (χ^2 = 4.2, P > 0.05), environmental factors such as type of premises (χ^2 = 2.1, P > 0.05), vegetation cover (χ^2=3.4, P > 0.05), type of drinking water (χ^2=21.6, P>0.05) and socio-economic factors including family income (χ^2 = 12.2, P > 0.05), educational level (χ^2 = 6.8, P > 0.05), previous attacks of leptospirosis (χ^2 = 2.2, P > 0.05) and any known incidence of leptospirosis (χ^2 = 4.3, P>0.05). Socio-economic factors, gender (χ^2 = 35.2, P = 0.00), and the age group (χ^2 = 41.2, P = 0.00) showed significant association with the transmission of leptospirosis. Suggestively results indicated that 90% of leptospirosis patients were males and age group 41-60 were endangered to the leptospirosis risk. Occupational exposure was a significant risk factor (P = 0.00, χ^2 = 72.4) and results suggest that most of leptospirosis infected patients were farmers (49.5%), laborers (15.5%), and masons (10.3%) with a proneness to get the infection through the contaminated environment. Identification of the potential risk factors suggests the transmission dynamics of leptospirosis initiate control and preventive measures to reduce the disease burden.

Keywords: *Environment, leptospirosis, occupation, surveillance*

Acknowledgement: *Financial assistance and technical support by the University of Kelaniya, research grant (RP/03/SR/04/16/01/2016)*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-060

Silver nanoparticles: eco-friendly synthesis using five varieties of *Annonaceae* leaf extract and evaluation of antioxidant, photocatalytic, and antibacterial properties

K.D.S Fernando[1], M. Kandiah[1*]

[1]*School of Science, BMS, 591. Galle Road, Colombo, Sri Lanka*

[*]*mathi@bms.ac.lk*

The development of reliable, eco-friendly, and sustainable methods to synthesize silver nanoparticles (AgNPs) is a rapidly developing field in nanotechnology. In this study, five varieties of *Annona* leaves were used to synthesize AgNPs to investigate their antioxidant, photocatalytic and antibacterial properties. The water extract was prepared by mixing 2 g of sample with 50 ml of water and was heated at 95 °C for 20 minutes. The phytochemical analysis uncovered the presence of phytochemical compounds that were responsible for the formation and stabilization of AgNPs. 1 ml of water extract was mixed with 9 ml of 1 mM $AgNO_3$ solution and was optimized at different temperatures and time intervals, such as room temperature at 24 hours, 90 °C and 60 °C at 15, 30, 45 and 60 minutes. Initially, the formation of AgNPs was observed by a colour change and was confirmed by the UV-Vis spectroscopy which displayed a plasmon resonance peak between 420-440 nm at room temperature. The size and shape of *Annona squamosa* red AgNPs were analyzed by the scanning electron microscope, and it was spherical in shape and with a size of 40 nm. The antioxidant properties were analyzed by Total Phenolic Content, Total Antioxidant Content, and Total Flavonoid Content. High levels of antioxidants were observed in the AgNPs than in water extracts. The photocatalytic activity of *Annona squamosa* red AgNPs was analyzed by Methyl Red for 267 mg l^{-1}, and 4000 mg l^{-1} and under sunlight with and without the presence of $NaBH_4$ catalyst. The degradation of methyl red was partially achieved without $NaBH_4$ in 75 minutes; however, the dye was completely degraded with $NaBH_4$ in 120 minutes in the presence of sunlight. The AgNPs showed significant antibacterial activity against *Escherichia coli* and *Staphylococcus aureus* assayed by the well diffusion method. Therefore, the results confirmed that the synthesized AgNPs can be used in a variety of medical and environmental applications.

Keywords: *Annonaceae leaves, antimicrobial, antioxidant, photocatalyst, silver nanoparticles*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-067

Development of an efficient *in vitro* propagation protocol for *Salicornia*

E.M.T.S. Ekanayake[1*], M.S. Gunasekara[1], D. Perera[1]

[1]*Department of Bioprocess Technology, Faculty of Technology, Rajarata University of Sri Lanka, Mihinthale, Sri Lanka*

[*]*sadiniekanayake@yahoo.com*

Salinization has been identified as a major global problem as it results in a serious loss of arable lands and freshwater required for cultivation and irrigation. It leads to a declined crop yield that could have otherwise been used to satisfy global demand for food, feed and raw material for various industries. In remediating the issue, developing greater salt-tolerant crops will take a long time and therefore introducing naturally salt-tolerant plants (i.e., halophytes) will be a feasible option. *Salicornia* is an annual succulent halophyte that is already utilized as a food in many parts of the world and is a potential raw material for several industries including pharmaceutical, biofuel, textile and edible oil. Even though some countries have already established *Salicornia* commercial cultivation, large-scale production of uniform plants throughout the year is still a challenge. *In vitro* techniques are widely used to regenerate many crops on a large scale but *Salicornia* has received less attention for *in vitro* multiplication. Thus, the current study aimed to develop a simple and rapid, yet efficient *in vitro* propagation protocol to regenerate native *Salicornia* species. First, the sterilization protocol for shoot tips was optimized where initial washing with a detergent for 1 min followed by immersion in 70% ethanol for 30 secs and then washing with 10% Clorox for 15 min was found to be the most effective (two-way ANOVA with 5% significance level). Different concentrations and combinations of 6-Benzylaminopurine and 1-Naphthaleneacetic acid are being used in Murashige and Skoog basal media and the best combination of those plant growth regulators for successful direct shoot initiation will be identified. The putative *in vitro* regeneration protocol developed for *Salicornia* will facilitate rapid clonal multiplication of *Salicornia* in large-scale cultivation.

Keywords: *Direct organogenesis, halophytes, micropropagation, sterilization*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-070

Comparative analysis of antidiabetic activities and total phenolic content of Sri Lankan herbal plants; Udahalu (*Passiflora foetida*), Heenbovitiya (*Osbeckia octandra*) and Ranawara (*Cassia auriculata*) flowers

M.A. Wickramasinghe[1], N.G.D. Anuradha[1], P.G.I. Dias[1], T.C. Kananke[1*], S.M.D.S. Gayathri[1], M.G.A.N. Perera[1], R.M.K.T. Rathnayaka[1], R.S. Sabaragamuwa[1], M.N. Wickramarathne[2], R.M.U.S.K. Rathnayaka[1]

[1]*Faculty of Applied Sciences, Sabaragamuwa University of Sri Lanka, P.O. Box 02, Belihuloya, Sri Lanka*
[2]*Faculty of Medicine, Sabaragamuwa University of Sri Lanka, P.O. Box 01, Hidellana, Sri Lanka*

[*]*thilini@appsc.sab.ac.lk*

At the present, diabetes mellitus (DM) is one of the major health problems in the world, which affects the consequences of human health. A number of conventional antidiabetic drugs are available with unavoidable side effects. But researchers revealed that medicinal plants may act as an alternative source of antidiabetic agents because of their biologically active components. In this study, herbal plants of Udahalu (*Passiflora foetida*), Heenbovitiya (*Osbeckia octandra*) and Ranawara (*Cassia auriculata*) flowers were subjected to air-drying process and the extractions were done by using hot water. The freeze-drying process was carried out to obtain the crude contents of these extracts while calculating the extraction yields. For these crude extracts, antidiabetic activities were analysed by using an alpha-amylase inhibition activity assay and the results were presented as IC_{50} values. Total Phenolic Content (TPC) was determined by the Folin-Cioacalteu method. Data analysis was carried out by using CompuSyn and Minitab software. According to the results, the extraction yields of samples were in the range of 20.35- 44.92% and the highest yield was shown by Udahalu (*Passiflora foetida*) 44.92 ± 2.45%. IC_{50} values for the alpha-amylase inhibition activities of plants ranged from 23.67-277.7 μg ml^{-1}. That value was higher than the IC_{50} value of acarbose (50.2 ± 3.8 μg ml^{-1}). The Total Phenolic Content (TPC) of these plants was in the range of 1.97-2.16 GAE mg/100 g, and the highest TPC and antidiabetic activities were obtained from Heenbovitiya (*Osbeckia octandra*). There was a strong negative (-0.99033) correlation was expressed between TPC and alpha-amylase inhibition activities. Therefore, this study sums up the diverse importance of the Heenbovitiya (*Osbeckia octandra*) herbal plant and its effectiveness for therapeutic natural food product developments.

Keywords: *Antidiabetic, herbal plants, phenolic, therapeutic*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-073

Histological studies to determine the toxicity of Profenofos on genetically improved farmed Tilapia *Oreochromis niloticus* (GIFT Tilapia)

D.N.G. Dayananda[1*], S.N. Surendran[1]

[1]*Department of Zoology, University of Jaffna, Jaffna, Sri Lanka*

[*]*ngdayananda23@gmail.com*

The extensive use of pesticides in modern agriculture can cause severe consequences because of their bio-magnification and persistence. This research was designed to study the toxicity of Profenofos, an Organophosphate pesticide used to control pests in agricultural lands on the genetically improved strain of farmed Tilapia (*Oreochromis niloticus*). The LC_{50} value of Profenofos for fingerlings with (2 ± 0.5) g average weight and (6 ± 0.5) cm average total length was determined by probit analysis using MS Excel 2013 software. Subadults with (14.0 ± 0.5) cm average total length and (71.0 ± 0.5) g average weight were stocked and exposed to different concentrations of Profenofos ranging from 0 to 0.20 mg l^{-1} for four weeks and the histological alterations of the liver, kidney, and gills were examined. The 72 hours LC_{50} value for *Oreochromis niloticus* fingerlings was 0.26 mg l^{-1} at 30.1 ± 1 °C. Histological results revealed that Profenofos causes histopathological alterations such as cytoplasmatic vacuolation, swelling hepatocytes with pyknotic nuclei, and severe infiltration of erythrocytes in the livers of exposed fish. Small vacuoles, pyknotic nuclei, glomerular Shrinkage, renal epithelium degeneration, and infiltration of erythrocytes were noticed in the exposed kidneys. Degeneration of gill epithelium in secondary lamellae and infiltration of leucocytes were noticed in the gills of exposed fish. The study revealed that Profenofos cause histological alterations in the genetically improved strain of *Oreochromis niloticus* and should be considered when used in agricultural fields close to natural freshwater bodies.

Keywords: *Aquatic toxicology, fish, histology, pesticides*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-074

Assessing the food safety and hygiene knowledge, attitudes and behaviour of street food vendors in Pettah, Sri Lanka

M.G.W.L. Jayasekara[1*], H.M.D. Nayomi[1]

[1]*Faculty of Science, Horizon Campus, Malabe, Sri Lanka*

[*]*wjayasekara@horizoncampus.edu.lk*

Street food plays a key role in feeding urban populations with cheap, affordable and nutritious food. However, street food is also seen as a potential health hazard as food safety has become a public health issue where major outbreaks of foodborne illness have been documented, highlighting both the public health and social significance. The majority of street food vendors lack training in food safety and hygiene and work in unregulated businesses. The knowledge on food safety and hygiene is essential for street food vendors to ensure that the food served for the consumers is safe for consumption, the goal of this study is to present considerations regarding the practices of street food vendors in terms of food safety and hygiene, at Pettah market located in the city of Colombo, Sri Lanka. The study was conducted by the means of face-to-face interview involving 20 participants selected by simple random sampling. A structured questionnaire and an observation checklist were used to collect data covering their demographic information, Knowledge on personal hygiene, sanitary requirements, food storage and handling practices. The data was analyzed using IBM SPSS Statistics 26.0. All (100%) of street food vendors were males and only 35% had no formal education. Most (53.7%) street food vendors had good personal hygiene knowledge and only 40% of street food vendors had no good food storage and handling practices. The results indicate that majority (70%) of street food vendors had good sanitary requirements. However, 60% of street food vendors lack sufficient knowledge concerning the environmental cleanliness around the stall. The general food safety and hygiene knowledge of street food vendors in Pettah market was moderate and the study suggests, better training for them in order to ensure that the street food vendors improve their knowledge on food safety and hygiene.

Keywords: *Food safety, food hygiene, health hazard, street food, street vendor*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-075

Development of plant-based sausage analogue incorporating anti-diabetic herbs and evaluation of its organoleptic and techno functional properties

K.M.S.A.K. Dehideniya[1], V.P. Bulugahapitiya[1*], R.S. Sabaragamuwa[2], T.C. Kananke[2]

[1]*Department of Chemistry, University of Ruhuna, Matara, Sri Lanka*
[2]*Department of Food Science and Technology, Faculty of Applied Sciences, Sabaragamuwa University, Belihuloya, Sri Lanka*

[*]*vajira@chem.ruh.ac.lk*

This study aimed to develop a plant-based sausage analogue as a vegan counterpart of meat-based sausages. Oyster mushroom (*Pleurotus ostreatus*), *kohila* stalk (*Lasia spinosa*) and soy protein (texturized vegetable protein) were used as the base of the product to obtain the required level of protein and the desirable texture. In addition, low glycemic ingredients, antidiabetic herbs (with ethnomedicinal and *in-vitro* proven evidence) and the mixture of spices were used to enhance the binding and flavour properties as well as added health benefits. Different formulations prepared based on three grinding and bawl chopping intensities. The varied texture and flavour profiles were organoleptically evaluated by hedonic test, to select the most preferable sensory attributes. Proximate analysis (AOAC methods) for the final product and microbial analysis were conducted over one month. No additional preservatives or artificial flavours are added to the vacuum-packed product. Moisture, crude protein, total fat, crude fiber, ash, and total carbohydrate contents of the developed sausage were 40.08 ± 0.30%, 2.26 ± 0.26%, 3.07 ± 0.10%, 6.70 ± 0.83%, 7.60 ± 1.68%, and 40.29% respectively. The microbial analysis revealed that the total plate count was at a safe level (2.8×10^5cfu/g), and no detectable yeast and mould counts were reported over one month stored at 4 °C. Water activity of 0.96 ± 0.01, emulsion stability of 46.75 ± 0.57%, frying loss of 1.32 ± 0.17%, pH value of 5.71 ± 0.10 and calorific value of 4.72 ± 2.34 kcal g^{-1} (dry basis) were determined. Colour of the sausage was dark brown, measured as L*; 44.37 ± 1.20, a*; 7.36 ± 0.02, and b*; -20.48 ± 0.27 values with Konica minolta CR- 400 colorimeter. The texture attributes measured by the Brookfield texture analyzer gave values; 1765.10 ± 33.23 g, 3.18 ± 0.17 mm, 0.59 ± 0.06, 921.06 ± 2.33 g and 29.66 ± 1.28 mJ for its hardness, springiness, cohesiveness, gumminess, and chewiness, respectively. This plant-based sausage analogue will serve as a competitive meat alternative with healthy ingredients and comparable sensory and textural properties, especially for vegetarian and vegan consumers seeking novel food products to satisfy their palate.

Keywords: *Antidiabetic, low glycemic ingredients, meat alternative, sausage, vegan*

Acknowledgement: *Authors wish to thank AHEAD/RA3/DOR-05/Ruh/Sci/Che project for financial support.*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-076

Characterization of *Salmonella* spp in self-mixed chicken layer feed: Possible food safety risk through food chain contamination

H.C. Gallage[1], H.M.T.K. Karunarathna[1], L.A.D.E. Weerasinghe[2], R.S. Kalupahana[1], K.S.A. Kottawatta[1*]

[1]Department of Veterinary Public Health and Pharmacology, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Peradeniya, Sri Lanka
[2]Hayleys Agriculture Holdings Limited, Colombo, Sri Lanka

[*]sarunika@yahoo.com/sandavphp@gmail.com

Feed is one of the potential sources for introducing hazardous microorganisms to animal-derived food chains. Fitting to EU standards, a feed sample with acceptable quality should be free from *Salmonella*. *Salmonella* is considered a major foodborne pathogen with greater public health importance. In a previous study, we found that compound feed manufactured for feeding chickens was free from *Salmonella*. Therefore, with this study, we aimed to investigate the presence of *Salmonella* in self–mixed chicken layer feed. Thirty-five feed samples in triplicates were collected from 35 layer farms located in three veterinary ranges: Bingiriya, Panduwasnuwara, and Kobeiganein Kurunegala district. The *Salmonella* detection methods described in ISO 6579:2002 and SLS: 516:5:1992 were used to isolate and identify *Salmonella*. *Salmonella* isolates were confirmed by Polymerase chain reaction (PCR) targeting the *inv*A gene. Thereafter, PCR-confirmed isolates were subjected to hanging drop and SIM tests to identify the motility of the organisms while using *Salmonella typhimurium* and *Shigella* ATCC 23354 as positive and negative control respectively. Phenotypic antibiotic susceptibility profiling of *Salmonella* isolates was performed by disk diffusion method for 10 antimicrobials. A *Salmonella* culture received from WHO with known Antimicrobial resistance (AMR) profile was used as a quality control strain. Out of 35, seven samples (20%) were confirmed positive for *Salmonella* and two (5.7%) were positive for the motility test. The highest AMR was reported for ampicillin (3.8%). Apart, 1.9% of *Salmonella* were resistant to each gentamycin and streptomycin. All the isolates were susceptible to tetracycline, sulfamethoxazole/trimethoprim, and chloramphenicol. The least susceptibility (47.2%) was reported for streptomycin. The absence of *Salmonella* in compound feed but the presence of the same in self-mixed feed alarm the necessity of testing raw materials used for self-mixed feed production and evaluating the process of self-mixing to take necessary precautionary measures to produce quality and safe feed.

Keywords: *Antimicrobial resistance profile, inv*A *gene, motility, PCR*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-080

An *in-silico* identification of potential tyrosine kinase inhibitors for wild-type and drug-resistant T315I mutant in CML

J.L. Subasinghe[1*], H.M.S.A. Kumari[1]

[1]*Department of Chemistry, University of Jaffna, Jaffna, Sri Lanka*

[*]*janyalumbini0@gmail.com*

Chronic myeloid leukaemia (CML) is a myeloproliferative disorder characterized by the BCR-ABL oncogene present in the Philadelphia chromosome, and therapies with tyrosine kinase inhibitors (TKI) are reported to be highly effective. However, TKI resistance may occur secondary to the development of ABL1 mutations. T315I is a common mutation that accounts for 20% of clinical resistance to TKIs such as Imatinib, Dasatinib, and Nilotinib. Even though Ponatinib is sensitive to the T315I mutant, some patients have developed Ponatinib resistance. Chemoinformatics and structure-based virtual screening approaches were used in this study to identify potential TKIs sensitive to the wild-type and the T315I mutant. The two kinases were docked against 24 compounds (18 novel and 6 compounds from PubChem), after which the top hits were filtered and their pharmacokinetic properties were evaluated to identify leads from hits. The candidate compounds were developed by applying a combination strategy of bio-isosteric replacement and conformational restrictions based on the structures of Nilotinib and Ponatinib. Target compounds consist of two heterocyclic fragments: one that binds to the adenine pocket and the other that attaches to the allosteric pocket. A carbon-carbon triple bond was used to avoid the steric clash of the bulky isoleucine residue in T315I. Autodock Vina was used to obtain their binding affinities and to propose structural hypotheses of how the molecules could inhibit the target. The target protein kinases were retrieved from the Protein data bank. According to the results, 6b was found to be highly potent against the wild-type Bcr-Abl. However, 6b violated 2 of Lipinski's rules, and modifications are essential to enhance its drug-likeness. Overall, 13 hits were found sensitive to the T315I mutation and 8 lead compounds (1b, 3a, 3d, 4b, 4d, 5b, 5c, and 6c) complied well with Lipinski's rules, bioavailability, and synthetic availability scores, turning hits into leads. The heterocyclic fragments of the 8 lead compounds consist of modified pyridine, pyrimidine, pyrazine, and imidazole rings. Furthermore, MD simulations and *in vitro* validations can be carried out to assess their stability in a biological environment.

Keywords: *BCR-ABL, molecular docking, pharmacokinetic properties, T315I, TKIs*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-081

Development of a control program for coffee roasting profile

W.H.T.D. Wickramahewa[1*], K.S.P. Amaratunga[1], R.M.R.D. Abeyrathna[1], M.I.M. Mowjood[1], A.A.P.S. Amarasinghe[1], H.K.P.P. Kariyawasam[2], E.M.A.C. Ekanayake[3]

[1]*Department of Agricultural Engineering, Faculty of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka*
[2]*Department of Agricultural Technology, Faculty of Technology, University of Colombo, Colombo, Sri Lanka*
[3]*Faculty of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka*

[*]*tdilshan18offc@gmail.com*

There is a need for an appropriate coffee roaster for speciality coffee processing in Sri Lanka as most of the available coffee roaster machines do not satisfy roasting uniformity. Coffee roasting machines require a controlling system to follow coffee roasting profiles to maintain the standard quality of the final product. Therefore, this study was conducted to develop the essentials to produce an open-source program to follow the temperature of the coffee roasting profile assuring the uniformity of roasting, and improve the ability to change the roasting profile controlling program, by anyone according to the requirements of the roast master. The control program was written by using the python language on a Raspberry Pi microcontroller board to measure the real-time temperature every 25 ms using a K-type thermocouple (MAX6675). The pulse width modulation (PWM) technique was used to control the heating element by considering the difference between the set value and the real-time mean temperature value in 250 ms time intervals. The parallel multiprocessing programming technique was used to run this programme as it facilitates real-time temperature monitoring and control. A roasting cylinder having 0.19 m^3 volume and a 1000 W hot air blower were used to calibrate the program by providing PWM ranges at various duty cycles with the aid of a predetermined standard temperature curve obtained from an experienced roast master. During the evaluation process, the temperature control system could maintain the roasting temperature with a Standard Error of Estimate (SSE) of ± 2 °C throughout the standard temperature curve. The results revealed that the python-based control system is a viable method to precisely control the temperature of the coffee roasting process.

Keywords: *Coffee roasting profile, parallel multiprocessing programming, pulse width modulationreal-time temperature controlling, specialty coffee*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-082

Assessment of socio-demographic data and knowledge, attitudes, and practices (KAP) regarding Vitamin D and its deficiency among undergraduates in KIU, Sri Lanka

R.H.R.N. Perera[1], V.P.O.H. Pramodhya[1], W.S.M.D. Abeysinghe[1], P.V. Bhagya[1], J.A.D.K. Wimanshika[1], P.J. Wijekumar[1*], S. Chakrewarthy [2]

[1]*Department of Biomedical Science, Faculty of Health Sciences, KIU, Sri Lanka*
[2]*Department of Biochemistry, Faculty of Medicine, University of Kelaniya, Sri Lanka*

[*]*jalini@kiu.ac.lk*

Vitamin D deficiency is a major public health problem worldwide because a significant portion of the global population is at risk of deficiency and insufficiency in all age groups. Many biological, ethnocultural, environmental, and lifestyle factors affect vitamin D deficiency. This study aimed to assess the association between socio-demographic factors and the level of KAP towards vitamin D and its deficiency among undergraduates in the Tertiary Educational Institute (KIU) in Sri Lanka. A descriptive cross-sectional study using a validated, self-administered questionnaire was conducted among a selected group of undergraduates at KIU. A total of 374 students (279 females and 95 males) participated. SPSS version 25 was used for the statistical analysis. Among the total population (n = 374), 279 (74.6%) were females and 95 (25.4%) were males. The mean age of the sample was 24.28 ± 2.04 years. Gender, civil status, ethnicity, study program, current academic year, place of residence, and employment status were included as socio-demographic factors. Among the study participants, 82 were residents of the Colombo district (21.9%). Most of the 333 (89.0%) respondents were unmarried. 174 (46.5%) of participants were students of the Biomedical Science degree program, and the majority were in the fourth year of their study program. Most students lived at home with their parents (44.7%), and most were unemployed. The Chi-square test was used to assess the association between socio-demographic data with KAP. The study revealed that the socio-demographic factors such as gender, study program, and current academic year of the undergraduates were significantly associated with the level of knowledge regarding vitamin D and its deficiency ($p < 0.05$). There was a significant association between attitudes and socio-demographic factors (study program; $P = 0.044$, current academic year; $P = 0.016$). There was no association between practices and socio-demographic factors. Thus, the results conclude that socio-demographic factors and attitudes significantly affect knowledge regarding vitamin D and its deficiency. The study further suggests carrying out awareness programs among the population regarding Vitamin D and its usage, which could reduce the prevalence of the deficiency of Vitamin D.

Keywords: *Knowledge, population, undergraduates, vitamin D deficiency*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-085

Effects of freezing methods on the frozen tomato qualities

A.M. Rikasa[1*], S.M.A.C.U. Senarathne[2], K.M.S. Wimalasiri[3]

[1]*Department of Biosystems Technology, Faculty of Technology, South Eastern University of Sri Lanka, Sri Lanka*
[2]*Food Research Unit, Department of Agriculture, Gannoruwa, Peradeniya, Sri Lanka*
[3]*Department of Food Science and Technology, Faculty of Agriculture, University of Peradeniya, Sri Lanka*

[*]*aasrikasa13@gmail.com*

In Sri Lanka, tomato (*Solanum lycopersicum*) is the second most widely grown crop, although it also has a larger potential for rapid degradation. This makes preserving such vegetables crucial. For keeping fruits and vegetables in their fresh state, freezing is one of the most practical and straightforward preservation techniques. This study examined the effect of the different freezing conditions on tomato quality. The cut (1/3 of whole fruit) tomato (cultivars Thilina and RIDA F1) pieces were pre-treated with 2.4% of calcium chloride solution for 3.5minutes. Then the tomato pieces were frozen for this investigation under air blast freezing (-30 °C, 3 m s^{-1} air velocity) and conventional freezing (-18 °C) conditions and thawed at room temperature conditions. The drip loss, pH, colour (L*, a*, b* and ΔE), ascorbic acid content, hardness and cutting shearing strength were analysed. Sensory analysis was done using a 5-scale hedonic test with 30 semi-trained panellists. The L* values of colour, pH and ascorbic acid content revealed substantial differences ($p < 0.05$) except for drip loss, a* and b* values of color, hardness, and cutting shearing strength. But conventional freezing caused more magnitude of color alterations (ΔE). Respect to sensory analysis, colour, odour, texture and overall quality of frozen tomatoes showed significant differences ($p < 0.05$) among the 2 freezing conditions and most preferred the air blast frozen tomatoes. Therefore, when it comes to some physiochemical analysis and sensory criteria of both tomato varieties, air blast freezing is superior to conventional freezing conditions.

Keywords: *Air blast freezing, conventional freezing, frozen tomato, tomato deterioration*

Acknowledgement: *Funded by AFACI and technically supported by CRYSBRO*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-096

Evaluating the potential of wall materials to encapsulate pigments from Dandila (*Dioscorea alata*) for natural food colourant

W.A.E.M.P. Menike[1*], J.W.A. Sajiwanie[2], R.M.U.S.K. Rathnayaka[2]

[1]*Faculty of Graduate Studies, Sabaragamuwa University of Sri Lanka, Belihuloya, Sri Lanka*
[2]*Faculty of Applied Sciences, Sabaragamuwa University of Sri Lanka, Belihuloya, Sri Lanka*

[*]*erandipremachandra@gmail.com*

Natural pigments are gaining worldwide attention in colouring foods, due to the potential health risks caused by synthetic colourants. However, natural colours are easily degraded mainly due to light, oxygen, temperature, and water activity. Thus they are difficult to store in ambient conditions limiting their utilization as food colorants in the industry. Therefore, this study aimed to assess the potential of two wall materials to encapsulate pigments from Dandila using the Microwave-assisted encapsulation technique to enhance the storage stability of the pigments in ambient conditions. Dandila's anthocyanin pigments were extracted by Microwave-assisted extraction with acidified water as the solvent in a ratio of 1:3 (W/V) for 15 minutes. The extraction process had repeated six times. The Total Monomeric Anthocyanin (TMA) content of the pigment extract was measured using the pH-differential method. Extracted pigments were encapsulated with Microwave-assisted encapsulation using maltodextrin and Gum Arabic as wall materials in three ratios of 10, 20, and, 30 mg per milliliter of pigment extract. The efficiency of encapsulation (EE) was calculated as the percentage of anthocyanins encapsulated throughout the process. The data were analyzed using analysis of variance (ANOVA) with the Minitab 19 statistical software. For 1 g Dandila yam, 0.187 ± 0.025 mg of anthocyanin pigments were extracted. Among the tested wall materials, the Encapsulation Efficiency of maltodextrin (94.38 ± 2.50%) was significantly higher ($p < 0.05$) compared to Gum Arabic (88.25 ± 5.28%). However, there were no significant differences ($p > 0.05$) among the Encapsulation Efficiency values obtained for ratios of maltodextrin. Therefore, maltodextrin can be successfully used as a wall material to encapsulate Dandila anthocyanin pigments while ensuring potential use and storage stability in ambient conditions.

Keywords: *Anthocyanin, Dioscorea alata, encapsulation, natural pigments*

Acknowledgement: *Financial assistance by the Sri Lanka Council for Agricultural Research Policy of the Ministry of Agriculture for research grant NARP/19/SU/FS/01 is acknowledged*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-098

Impacts of various drying techniques on proximate quality of maize flour (*Zea mays*)

A.M. Rikasa[1*], M.B.F. Jemziya[1]

[1]*Department of Biosystems Technology, Faculty of Technology, South Eastern University of Sri Lanka, Oluvil, Sri Lanka*

[*]*rikasaseusl@seu.ac.lk*

A common and well-liked gluten-free cereal is maize (*Zea mays*). Maintaining a sufficient food supply for people all around the world depends on maize biodiversity. There is empirical evidence that it enhances nutrition and lowers poverty in the world. It contains crucial elements that are often lacking in diets around the world, such as protein, minerals (iron, zinc) and vitamin A. However, post-harvest losses lead to food insecurity, and to address this problem, preservation techniques must be used. Drying off the surplus moisture from the fresh material is the simplest method of preservation. Other drying techniques also yield high-quality dried seeds in addition to the sun drying that is frequently used in Sri Lanka. Therefore, in this experiment, the impact of different drying processes on maize flour's nutritional qualities (Jet 999-variety) was determined by proximate analysis. Direct fire drying (200 ℃ for 8 hrs), hot air drying (105 ℃ for 1 hr), field drying (37-45 ℃, RH 50% for 2 days), solar drying (32-35 ℃, 55% of RH for 2 days), forced air drying (105 ℃ for 5 hrs) and greenhouse drying (40-50 ℃, RH 55% for 2 days) methods were used. The different drying processes exhibited significant ($p < 0.01$) changes in terms of moisture, fat, protein and fiber content of the flour. However, the amount of ash in the flour didn't change considerably ($p < 0.01$) with different drying methods. Samples dried by direct force drying were superior in quality as they contained higher protein, less fat and less moisture. Field-dried and greenhouse-dried samples showed the lowest gluten content. Respect to the gluten content, greenhouse drying and field drying are safe for health. In addition, the amount of protein varied considerably depending on how long the food was dried. As a result, the proximate properties of the maize flour are altered differentially by the various drying procedures for different food applications.

Keywords: *Drying methods, flour quality, food applications, maize flour*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-104

Encapsulation of antioxidants of *Polyscias scutellaria* and *Talinum triangulare* in electrospun Poly (Ethylene Oxide) nanofibers: Improve bioaccessibility fraction

P.S. Peduruhewa[1, 2], K.G.L.R. Jayathunge[1*], D.C. Manatunga[1], R. Liyanage[1], W.R.M. De Silva[3], K.M.N. De Silva[3]

[1]*Department of Biosystems Technology, Faculty of Technology, University of Sri Jayewardenepura, Homagama, Sri Lanka*
[2]*Faculty of Graduate Studies, University of Sri Jayewardenepura, Nugegoda, Sri Lanka*
[3]*CAMD research laboratory, Department of Chemistry, Faculty of Science, University of Colombo, Colombo, Sri Lanka*

[*]*lasanthi@sjp.ac.lk*

The effectiveness of plant-derived antioxidants against reactive oxygen species promotes numerous health effects. However, antioxidants are sensitive to chemical and mechanical degradation during gastrointestinal digestion. Depletion of antioxidants due to various stress conditions leads to their low bioaccessibility and also reduces their functionality. Therefore, the encapsulation of antioxidants is a growing trend in the food industry for the development of functional foods with a high bioaccessibility fraction. In this study, nanofiber mats enriched with plant derived-antioxidants were successfully obtained by electrospinning technique. Ethanol extracts of selected underutilized plants including *Polyscias scutellaria* (Koppa kola) and *Talinum triangulare* (Gasnivithi) (0.2%) were loaded into poly (ethylene oxide) (PEO) nanofibers using the electrospinning technique. The nutritional properties of electrospun nanofiber mats were investigated and digested fiber mats were tested to the determination of their bioaccessibility fraction. Physical properties were revealed by scanning electron microscopy and differential scanning calorimetry. Total polyphenol contents were calculated using the Folin ciocalteu reagent method while the antioxidant capacity was evaluated using 2,2-diphenyl-1-picrylhydrazyl (DPPH) and 2,2'-azino-bis (3-ethylbenzothiazoline-6-sulfonic acid (ABTS) assays. Antioxidant activity of *T. triangulare* loaded fiber mat was found to be 0.173 mg ml^{-1} and 431.11 Trolox equivalents antioxidant capacity from DPPH and ABTS assays respectively. The total phenolic content of *T. triangulare* and *P. scutellaria* fiber mates ranged between 347-357 gallic acid equivalents (GAE) mg per 100 g and ascorbic contents were observed between 4 to 8 mg per 100 g. In terms of bioaccessibility, both electrospun mats showed more than a 50% increment in bioaccessibility fraction while it was 53.54% in the *P. Scutellaria* loaded fiber mat and 61.54% in the *T. triangulare* loaded fiber mat. This study provided information on effective antioxidant encapsulation techniques to improve the bioaccessibility fraction of *T. triangulare* and *P. scutellaria* plants.

Keywords: *Antioxidants, bioaccessibility, electrospinning, encapsulation, underutilized*

Acknowledgement: *Financial assistance from the Faculty of graduate studies, University of Sri Jayewardenepura (Grant No ASP/RE/01/FOT/2019/59) is acknowledged*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-107

Comparison of the *in vitro* cytotoxicity of the Sri Lankan *Annona muricata* immature and mature leaves on cancer cell lines

O.C. Pathirana[1], M.P. Paranagama[2*], R.P.V.J. Rajapakse[1], K.K. Wijesundera[1]

[1]Department of Veterinary Pathobiology, Faculty of Veterinary Medicine & Animal Science, University of Peradeniya, Peradeniya 20400, Sri Lanka
[2]Department of Basic Sciences, Faculty of Dental Sciences, University of Peradeniya, Peradeniya 20400, Sri Lanka

[*]madhaviparanagama@gmail.com

Annona muricata Linn. is a tropical plant receiving global interest as a nutraceutical to prevent numerous diseases including cancer. As phytoconstituents concentrations may vary according to the geographical location, climate and maturity stage of the leaf, Sri Lankan varieties of *A. muricata* are worth exploring for their therapeutic effects on cancer. This study is aimed to investigate the *in vitro* cytotoxicity of *A. muricata* leaves on two different cancer cell lines and a normal cell line. *A. muricata* both mature and immature leaves were authenticated, air-dried and extracted (leaves-to-water ratio of 1:6). The cytotoxicity of the freeze-dried aqueous extracts was determined by MTT assay. MCF-7 (ATCC HTB-22), DLD-1 (ATCC CCL-221) and Vero 76 cells (ATCC CRL-1587) were treated for 48 h with serial dilutions of extracts (1.6 mg ml^{-1} - 3.1×10^{-3} mg ml^{-1}). The results are expressed as the mean cell viability ± SD (n = 8) and the IC_{50} values were calculated. The results were compared using one-way ANOVA followed by post hoc Tukey's test. $P < 0.05$ was considered statistically significant. Bleomycin was used as the standard. The immature leaves aqueous extract showed IC_{50} values of 2.29 ± 0.13 mg ml^{-1}, 2.17 ± 0.38 mg ml^{-1} and mature leaves aqueous extract showed IC_{50} values of 1.52 ± 0.35 mg ml^{-1}, 1.76 ± 2.1 mg ml^{-1} on MCF-7 and DLD-1 cell line, respectively. However, cell viability of the normal cell line was not inhibited by 50% even at a concentration of 4 mg ml^{-1}. In conclusion, the aqueous extracts of both immature and mature leaves had a significant cytotoxic activity on cancer cell lines. Comparatively, the immature leaves extract has a significantly higher cytotoxic activity than the mature leaves extract. Therefore, future *in vivo* studies will commence testing the anticancer effects of *A. muricata* immature leaves.

Keywords: *Anticancer, nutraceutical, therapeutic*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-111

A study on the dietary and behavioural factors influencing development of dental caries in young adults of Sri Lanka

H.A.S. Yapa[1], L.H. Walpola[1*], H.M.S.N.B. Medawaththa[1], A. Munazil[1], P.J.N.N. Gomis[1], G.A.N. Perera[1], P. Stephanie[1], M.P.S. Arachchi[1]

[1]*Department of Biomedical Science, Faculty of Health Science, KIU, Battaramulla, Sri Lanka*

[*]*hasanthika@kiu.ac.lk*

Dental cavities are among the world's most common health problems and occurance of dental cavities has a multifactorial origin. Young adults aged 18 to 35 years are also a particularly important age group in the study of tooth decay and oral health. Many factors influence the risk of developing dental caries, including environmental agents, behavioral factors, oral hygiene, tooth position and morphology, enamel composition, saliva composition, and flow rate and socio demographic characteristics. Among the many factors that contribute to dental caries, diet play a major role and different properties of food which alter the physical and chemical nature of teeth as well as the oral cavity. Thereby several dietary factors and behavioural factors such as food patterns, different types food and beverages and smoking affect for the occurance of dental caries in young adults were assessed. A descriptive cross-sectional study was carried out by convienient sampling method with 442 young adults in the age group 18 to 35 (304 females and 133 males) belonging to the young adult population of Sri Lanka by distributing self-administered questionnaires. SPSS version 25 was used for the analysis of data. In this study, out of all the dietary factors analyzed a significant aasociation ($p = 0.000$) was discovered between frequency of drinking alcoholic beverages and occurance of dental cavities. From the behavorioral factors, a significant association ($p = 0.026$) was found between the occurance of dental caries and smoking. Therefore, this study concludes that there is an influence of diet and behavioural factors for the occurance of dental caries and for good oral health. Frequency of drinking alcoholic beverages and smoking showed a significant influence on development of dentalcaries in young adults in Sri Lanka.

Keywords: *Behavioural factors, dental caries, dietary factors, young adults*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-112

Bacterial contamination and prevalence of MRSA and ESBL-producing bacteria on mobile phones among KIU undergraduates

M.N.F. Shazna[1], H.G.K. Shashikala[1], B.R.J. Wimalarathna[1], U.B.M.P.M. Thilakarathne[1], M.I. Ameer [1], S.S.S. Perera [2], L.H. Walpola[1*], P.D.V.M. Perera[3]

[1]*Department of Biomedical Science, KAATSU International University, Colombo, Sri Lanka*
[2]*Faculty of Sciences, University of Adelaide, Australia*
[3]*Department of Microbiology, Faculty of Medicine, Sabaragamuwa University of Sri Lanka*

[*]*hasanthika@kiu.ac.lk*

The mobile phone has become a mere extension of human hands, especially that of youth. With a wide range of surfaces, they come in contact with, they could be a reservoir as well as a route of transmission for potential pathogens including antimicrobial-resistant pathogens such as Methicillin-resistant *Staphylococcus aureus* (MRSA) and Extended Spectrum Beta-Lactamase (ESBL) producing bacteria. These pathogens pose a serious threat to the community causing life-threatening infections. Therefore, this study aims to determine bacterial contamination of mobile phones along with the prevalence of MRSA and ESBL-producing bacteria among the Undergraduates of KIU. Among KIU Undergraduates who carry mobile phones, 50 participants were randomly selected for this lab study. Swab samples were collected from the mobile phones of the participants. Samples were cultured in agar medium and then subjected to differential staining (Gram staining). Separate colonies were tested according to different colony morphologies using catalase, coagulase and oxidase tests. Subsequently, an antibiotic susceptibility test (ABST) was performed for the screening of MRSA and ESBL-producing bacteria using augmentin (30 µg), cefoxitin (30 µg), and ceftazidime (30 µg) discs. Out of 50 samples, 48 (96%) were culture positive with one or more organisms in each. Gram-positive cocci were found in 39 (78%) mobile phone samples while 31 (62%) mobile phones harboured gram-negative bacilli. Among the 49 samples, 15 (30%) *Staphylococcus aureus*, 25 (50%) coagulase-negative *Staphylococcus* (CNS) and 19 (38%) *Streptococcus spp*. were isolated as per the total population of this study. Out of 50 mobile phone samples, 27 (54%) had oxidase-positive gram-negative bacilli. ABST results revealed a 10% presence of MRSA along with a 6% presence of ESBL-producing bacteria. This study confirms the contamination of mobile phones with potential pathogens and the potential transmission of such pathogens, as well as the dissemination of AMR through mobile phones.

Keywords: *AMR, Staphylococcus aureus*

PHYSICAL SCIENCES

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-008

The concept of convex function on topological manifold

P.G.P. Kumara[1*], N.P.W.B.V.K. Senanayake[1]

[1]*Department of Mathematics, University of Kelaniya, Sri Lanka*

[*]*prasadkgsc@gmail.com*

The concept of a convex function plays an important role in many areas of mathematics. One can investigate the structure of a topological manifold by looking at the properties of convex functions defined on it. The concepts of convex sets and convex functions are intimately connected, as convex functions can be characterized as functions whose epigraph is a convex set. There are many equivalent definitions of a convex function φ on a topological manifold M. In this study, we use the definition: A function φ: M→**R** on topological manifold is convex if its restriction to every geodesic, i.e., if for every geodesic segment ζ: [μ,ν] → M and every γ ∈ [0,1], $\varphi\circ\zeta((1-\gamma)\mu + \gamma\nu) \leq (1-\gamma)\varphi\circ\zeta(\mu) + \gamma\varphi\circ\zeta(\nu)$. The differentiable structure of a convex function on a complete non-compact manifold has been discussed in a paper by Greene and Shihoma in 1981. In the present work, the topological structure of a manifold is taken into consideration without appealing to the smooth structure of the manifold. In the theorems proved herein, the only assumption employed is that the domain of a function is a subset of a topological manifold. The first step of this discussion is to investigate the level sets of such a function. We prove, using the method of contradiction, that the level sets $M^a(\varphi)$ of a convex function φ is a convex closed set for all a ∈ **R**. Throughout the research, we assume the convex function to be locally non-constant. As the next theorem, we prove that the level set of a strictly convex function in a topological manifold of dimension at least two is arc-wise connected. Finally, special properties of Ends were used to discuss the convex function on the manifold from the topological point of view.

Keywords: *Convex function, convex set, geodesic, level sets, topological manifold*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-042

Design a solar concentrator using Fresnel lens for Photovoltaic (PV) panels for efficiency enhancement

S.S. Paniyanduwa[1], R.H.G. Sasikala[1*]

[1]*Department of Electrical and Computer Engineering, The Open University of Sri Lanka, Nawala, Nugegoda, Sri Lanka*

[*]*rhsas@ou.ac.lk*

Photovoltaics (PV), is one of the fastest-growing renewable energy technologies and is ready to play a major role in the future global electricity generation mix. One of the Photovoltaics technologies is Concentrated PV (CPV). Unlike conventional PV systems, it uses lenses or curved mirrors to focus sunlight. There were different lenses and mirrors available for large-scale development projects but for household applications use of lenses is limited due to their associated cost. In Sri Lanka, solar PV installations in domestic rooftop applications are significantly increasing with the present energy crisis, which mostly uses fixed solar panels for small installations. Solar tracking systems are rarely used in domestic installations due to high costs and technical complications. This research study intends to develop a Fresnel lens-based solar tracking system where the lens is rotated to get maximum solar irradiance. The proposed Fresnel lens is used to focus the sunlight into the conventional PV panel to enhance its efficiency and reduce the panel area. Therefore, the main objective of this research is to design and develop a Fresnel lens-based solar tracking system which simultaneously rotates the prisms in the lens resulting in higher solar irradiance while keeping the solar panel fixed to the installation. This Fresnel lens-based setup acts as a concentrated PV for fixed solar panels. Servo motors are used to control the angle of prisms in the Fresnel lens and an Arduino microcontroller is used as the main controller to rotate each prism in various pre-determined sets of angles to focus more sun rays on the solar panel. The increment of output power was calculated as the average of 17.46% for both measured days after introducing the concentrator. The results showed that the prototype is useful for improving the efficiency of the solar panel throughout the day and it can reduce the solar panel area and reduce the cost of developing new tracking systems.

Keywords: *Concentrated PV, fresnel lens, microcontroller, prisms, solar tracking system*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-045

Petrogenesis of dolerite dykes in Sri Lankan basement

S.A. Munasinghe[1], P.L. Dharmapriya[1*], S.P.K. Malaviarachchi[1], R. Kleinschrodt[2], S.A.T.D. Kumarasiri[3], S.A. Samaranayake[4], B. Spiering[5], M. Hellers[2], N.D. Subasinghe[6]

[1]*Department of Geology, University of Peradeniya, Sri Lanka*
[2]*Institute for Geology and Mineralogy, University of Cologne, Germany*
[3]*Wimpey Laboratories, Muscat, Oman*
[4]*National Ocean Affairs Committee, Ministry of Foreign Affairs, Sri Lanka*
[5]*Steinmann Institutfür Geologie, University of Bonn, Germany*
[6]*National Institute of Fundamental Studies, Kandy, Sri Lanka*

[*]*prasanad@sci.pdn.ac.lk*

Dolerite dykes represent the youngest post-tectonic intrusions in the Sri Lankan basement. To this day, dolerites have mainly been reported from the Vijayan Complex (VC). Other than a few published literatures on those occurrences, no regional survey of dolerites in Sri Lanka has been conducted. Study of representative samples from five (05) localities in the VC (two samples each from Wahawa, Rukkamputur, and Gallodai) and one each in the Highland Complex (HC) (close to Badulla) and Wanni Complex (WC) (close to Kurunegala) is presented here. Mineralogy, mineral textures, mineral chemistry and petrography of the dolerite at these localities have been used to characterize composition of their parent magma, probable crystallization temperature, and petrogenesis. Mineral chemical data of four (04) samples (from Wahawa, Rukkamputur, Badulla, and Kurunegala) were obtained by Electron Probe Microanalysis (EPMA). The dolerites are composed of plagioclase (An_{40-79}, Ab_{21-55}), Fe-Ti-oxides, clinopyroxene (mainly augite: Fs_{10-30}-En_{37-51}-Wo_{20-40}), ± orthopyroxene (Fs_{15-42}-En_{60-80}-Wo_{4-9}), ± olivine (Fo_{82-84}-Fa_{16-17}-Tp_{1-3}). Studied dolerites can be divided into two groups: namely, olivine-bearing dolerites (HC and WC) and olivine-absent dolerites (all from VC). Both groups contain porphyritic, ophitic, sub-ophitic, and inter-granular textures, typical of mafic igneous rocks. Serpentine, biotite, and quartz occur as secondary mineral phases in all dolerites while Hornblende only found in Wahawa samples. Both groups host dendritic and skeletal Fe-Ti oxides, and are characterized by orthopyroxene, outlined by a thin, discontinuous clinopyroxene rim. Based on Ol-Spl and two-pyroxene thermometers, it is estimated that the crystallization of olivine from parent magma commenced at temperature (T)~ 1300 °C, and dolerites have been crystallized at T ~ 1100–1200 °C respectively. The absence of primary hydrous minerals in the dolerites indicates the dry nature of the parent magma. The olivine-bearing HC and WC dolerites are likely to represent an earlier stage of fractional crystallization compared to those from the VC. The presence of chromite inclusions within olivine phenocrysts provides evidence for the linkage of parent magma with a mantle source.

Keywords: *Dolerites, crystalline temperature, parent magma, petrogenesis*

Acknowledgements: *The National Research Council, Sri Lanka Grant No. 19-092 and the German Academic Exchange Service Fellowship for Research stay for University Academics and Scientists, 2021 (grant no. 5755233) are acknowledged*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-046

Petrogenesis of basement gneiss of Cauvery basin: Implications for linkage between the Wanni Complex, Sri Lanka and the Southern Madurai Block, India

S.U. Hansini[1], P.L. Dharmapriya[1*], E.K.C.W. Kularathne[2], R. Kleinschrodt[3]

[1]*Department of Geology, University of Peradeniya, Sri Lanka*
[2]*Petroleum Development Authority of Sri Lanka*
[3]*Institute for Geology and Mineralogy, University of Cologne, Germany*

[*]*prasanad@sci.pdn.ac.lk*

Cauvery basin is interpreted as a failed rift basin located marginal to the Southern Madurai Block (SMB) in India and Wanni Complex (WC) in Sri Lanka. Geophysical investigations indicate the continental lithosphere between the eastern margin of India and the northwestern margin of Sri Lanka was little deformed during the rift-related evolution of the Cauvery basin. Six oil-exploration wells drilled in the Sri Lankan sector of the basin penetrated the metamorphic basement. However, no attempt has been made to study the nature of these basement rocks. In this study, the basement rocks (three samples) of the central part of the Cauvery Basin were studied to envisage their petrogenesis. Core drill samples of basement rocks of the Pedro-1 well were (depth ≈1425 m - 1428 m) collected from the Petroleum Development Authority of Sri Lanka. The samples are well foliated and the petrographical studies indicate the presence of quartz, plagioclase, alkali feldspar, hornblende, and clinopyroxenes as major minerals, biotite, orthoclase as minor minerals and apatite, magnetite, titanite, ilmenite as accessory phases. Biotite mainly occurs as a retrograde product. Based on the mineralogy and mineral modes present, the rock can be classified as a metadiorite. The amoeboid texture is common among the quartz and feldspar and the preferred oriented hypidiomorphic to xenomorphic clinopyroxene represents the major lineation of the rock. Electron Probe Micro Analysis of mineral chemistry indicated that the clinopyroxene is diopside and the hornblende is Ferro-tschemakite. Plagioclase composition varies from labradorite to bytownite. Pressure-Temperature (*P-T*) estimations using conventional thermobaromery indicated that the rock has metamorphosed at $T \approx 800$ °C at P 5.5-7 kbar. These conditions suggest that the rock has metamorphosed at granulite facies conditions and the mineral assemblage suggests that the rock belongs to the hornblende granulite subfacies. Estimated *P-T* conditions are well correlated with those in SMB India and WC Sri Lanka and hence provide useful insights into the presence of continental linkage between SMB and WC across the Cauvery Basin.

Keywords: *Basement rocks, Cauvery basin, Madurai Block, Wanni Complex*

***Acknowledgement**: The Petroleum Development Authority of Sri Lanka is acknowledged for providing samples. EPMA was carried out under the support of the German Academic Exchange Service (DAAD) grant "DAAD Fellowship for Research stay for University Academics and Scientists, 2021 (grant no. 5755233)*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-047

Petrogenesis of flood basalt sequence in the Mannar Basin, offshore- Sri Lanka

A.M.S.M. Karunarathne[1], P.L. Dharmapriya[1*], W.M.H.M. Wijesinghe[1,2], A.U. Wijenayake[1], H.M.T.G.A. Pitawala[1,2], R. Kleinschrodt[3], M. Hellers[3], E.K.C.W. Kularathne[4]

[1]*Department of Geology, Faculty of Science, University of Peradeniya, Sri Lanka*
[2]*Postgraduate Institute of Science, University of Peradeniya, Sri Lanka*
[3]*Institute for Geology and Mineralogy, University of Cologne, Germany*
[4]*Petroleum Development Authority, Sri Lanka*

[*]*prasannad@sci.pdn.ac.lk*

Explorations for hydrocarbons have revealed regionally distributed igneous sequences, interbedded within the sedimentary rocks of the Mannar basin. These igneous sequences show whole-rock geochemical characteristics of flood basalts (resulting from a series of eruptions 60 - 62 Ma ago). However, no study has been carried out on the petrogenesis of this flood basalt. Here, we provide mineralogical compositions, mineral chemistry, and crystallization temperatures. These data help to gain better insights into the petrogenesis of the igneous sequences, as well as into the sedimentological characteristics of the interlayered sedimentary layers using the unwashed drill cuttings of the Barracuda well (covering 4000-4200 m depth range). Petrographic and Electron Probe Microanalysis (EPMA) observations showed that basalts are composed of plagioclase (An_{50-75}) and clinopyroxene (mainly augite) as major mineral constituents and orthopyroxene (En_{50-60}) and magnetite as minor phases. The bottom-most basalt layer (4200-4210 m) contains olivine (Fo_{55-72}). Plagioclase, clinopyroxene and olivine are present as both phenocrysts and matrix minerals. Geothermometric calculations (clinopyroxene-liquid, plagioclase-liquid and two pyroxene geothermometers) indicate that the basalts crystallized at around 1000-1100 °C. The interbedded sedimentary rocks are dark-coloured and consist of weathered feldspar and clinopyroxenes with minor quartz and calcite. The Powder X-ray Diffraction (XRD) analysis indicated the presence of clay minerals such as smectite, antigorite, attapulgite, and chlorite in these sedimentary rocks. The absence of primary hydrous mineral phases in basalt indicates the dry nature of the parent magma. The presence of olivine-bearing basalt probably originates from a more primitive magma relative to the samples from the upper part of the studied section. The interlayered sedimentary rocks can be interpreted as volcanoclastic sediments derived from the weathering of individual layers of the flood basalt sequence after their eruption.

Keywords: *Basalt sequence, petrogenesis, Mannar basin, volcanoclastic sediments*

Acknowledgement: *The authors are grateful to the Petroleum Development Authority, Sri Lanka (PDASL) for providing the samples. PGIS Research Grant (rant No PGIS/2020/03) is acknowledged for funding the XRD analysis and EPMA was carried out at the University of Cologne, under the support of the German Academic Exchange Service (DAAD; grant "DAAD Fellowship for Research stay for University Academics and Scientists, 2021 (grant no. 5755233)*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT- 068

Correlation analysis of image and physical parameters for studying the black tea fermentation process

W.A.D.U. Ishadi[1], B.J. Watawana[2], T. Kartheeswaran[3], W.K.I.L. Wanniarachchi[1], D. Wanniarachchi[4*]

[1]*Department of Physics, Faculty of Applied Sciences, University of Sri Jayewardenepura, Sri Lanka*
[2]*Department of Industrial Management, University of Kelaniya, Sri Lanka*
[3]*Department of Physical Science, Faculty of Applied Science, University of Vavuniya, Phampamadu, Sri Lanka*
[4]*Department of Chemistry, Faculty of Science, University of Kelaniya, Sri Lanka*

[*]*dakshikacw@kln.ac.lk*

Sri Lanka is a country that produces tea throughout the year and the tea industry is a major partner of the Sri Lankan economy. Among the main tea manufacturing steps, the fermentation process plays a vital role. This stage is crucial for the final quality of tea. Since the beginning of the tea industry, the fermentation process has been controlled by subjective methods. Tea inspectors examine the colour, aroma and taste to decide the optimum fermentation level. It is not always possible to gain a consistent result with these methods. This study aimed to find the colour changes in the tea particles during the fermentation process. Images were captured during the fermentation by an image acquisition system. The system acquired 1234 images of tea particles from 28 batches during the fermentation stage. Colour and texture are essential characteristics that can be used to examine the patterns and correlation of tea images. The extracted image features, measured physical parameters and fermentation time were analysed to find the correlation between those characteristics after eliminating outliers. The batch-wise correlation analysis results revealed that the colour and texture features of the green and blue colour matrices have the highest negative and positive correlation with the fermentation time when compared to red. Among the physical parameters, the bottom temperature has a noticeable correlation with the fermentation time. All the colour and texture features of the green matrix are significantly correlated to the temperature parameters. Furthermore, the batches kept under fermentation for more than 50 minutes show that the gap between green and blue colour mean values decreases and coincides with each other after 50 minutes. Meanwhile, the bottom temperature shows a steady variation with fermentation time after 50 minutes. It can be concluded that the image features significantly depend on fermentation time and temperature parameters.

Keywords: *Colour matrices, correlation, digital image processing*

Acknowledgement: *Funds received from the national research council grant 17-038*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-084

Structural analysis of CZTS films grown by sequential and single-step electrodeposition techniques

W.T.R.S. Fernando[1], K.M.D.C. Jayathilaka[1], R.P. Wijesundera[1*], W. Siripala[1]

[1]*Department of Physics, University of Kelaniya, Kelaniya*

[*]*palitha@kln.ac.lk*

A comparative study on CZTS films grown by two different techniques, namely, sequential electrodeposition and single-step electrodeposition, has been carried out. Electrodeposition of Cu, Sn and Zn stack layers followed by sulphurisation with H_2S is one of the CZTS growth techniques. Growth parameters of sequentially electrodeposited CZTS were optimized based on photoactive measurements of CZTS thin films in a photoelectrochemical cell (PEC). Cu thin film was electrodeposited on Mo substrate at -0.89 V vs Ag/AgCl in an electrochemical cell containing 0.4 M CuSO4, 3 M lactic acid and NaOH at pH 11. Deposition of Sn thin film on Mo/Cu electrodes was carried out at -1.2 V vs Ag/AgCl in an electrochemical cell containing 0.055 M, 2.25 M NaOH and 8 ml of sorbitol. Zn thin film was electrodeposited on Mo/Cu/Sn at -1.2 V vs Ag/AgCl in an electrochemical cell containing 0.2 M $ZnSO_4$. In order to grow CZTS, Mo/Cu/Sn/Zn thin films were annealed at 550 °C for 60 min in H_2S. For single-step, CZTS thin films on Mo substrate were potentiostatically electrodeposited at -1.05 V vs Ag/AgCl for 40 min in a three-electrode electrochemical cell containing 0.02 M copper (II) sulfate pentahydrate ($CuSO_4 \cdot 5H_2O$), 0.01 M zinc sulfate heptahydrate ($ZnSO_4 \cdot 7H_2O$), 0.02 M tin sulfate ($SnSO_4$) and 0.02 M sodium thiosulfate ($Na_2S_2O_3$) at room temperature. 0.2 M tri-sodium citrate ($C_6H_5Na_3O_7$) was used as the complexing agent. Ag/AgCl and platinum electrodes were used as the reference and the counter electrodes, respectively. Then samples prepared were annealed at 550 °C for 30 min in H_2S. X-ray diffraction was carried out to study the structural analysis of CZTS films grown by two techniques. Lattice parameters, i.e. a, c, the unit cell volume, the crystallite size (D), lattice strain, dislocation density (δ), stress and energy density of the CZTS sample are 5.42 Å, 11.0 Å, 323.21 $Å^3$, 35.55 nm, 1.17×10^{-3}, 0.7×10^{15} m^{-2}, 6.46×10^{7} N m^{-2}, 3.9×10^{4} J m^{-3} and 5.42 Å, 10.83 Å, 318.44 $Å^3$, 26.76 nm - 1.19×10^{-3}, 1.3×10^{15} m^{-2}, -6.55×10^{7} N m^{-2}, 3.7×10^{4} J m^{-3} for single step and sequential electrodeposition, respectively. In conclusion, the single step exhibits higher crystallite size in comparison to sequential electrodeposition indicating a lowering of the dislocation density. The increase in crystallite size has an advantage for photovoltaic applications.

Keywords: *Cu_2ZnSnS_4, Cu/Sn/Zn metal stack layers, I-V characteristics, single-step electrodeposition*

Acknowledgement: *National Research Council is gratefully acknowledged for the financial assistance through the research grant NRC 15-41*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-095

Mathematical optimization of laccase activity of *Phlebiopsis flavidoalba*

H.H.K.D.C. Wickrama[1*], B.D.H.N. Dharmasiri[2], R.N. Attanayake[2], G.S. Wijesiri[1]

[1]*Department of Mathematics, University of Kelaniya, Kelaniya, Sri Lanka*
[2]*Department of Plant and Molecular Biology, University of Kelaniya, Kelaniya, Sri Lanka*

[*]*chamodini1996@gmail.com*

Laccase is an enzyme produced by fungi with great market demand in biotechnological, and industrial applications. However, laccase production by fungi under natural conditions is insufficient. Wet lab experiments have found that factors like carbon, nitrogen, and metal ion sources affect laccase secretion. This study focuses on the mathematical optimization of the laccase activity of *Phlebiopsis flavidoalba* in the presence of the above sources. Woodchips, starch, cellulose, lignin, and glucose were used as carbon sources, NH_4Cl, NH_4NO_3, peptone, urea, and yeast were used as nitrogen sources, and $CuSO_4$, $FeSO_4$, and $ZnSO_4$ were used as metal ion sources. Liquid Potato Dextrose Broth mediums amended with each C, N, or metal ions were incubated separately for 3, 6, 9, 12 and 14 days and laccase activities were determined. The objectives of this study were to optimize the incubation period mathematically, and culture medium composition for the best laccase activity. Graphical analysis was done using Microsoft Excel by drawing scatter plots and trend lines. Linear regression equations were obtained to predict the activity on a given day for a source. Statistical analysis was done by R programming. Carbon and metal ion sources had the highest activity on the 14th day. Generalized linear models (gamma regression) were developed for each source to determine the optimum medium on the 14th day where woodchips, urea, and $CuSO_4$ were found as key components. By the coefficients of the regression model, a regression equation was formed by introducing two dummy variables such that combinations of optimum mediums can be obtained. It was predicted that if the media is amended with $CuSO_4$ and woodchips, it will enhance laccase activity by 43-fold. However, if $CuSO_4$, woodchips, and urea were used, it would reduce the laccase activity by 2-fold. Mathematical optimization could be used in predicting and for effective in-vitro assay designs.

Keywords: *Gamma regression, laccase activity, linear regression*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-102

Total absolute curvature of open curves of fixed length in E^2

D.T.J.K. Weedagama[1*], N.P.W.B.V.K. Senanayake[1]

[1]*Department of Mathematics, Faculty of Science, University of Kelaniya, Sri Lanka*

[*]*toreen075@gmail.com*

This research is about finding a lower bound for a non-closed curve with the help of total absolute curvature and the main theorem. In this study, we focused on giving precise proof of the main theorem. The notion is extended to piecewise linear curves. We study the family of planar curves which attains the infimum of the total absolute curvature in the family of curves with fixed endpoints, end directions and a fixed length. When a curve is closed, then the lower bound is 2π, which does not depend on the length. But when the curve is not closed, it depends on the length. Accordingly, we considered finding a lower bound for a non-closed curve through a well-explained main theorem. Also, we have used mainly ten lemmas and many other results to explain the proof of the main theorem. The importance of minimizing the total absolute curvature of curves is also discussed by mentioning some applications of total absolute curvature.

Keywords: *Lower bound, non-closed curves, piecewise linear curves, total absolute curvature*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-117

Determination of optimum over excitation limits of cylindrical rotor generator with brushless exciter to maximize the system performance

P.A.T. Wathsala[1], K.M.G.Y. Sewwandi[1*]

[1]*The Open University, Nawala, Sri Lanka*

[*]*ysewwandi91@gmail.com*

The performance of the excitation system is a major factor that affects the voltage stability of the power grid. The Excitation system generates variable DC voltage and current to the rotating field to regulate the terminal voltage of the generator within the permissible operating range. In brushless excitation systems, the main field is excited by a rotating AC exciter and there is no possibility to get actual instantaneous field current and voltage values to the automatic voltage regulator (AVR). The field current and field voltage of the rotating AC exciter gives the image of the main field current and voltage for excitation controls. Therefore, due to a lack of parameter details, AVR configuration engineers are using typical generator and system parameter values and which creates problems with generator performance. Especially in excitation limiter configuration, these engineers are concerned more safe operation rather than optimum performance generators with optimum limiter values. Hence AVR manufacturers elaborately maintain their limits within the safe region, without allowing machines to reach their optimum levels. Hence the utilization limits of the generator have not been supported by transient and steady-state generator performance. It may directly affect the stability of the system. The research was carried out based on one of the 20 MW gas turbines in Kelanitissa Power Station. With the excitation limitations, these small gas turbines are currently operating at the 12 MW-15 MW range and that will directly affect the generator's performance. Therefore, it will be more beneficial to optimize the excitation limits to extract maximum benefits from these generating units to optimize the performance of peak operating generator units.

Keywords: *Automatic voltage regulator, brushless exciter, over excitation limiter*

Acknowledgement*: We gratefully acknowledge the assistance of Eng. R.R.T.W.M.R.A.I. Madawala to conduct this research*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-118

The geochemical signature of feldspars from small-scale and larger bodies of granitic pegmatite in Sri Lanka

P. Abewardana[1,2*], P.L. Dharmapriya[2], H.M.T.G.A. Pitawala[2], S.P.K. Malaviarachchi[1], R.F. Martin[3], N.D. Subasinghe[4]

[1]*Department of Geology, University of Peradeniya, Peradeniya, Sri Lanka*
[2]*Postgraduate Institute of Science, University of Peradeniya, Sri Lanka*
[3]*Department of Earth and Planetary Sciences, McGill University, Montreal, Canada*
[4]*National Institute of Fundamental Studies, Kandy, Sri Lanka*

[*]*pahana@sci.pdn.ac.lk*

Pegmatites are post-kinematic plutonic igneous rocks with grain sizes that generally range from giant crystals to fine groundmass crystals. Furthermore, granitic pegmatites represent a typical mineral assemblage of quartz, albite, and potassium feldspar and mainly serve as storehouses for economically important minerals. Since the formation and mineralization of pegmatites are directly correlated with the chemical composition of their source magma, the K-feldspar as a key mineral can provides information on the petrogenetic evolution of pegmatites and can also be used as an indicator for mineral explorations. Although several researchers have studied the economic mineralization of the Sri Lankan pegmatites, only a handful of studies were carried out to determine their origin. Here we attempted to study the origin of Sri Lankan pegmatites using their major and trace element geochemistry of K-feldspars. K-feldspar samples of small-scale pegmatites (4 samples) and large-scale granitic pegmatites (15 samples) were selected from the mantle areas of pegmatite bodies. Trace element geochemical analysis was conducted at the Actlabs, Ontario, Canada laboratories. Obtained results were interpreted with the aid of chemical discrimination diagrams. According to the K/Rb vs Ga diagram, all analyzed samples represent NYF group pegmatites which are enriched in Nb, Y, and F (with Be, Sc, Ti, Zr, Th, U, and REE) indicating an origin from A-type granites typically associated with anorogenic suites, emplaced in extensional zones in the crust. Considering the K/Rb vs Rb correlation, the studied pegmatite samples show primitive nature which suggests the formation of the parent melt through the anatexis process. A barren pegmatite signature is observed for the analyzed K-feldspars in the correlation of the K/Rb vs Cs discrimination diagram while the large pegmatite samples indicate a negative correlation. According to the K/Rb vs Cs, Ba, Sr, and Ga discrimination diagrams, generally undeformed small-scale pegmatites indicate scattered nature while the large pegmatite K-feldspar samples represent negative correlations inferring the pegmatites are the products of the late residual portion of the parental melt.

Keywords: *Deformed, granitic pegmatite, geochemical signature, Sri Lanka, undeformed*

Acknowledgement: *This project is funded by National Research Council Grant no: 19-092*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-123

Oil spill maritime disaster management using remote sensing application; X-press pearl incident

H.K.H.D. Kankanamge[1,2], S.M.D.M.C. Senarathna[1,2*], B.A.Y.B. Jayawardhana[1], D.A. Bandara[3], N.T.B. Madusankha[4]

[1]*National Institute of Fundamental Studies, Kandy, Sri Lanka*
[2]*Postgraduate Institute of Science, University of Peradeniya, Sri Lanka*
[3]*Institute of Geology, Mineralogy and Geophysics, Ruhr-University Bochum, Universitätsstraße 150, 44801 Bochum, Germany*
[4]*Department of Indigenous Medical Resources, Faculty of Indigenous Health Sciences and Technology, Gampaha Wickramarachchi University of Indigenous Medicine, Kandy Road, Yakkala, Sri Lanka*

[*]*mahesh.se@nifs.ac.lk*

Maritime vessel disasters are critical in environmental concerns and challenging to manage under real scenarios. As Sri Lanka is located on the maritime hub of the Silk Road, there is an abundance of shipment activities. Risk exposure includes crude oil shipments, hazardous chemicals and infectious substances. Therefore, Sri Lanka needs to acknowledge the necessary equipment and information to identify and manage such events. Unfortunately, developing countries are running lack information, expertise, and resources. Remote sensing lay an emerging technique to manage such events in an informative manner. In this study, our focus is to identify an X-press pearl oil spill using remote sensing techniques. The Landsat 8 OLI spectral data were used to evaluate oil spills in the Mannar basin. The spectral bands of 1 to 7 were used to develop an algorithm related to oil spill detection. Initially, spectral bands were transformed into planetary reflections using QGIS for atmospheric correction. Then, Landsat 8 oil slick detection index (L8OSDI) normalization algorithm was iterated using Green and NIR spectral bands. The verification of the L8OSDI normalization algorithm for this study area was conducted using the Gulf oil spill. The reflectance of normal sea water and suspected oil slicks show considerable separation along the bandwidth. This confirms that the earlier sea condition of the same oil slick coordinates prior to months of the incident, with higher reflectance and no suspected oil spills. Therefore, the practical accountability of L8OSDI is well described with derived normalization and shape of oil slicks delineated from the seawater. With the wind effect following towards the land area, cloudy oil seepage can be identified with the form of spread. The validity of the normalization model with older gulf studies confirms good fitting and depicts applicability to the Mannar basin in the Indian Ocean.

Keywords: *Landsat 8, oil slicks, remote sensing, X-press pearl*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-124

A preliminary geomagnetic study of Wahawa-Padiyathalawa hot springs field

M.P. Thilakarathna[1], A.M. Abeysinghe[1], H.M.D.A.H. Bandara[1], N.D. Subasinghe[1*]

[1]*National Institute of Fundamental Studies, Kandy, Sri Lanka*

[*]*deepal.su@nifs.ac.lk*

Sri Lanka represents a tiny crustal fragment located far away from active plate boundaries. However, there are nine geothermal springs found in Sri Lanka. Among them, six geothermal springs are associated with dolerite dykes (160 Ma to 170 Ma). Several studies suggest that dolerite dykes play a major role in the geothermal occurrences of Sri Lanka. However, no conclusion has been made on the role of dolerite dykes in the formation of geothermal resources. The study was conducted at Wahawa-Padiyathalawa hot springs cluster to identify any relation between dolerite dyke and thermal discharges. Wahawa-Padiyathalawa geothermal discharges occur as a cluster of about 18 individual thermal springs in the paddy fields and as one artesian well. The study area has been intruded by a dolerite dyke that extends for 60 km in the North-West direction. A preliminary desk study has been carried out using geological maps and satellite images to study surface geology including lithological variations, intrusions and structural features such as lineaments. All the geological and structural features were compiled into digital maps using Arc GIS software to study any relation between geology and structural features. A magnetic survey was conducted using an Overhauser magnetometer and data were collected every 2 seconds covering a 5 km^2 area around the hot spring cluster. There are several interconnected fractures, some of which seem to continue on either side of the dolerite dyke. The cluster of hot springs is aligned with a lineament feature in the NW-SE direction. The magnetic anomaly map obtained from the survey clearly shows a low magnetic anomalous structure in the vicinity of hot spring cluster. Negative anomalies were observed in the area where fractures are accumulated and oriented in different directions. It is envisaged that the deep fractures are interrupted by the dolerite dyke which would allow the deep ground water to rise to the surface. The deep water retains a considerable amount of heat even at the surface, due to steeper geothermal gradient in the area. Thus, it is evident that the dolerite dykes at least play a passive role in producing thermal springs

Keywords: *Geothermal, geological features, magnetic survey*

CHEMICAL SCIENCES

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-009

Temporal variations of selected surface water quality parameters and pollution status of Batticaloa lagoon – A review

M.N.F. Nashath[1], A.M.M. Asmath[1*], M.R.F. Rishadha[1]

[1]*Department of Biosystems Technology, Faculty of Technology, South Eastern University of Sri Lanka*

[*]*mohamedasmath@seu.ac.lk*

Batticaloa lagoon is an economically important ecosystem on the East Coast of Sri Lanka. It is surrounded by densely populated areas, rice and coconut plantations, as well as fish and shrimp farms. Large-scale rapid development, extensive agricultural practices and anthropogenic activities have degraded the quality of the lagoon water threatening the sustainability of the ecosystem. Hence, this review was conducted to study the variations of selected water quality parameters including electrical conductivity (EC), salinity, dissolved oxygen (DO) and nitrate and phosphate content of Batticaloa lagoon to determine the variation in pollution status of the lagoon. Data were obtained from previous studies conducted from 2004 to 2019. The results showed that the maximum EC value of the Batticaloa lagoon has been increasing from 2013 (170 mS m^{-1}) to 2019 (590 mS m^{-1}) exceeding the allowable range for aquatic water. Salinity, DO and nitrate content fluctuated during the study period, making the lagoon water not suitable for human consumption but favourable for the growth of aquatic species. The highest values for salinity (35 ng l^{-1}), DO (19.93 mg l^{-1}) and nitrate content (8.3 mg l^{-1}) had been recorded in 2004, 2019 and 2013 respectively. The phosphate content range surpassed the maximum permissible level, causing threats to aquatic life and enhanced eutrophication. Based on the results, Batticaloa lagoon is severely polluted making it not suitable for drinking purposes. However, it can be still used for the production of brackish water fish and prawns and irrigation. Increased agrochemical usage, shrimp farming and the release of waste effluents without proper pre-treatment are considered to be the primary pollution sources of Batticaloa lagoon. Continuous surveillance through regular monitoring programs is needed to conserve this valuable resource from complete loss. It is also important to educate people living there about the current status of the lagoon and the consequences of its pollution.

Keywords: *Anthropogenic activities, Batticaloa lagoon, ecosystem, pollution, water quality*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-010

Microwave-assisted phytosynthesis of silver nanoparticles

C. Wickramarathne[1*], S. Rajapakse[2], V.N. Seneviratne[3]

[1]*Postgraduate Institute of Science, University of Peradeniya, Peradeniya, Sri Lanka*
[2]*Department of Molecular Biology and Biotechnology, Faculty of Science, University of Peradeniya, Peradeniya, Sri Lanka*
[3]*Department of Chemistry, Faculty of Science, University of Peradeniya, Peradeniya, Sri Lanka*

[*]*chayauwickramarathne@gmail.com*

Phytosynthesis of silver nanoparticles (AgNPs) by means of microwave irradiation in the presence of plant gums had gained widespread attention. Plant gums are reliable and promising nano-factories owing to their high metal tolerance and economic feasibility. The applications of bio-nano-synthetic methods are limited due to the difficulty in controlling particle size, shape, crystallinity, polydispersibility and slow rate of production. It is evident that microwave heating is advantageous owing to the promotion of homogeneous nucleation due to fast and uniform heating within a short time. This leads to high crystallinity, narrow size distribution, and controlled morphology while enhancing the experimental efficiency. Hitherto AgNPs synthesis employing the gum of *Commiphora wightii* (guggul) had not been reported. It is a medicinal plant used in therapeutics for centuries. The objective of this study was to develop a viable, one-step, efficacious and cost-effective procedure with the potential of scaling up for different applications. AgNPs were fabricated by microwaving the guggul extract and $AgNO_3$ mixture for 2 min at full power in a microwave oven of 1800 MW. The colour transformation to brownish-maroon and surface plasmon band at 442 nm preliminarily indicated AgNP formation. TEM revealed the presence of different morphologies such as polyhedral-like, few prism-like and rod-like AgNPs of an average size of 20 nm. FTIR was used to identify the specific functional groups that reduced $AgNO_3$ and stabilized AgNPs. The spectra depicted the availability of amines, alcohols, aromatic functional groups etc. in the gum and the change in intensity with a shifting of band positions in AgNPs revealed their involvement in synthesis. Compared to other studies, using guggul gum is more advantageous owing to the low concentration of gum extract required and less time taken to produce AgNPs. The feasibility, cost-effectiveness, energy and time efficiency of this one-pot synthetic approach, propose its applications in myriad fields augmenting its scale-up possibility. Studying the effect of irradiation time, microwaving power and the optimization of the procedure to fabricate AgNPs of single morphology will be performed in future experiments.

Keywords: *Commiphora wightii, guggul, microwave, plant gum*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-014

Isolation of saponins from Guava leaves and evaluation of their antioxidant capacity

S. Kokilananthan[1], V.P. Bulugahapitiya[1*], H. Manawadu[1], C.S. Gangabadage[1]

[1]*Depertment of Chemistry, Faculty of Science, University of Ruhuna, Matara, Sri Lanka*

[*]*vajira@chem.ruh.ac.lk*

Saponins are a broad class of chemicals that comprises glycosylated steroids, steroidal alkaloids, and triterpenoids and are found across the plant kingdom with diverse applications in the food, cosmetics, and pharmaceutical industries**.** Though *Psidium guajava* (Guava) is known to be an important medicinal tree, especially in the Asian region, no adequate studies have been reported on its saponins content and its antioxidant properties. Therefore, this study aimed to isolate saponins from the leaves of guava (*P. guajava*, common guava), and assess the antioxidant activity of the isolated saponins. The dried powder of guava leaves was sonicated with ethanol (80%), and the crude was subjected to a sequential extraction technique to extract saponins. The individual saponins from the crude were obtained using size-exclusion chromatography and HPLC. Isolated saponins were qualitatively analysed using TLC with a Vanillin-sulfuric acid visualization test and Froth test. FRAP and DPPH assays were carried out to assess the antioxidant capacity where Trolox and Ascorbic acid were used as standards. As a result, seven saponins were isolated (GuSBF1, GuSBF2, GuSBF3, GuSBF4, GuSLF1, GuSLF2, and GuSLF3) from guava leaves. Interestingly, crude saponins as well as isolated saponins showed high antioxidant capacity. When compared with crude saponins, most of the isolated saponins have shown higher antioxidant capacity. The FRAP and DPPH assays revealed that out of all the crude and isolated saponins, the GuSBF3 showed the highest total antioxidant capacity (1753.86 ± 1.52 mg Trolox Eq/g) and radical scavenging capacity (IC_{50} value: 78.47 ± 0.02 mg l^{-1}). In conclusion, this is the very first study of isolating saponins from guava grown in Sri Lanka. Seven saponins were isolated and almost all the isolated saponins as well as crude saponins show high antioxidant capacity, of them GuSBF3 shows outstanding antioxidant capacity based on FRAP and DPPH assay.

Keywords: *Antioxidants, chromatographic techniques, isolation, Psidium guajava, saponins*

Acknowledgement: *Authors wish to thank AHEAD-DOR-RUH (No-05) project for financial support.*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-015

Composition accentuation and acetaldehyde generation in polyethylene terephthalate-made water bottles during first-phase protocols

T.A. Vishwanath[1,2], A.C.A. Jayasundera[1,2,3*]

[1]*Postgraduate Institute of Science, University of Peradeniya, Peradeniya, Sri Lanka*
[2]*Department of Chemistry, Faculty of Science, University of Peradeniya, Sri Lanka*
[3]*Division of Mathematics and Science, Missouri Valley College, Marshall, MO, 65340, USA*

[*]*acaj@sci.pdn.ac.lk*

Polyethylene terephthalate-made bottles are widely known for their safe packaging for drinking water. But, extensive production controls during the first phase of the manufacturing process called drying and injection moulding leads to thermal degradation. One such degradation species is acetaldehyde. Thus, the studying of general practices of manufacturing provides a scientific approach to reducing health concerns with better process controls. To that, moisture analysis followed by ATR and acetaldehyde investigation discloses the fewer degradation by-products. For drying, PET underwent 170 - 180 °C for less than 7 hours, 170 - 180 °C for around 8 hours, and 180 °C with a 6-hour process. In injection moulding practices, 14g preform was tested against two cyclic times with the same barrel temperature as well as nearly 82 g preform was studied with higher cyclic time and same barrel temperature. Additionally, 18g preform was tested against the least possible cyclic time and barrel temperature with advanced technology called a double-barrel. Moisture analysis reveals 180 °C with a 6-hour process contains the least moisture with 0.002%. Yet, all three ATR spectrums of the drying processes show no difference around the 3535 cm^{-1} hydroxyl peak. Simultaneously, all three drying processes show acetaldehyde at nearly 1 mg kg^{-1}. During the injection moulding process, 18 g preform indicates the most minor acetaldehyde level of 5.28 mg kg^{-1}. The 14 g preform having 17 s cyclic time acquired a 7.51 mg kg^{-1} acetaldehyde level while 16 s acquired 6.59 mg kg^{-1}. The 82 g preforms' acetaldehyde found to be 11.89 mg kg^{-1}. Accordingly, ATR spectrums show an increase in carbonyl peak. Thereby, maintaining low cyclic time with possibly low barrel temperature leads to the genesis of fewer degradation products. Considering the weight of the preform both the polymer amount and the cyclic time together decide the degradation amount. Practising double barrel technology against single barrel discloses the advantages.

Keywords: *Acetaldehyde, bottled drinking water, injection moulding, PET degradation, PET ATR spectrum*

Acknowledgement: *All the technical support relevant to manufacturing and acetaldehyde analysis was given by snacking's (Pvt.) ltd. exact manufacturing controls are intellectual properties of the snacking's (Pvt.) ltd. including such parameters in this content was represented as proximate or round-up values*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-033

The effect of membrane on the alkaline water production

H.M.B.N. Wickramasooriya[1*], M.D.Y. Milani[2], A.M.K.L. Abeykoon[2], R.C.W. Arachchige[2], H.M.B.I. Gunathilaka[2]

[1]Uva Wellassa University, Badulla, Sri Lanka
[2]Industrial Technology Institute, Colombo, Sri Lanka

[*]wickramasooriyabhagya96@gmail.com

The alkaline ionized water (AIW) produced by the electrolysis process has growing demand due to several health benefits in humans as it hinders the oxidation process caused by free radicals. A batch-mode membrane-aided ionizer is developed in the current research study to produce AIW. Electrodes and cation exchange membrane are the major parts of the device, and the selective penetration of mineral cations into the cathode chamber is governed by the membrane, which further enhances the electrolysis at the cathode to produce more hydroxyl ions, hydrogen, and active hydrogen in the cathode chamber. The produced hydroxyl ions increase the alkalinity of water. Furthermore, the membrane avoids the direct intermixing of the water and gases in between electrode chambers. Four different membranes such as polyvinylidene fluoride (PVDF), cellulose filter paper (CFP), polyethersulfone (PES), and polytetrafluoroethylene (PTFE), were characterized and used in batch ionizer for selective penetration of mineral cations into AIW, and the ionizer performance is investigated against a control experiment without using a membrane. In PVDF and CFP membranes, the pH values were increased and reached the desired 9.5 pH level in 7.2 and 6.4 minutes respectively. However, PES PTFE and control did not achieve desired 9.5 pH. CFP might reach the 9.5 pH level in a short time due to its high ion conductivity (3.8×10^{-3} S cm^{-1}) than PVDF (9.1×10^{-5} S cm^{-1}) and larger pore size (~8 µm) than the other membrane types (~0.45 µm). The durability and chemical/physical stability of CFP are lower than PVDF. Furthermore, the membrane is essential for generating AIW without intermixing the water in between the cathode and anode chamber. As a result of that, the present study concluded PVDF is found to be a highly suitable and the best membrane for the proper functioning of the ionizer to produce mineral and antioxidant-enriched AIW.

Keywords: *Electrodes, ionizer, penetration*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-036

Synthesis and characterization of bismuth oxyiodide-sensitized TiO_2 electrodes for solar energy conversion

M.A.K. Madhumekala[1], M.G.R. Shyamamala[2], G.D.M.H. Wijewardhana[1], M.S. Kandanapitiye[3], T. Jaseetharan[2,4], M.N.M. Farhath[1,4*]

[1]*Department of Chemical Sciences, Faculty of Applied Sciences, South Eastern University of Sri Lanka*
[2]*Department of Physical Sciences, Faculty of Applied Sciences, South Eastern University of Sri Lanka*
[3]*Department of Nanoscience Technology, Faculty of Technology, Wayamba University of Sri Lanka*
[4]*Science Research Centre, Faculty of Applied Sciences, South Eastern University of Sri Lanka*

[*]*mmohamed@seu.ac.lk*

Bismuth Oxyiodide (BiOI) have recently gained considerable attention as a non-toxic sensitizing material in the solar energy conversion process. Usually, in dye-sensitized solar cells, Ru-based dyes are used as sensitizers and they are high-cost materials. In the present work, BiOI nanofilms were deposited on TiO_2 nanoporous electrodes by the Successive Ionic Layer Adsorption and Reaction (SILAR) method and the optical and electrical properties have been studied. BiOI film shows better absorption in the visible region of the solar spectrum. In order to find the suitable number of SILAR cycles for high-performance BiOI-sensitized solar cells, FTO/TiO_2/BiOI/electrolyte/Pt type solar cells have been fabricated and characterized. Iodide/triiodide redox couple-based liquid has been used as electrolytes in solar cells. TiO_2 electrode fabricated with 15 SILAR cycles of BiOI shows a maximum power conversion efficiency of 0.54% while N719 dye-sensitized solar cell shows an efficiency of 3.39% under the simulated light of 100 mW cm^{-2} with AM 1.5 spectral filter. However, N719 dye is an expensive commercial dye and BiOI is a new low-cost alternative sensitizer for dye-sensitized solar cells.

Keywords: *Bismuth oxyiodide, dye-sensitized solar cell, photoanode, sensitizer, successive ionic layer adsorption and reaction*

Acknowledgement: *Authors gratefully acknowledge the Condensed Matter Physics and Solid State Chemistry project, National Institute of Fundamental Studies, Kandy, Sri Lanka.*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-043

Human histamine-1 receptor antagonist activity of flavonoids found in 'Paspanguwa' herbal formula

J.C. Gunaratne[1*], D.R. Uduwela[1,2], R.J.K.U. Ranatunga[1,2]

[1]*Department of Chemistry, Faculty of Science, University of Peradeniya, Peradeniya, Sri Lanka*

[2]*Postgraduate Institute of Science, University of Peradeniya, Peradeniya, Sri Lanka*

[*]*s16180@sci.pdn.ac.lk*

Globally, many traditional medicinal systems acknowledge the efficacy of flavonoid-rich therapeutics against allergy and inflammation. In Sri Lanka, 'paspanguwa' is a popular traditional medicine used to treat and prevent the mentioned ailments. In western allopathic medicine, the first-line treatment of allergy and inflammation are oral antihistamines, which act as Histamine-1 Receptor (H1R) antagonists. We hypothesise that flavonoids from 'paspanguwa' could act as H1R antagonists and show favourable binding at the active site of the receptor. Kaempferol from *Coscinium fenestratum*, quercetin from *Zingiber officinale*, and apigenin from *Solanum xanthocarpum* were identified as flavonoids present in the formula. Molecular docking was carried out using AutoDock Vina to evaluate the binding of flavonoids to the H1R active site. Physiological ligand histamine and clinical oral antihistamines were used for comparative analysis. UCSF Chimera and BIOVIA Discovery Studio were used to analyse non-covalent interactions between ligands and H1R. The GROMACS 2021.5 code was used for molecular dynamics simulations. Flavonoid-H1R complexes were simulated for 40 ns using CHARMM36 all-atom force field under physiological conditions. Flavonoids showed binding free energies higher than that of histamine and clinical antihistamines. They also formed molecular interactions with H1R that are deterministic for ligand binding at the active site. Key interactions were observed with Asp $107^{3.32,}$ Tyr $108^{3.33}$, Lys 179^{ECL}, Lys $191^{5.39}$, and conserved residues Trp $428^{6.48,}$ Tyr $431^{6.51}$, Phe $432^{6.52}$, and Phe $435^{6.55}$. No conformational changes were observed during the simulation trajectory and ligand RMSD was less than 2 Å indicating the flavonoid-H1R complexes and the binding were stable. This study showed that flavonoids from 'paspanguwa' may have the capacity to block the H1R active site. The reported anti-inflammatory properties of the formula may, at least in part, be due to the H1R antagonism of kaempferol, quercetin, and apigenin.

Keywords: *Antihistamine, molecular docking, molecular dynamics*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-044

Formulation of antioxidants-rich herbal tea from medicinal plants for the replacement of *Psidium guajava* tea

S. Lilachjini[1], M.H. Haroon[1*]

[1]*Department of Chemical Sciences, Faculty of Applied Sciences, South Eastern University of Sri Lanka, Sri Lanka*

[*]*haroonmh@fas.seu.ac.lk*

Herbal tea has been consumed as a beverage for health in Asia owing to people feeling they are natural, and safe, and can help treat or control a variety of diseases. Even though guava tea's anti-diabetic and antioxidant qualities have already been established and demonstrated. This study aimed to improve the pharmacological quality of guava tea by developing a guava leaf-based herbal tea by incorporating some other medicinal plants including cinnamon (*Cinnamomum zeylanicum*) leaf and bark, avaram senna (*Senna auriculata*) flower, gurmar (*Gymnema Sylvestre*), holy basil (*Ocimum tenuiflorum*) leaf and lemon (*Citrus limon*) leaf. Plant materials were collected, cleaned, and processed to prepare herbal tea. Nine different combinations of herbal teas were prepared using above mentioned plants along with guava tea for comparison. Extraction of tea was done by infusion the total antioxidant capacity was determined by FRAP (Ferric reducing antioxidant power) assay, radical scavenging activity was determined by DPPH (2,2-diphenyl-1- picrylhydrazyl) assay, and the toxicity was assessed using the brine shrimp micro-well cytotoxicity assay and finally, the sensory evaluation also was conducted with a semi-trained panel. According to the findings, the combination of guava-leaf: cinnamon-bark: cinnamon-leaf: avaram senna-flower: gurmar-leaf: holy basil-leaf: lemon-leaf: (35:20:1:1:1:1:1) exhibited the highest antioxidant capacity (82.33 mg Ascorbic acid Eq ml^{-1}) and also, it showed nontoxic to brine shrimp. Interestingly, this was the one mostly preferred by semi-trained sensory panels due to its taste, colour, smell, and texture. In conclusion, the developed herbal tea showed the highest antioxidant capacity, and nontoxic nature and was mostly preferred by the panel. Further analysis is required based on anti-diabetic properties in order to compare the anti-diabetic property of guava tea.

Keywords: *Antioxidants, brine shrimp, guava-tea, herbal-tea, toxicity*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-050

Identification of residues of kerosene in fire debris evidence in the presence of polystyrene interfering compounds in an arson investigation

A.C.W.W.M.N.P. Koswatta[1*], S. Malavipathirana[1], S.D.A. Sandanayaka[1], N.I.K. Fernando[2]

[1]*Department of Physical Sciences and Technology, Sabaragamuwa University of Sri Lanka*
[2]*Forensic Explosive and Fire Investigation Section, Government Analyst's Department, Sri Lanka*

[*]*pknilakshi@gmail.com*

Forensic science, in its broadest sense, refers to the application of different scientific disciplines to subjects that may have legal implications. In this context, the use of forensic science to investigate fires and fire-related crimes covers all evidence of the investigation of the cause and origin of the fire scene. The study involves the results of the analysis of polystyrene- (PS-) based household products without burning and burning under various test conditions for the purpose of identifying potential interfering compounds in kerosene-accelerated fires. Volatile compounds, in polystyrene with and without burning, were solvent extracted using passive headspace adsorption by charcoal strips followed by acetone. This assessment was carried out by gas chromatography/mass spectrometry (GC/MS), and the data evaluation was done by extracted ion profiling (EIP) and target compound analysis. Data interpretation was found to be somewhat complicated if fire debris samples include PS-based products in kerosene-accelerated fires. Because PS-interfering compounds resemble target compounds of C12-C15 alkanes in kerosene with a Gaussian pattern. Therefore, it will cause pattern distortions and might be mistakenly interpreted as both a false negative by masking alkane peaks and a false positive for kerosene. However, Styrene was identified as the prominent interfering compound in both PS tested. Nevertheless, PS-interfering compounds did not elute C3 aromatics (C3 alkylbenzenes) as in kerosene and it shows a styrene peak. Hence, these important key features, styrene peak and also consecutive C3 aromatics (castle group compounds) and target kerosene compounds could be considered to resolve this misinterpretation since kerosene in Sri Lanka contains aromatics in addition to alkanes relatively with a low abundance when it comes from the refinery.

Keywords: *Arson, castle group, GC-MS, interferences, pyrolysis*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-057

Targeting JAK2 with phytochemicals as antagonists via molecular docking approach

M. Ifran[1], H. Mudalige[1*], O. Perera[1]

[1]591, School of Science, BMS, Colombo-6, Sri Lanka

[*]heshani.m@bms.ac.lk

Cancer is one of the most studied diseases in the world due to its prevalence, types, and morbidity rate. It is caused by various pathophysiological pathways. Harmful side effects of current treatments are drawbacks and problems. Targeting the Jase Kinase-2 (JAK-2) pathway of oncogenesis is crucial to discovering potent drugs since its mutation is involved in many types of cancer. This study primarily aims to uncover potent novel drug candidates from various plant sources to target the JAK-2 pathway through protein-ligand docking using Autodock vina 1.2.6. The 3D structure of JAK-2 was downloaded from the RCSB PDB website. The structures of the phytochemicals were retrieved from the NCBI PubChem database and the docking procedure was executed. The ADME properties were assessed using the SwissADME web tool. Visualization of the interactions was observed in BIOVIA DS. The natural ligand was re-docked for the validation of the methodology. Among the docked 24 ligands, Liriodenine Cliomiscosin, Ajmalimine, Hecogenin and Ellagic acid showed the higher binding affinity, -10.3, -9.7, -9.5, -9.5, and -9.0 kcal mol^{-1} respectively and these phytochemicals formed hydrogen bonds with the receptor. The re-docked value was obtained as -9.9 kcal mol^{-1}. The ADME analysis revealed that except for Ajmalimine, all the other top 5 phytochemicals are suitable for further analysis. In ADME analysis GI absorption, Lipinski's rule and total polar surface area (TPSA) were assessed for all the ligands. Corresponding to the hydrogen bond, LEU 932 was identified as a common residue. VAL 863, LEU 855 and LEU 983 were identified as common amino acid residues in the binding pocket of JAK-2 with respect to hydrophobic interactions. *In vitro* and *in vivo* research to discover the possibility of these compounds being utilized as effective therapy can be carried out.

Keywords*: ADME, ajmalimine, cliomiscosin, BIOVIA DS*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-062

Changes in pH of cow milk from cattle depending on saltmarsh pastures and dry pastures during the lactation period

G. M. M. Kumari[1*], A.N. Navaratne[1,2], K.B Ranawana[3]

[1]*Postgraduate Institute of Science, University of Peradeniya, Sri Lanka*
[2]*Department of Chemistry, Faculty of Science, University of Peradeniya, Sri Lanka*
[3]*Department of Zoology, Faculty of Science, University of Peradeniya, Sri Lanka*

[*]*gmadushikamk@gmail.com*

pH in raw cow milk is an important physical property that ranges between pH 6.6 and pH 6.8 during the non-colostrum lactation period of dairy cattle. The pH value of raw cow milk is related to the composition of chemical constituents, especially the concentration of soluble calcium and phosphate ions. The stability of the casein micelle of the protein constituent of milk is related to the pH value of milk where the micellar size expands with the increasing pH value of milk. Acidification on the other hand results in decreasing the size of the micellar. The low raw milk pH is also an indication of bacterial contamination of milk while the high pH value ($\geq$ 7.0) is a pre-determination of the mastitis condition of lactating dairy cattle. Hence, evaluation of the raw cow milk pH value is important during the lactation period of cattle. This study focuses on the evaluation of raw cow milk pH variation within the lactation curve in the indigenous breed of dairy cattle fed on two different feeding pastures, namely saltmarsh pastures and dry pastures. Samples were collected during the early, mid and late lactation stages, from the two cattle groups namely, saltmarsh-pasture cattle (n = 90) in Mannar and dry-pasture cattle (n = 90) in Medawachchiya. During the complete lactation period, the mean raw milk pH values of salt marsh-pasture cattle and pasture-feeding cattle were 6.50 ± 0.08 and 6.61 ± 0.04, respectively. In their mid-lactation stage, the pH of both salt marsh-pasture and dry-pasture cattle's milk resulted in high pH of 6.58 ± 0.06 and a pH of 6.63 ± 0.02, respectively. However, the saltmarsh pasture feeding cattle's milk resulted in a low pH value during the three lactation stages compared to the dry pasture feeding cattle's milk. Results suggested that the pH value of cow milk was dependent on the feeding pasture as well as the lactation stage of cattle. The compositional behaviour of pH-dependent constituents of milk during lactation would require further investigation.

Keywords: *Lactation stage, pasture, raw milk*

Acknowledgement: *The authors are grateful to the National Science Foundation, Sri Lanka for providing financial assistance to the success of this study*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-065

Sustainable synthesis and characterization of copper-modified zeolite Y (Kaolin-CuY) from purified Meetiyagoda kaolin

R.A.L.R. Amarasena[1,2*], W.M.A.T. Bandara[3], R. Weerasooriya[1], I.P.L. Jayarathne[1]

[1]*National Institute of Fundamental Studies, Kandy, Sri Lanka*
[2]*Postgraduate Institute of Science (PGIS), University of Peradeniya, Sri Lanka*
[3]*Department of Chemistry, Faculty of Science, University of Peradeniya, Sri Lanka*

[*]*lrlasanga@gmail.com*

Sustainable synthesis of zeolite is important since zeolites are employed in many industrial and environmental applications. However, the use of pure chemicals on large scale is not sustainable due to the high cost and production of hazardous chemical waste. To avoid these negative impacts natural aluminosilicate materials can be used. Among various raw materials, it has been investigated that kaolin is very suitable as a starting material which has an uncharged layer with a silica tetrahedral sheet and alumina octahedral sheet. Kaolin is naturally available but needs to purify before the synthesis process to remove impurities. The main objectives of this study are the synthesis of faujasite type Zeolite-Y from kaolin which was mined from Meetiyagoda, Sri Lanka, and modification by copper cation. Copper-modified zeolites can be used as a catalyst in many applications. To synthesize gel precursors, known ratios of purified metakaolin, silica, NaOH and water were mixed. An environmentally friendly hydrothermal seed-assisted method was used for the crystallization process. Synthesized zeolite was labelled as Kaolin-Y and it was modified with copper(II) cation (Kaolin-CuY). These materials were characterized by PXRD, FTIR and Raman spectroscopy by comparing the structure of Zeolite-Y. The availability of characteristic diffraction of Zeolite-Y in Kaolin-Y data representing zeolite synthesis becomes successful. In FTIR spectra a small band is appearing around 612 cm^{-1} representing the loading of cation (M-O bond) with internal deformation vibration modes of T-O-T bridging bonds. A small peak that appears in the Kaolin-CuY Raman spectrum around 129 cm^{-1} represents the formed M-O bond that affects the O-Si-O bond and a peak at 202 cm^{-1} in Kaolin-CuY also proves cation loading. According to these results, in this study synthesis and modification of Kaolin Y have been successfully achieved. The application of copper-modified kaolin in the catalytic reaction will be studied.

Keywords: *Characterization, copper modification, metakaolin, zeolite Y*

Acknowledgement: *Financial assistance from National Research Council (Grant No: NRC 19-090) is acknowledged*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-066

Estimation of route-specific vehicular air pollution via dispersion modelling: A case study in Kandy, Sri Lanka

E.P.T.M. Rajaratne[1*], R.J.K.U. Ranatunga[2]

[1]*Department of Environmental and Industrial Sciences, Faculty of Science, University of Peradeniya, Sri Lanka*
[2]*Department of Chemistry, Faculty of Science, University of Peradeniya, Sri Lanka*

[*]*tharosa@sci.pdn.ac.lk*

Vehicular emissions contribute to more than half of the air pollution in Sri Lanka. Despite having a lower number of sources, Kandy city experiences higher air pollution due to the basin effect. Regular monitoring of air quality is imperative to ensure public health, however, monitoring equipment is often stationary, expensive, and only provides *in situ* measurements of pollutants. Therefore, we intended to use dispersion modelling techniques to investigate the vehicular Carbon monoxide (CO) pollution in a section of Kandy, namely, the Kandy Lake route from *Saṅgarāja Mawatha* up to *Dharmarāja* College Junction (B518+AA026). A primary goal was to identify areas that exceed maximum permissible ambient CO levels: 1 hour (μ_{1hr}) and 8-hour (μ_{8hr}) averages, 29.8 mg m^{-3} (26 ppm) and 10.3 mg m^{-3} (9 ppm) respectively. Specific emission rates (Q^0_{CO}) of the route were estimated using semi-empirical formulae and analogous emission factor data for CO from a study conducted in China in 2008. Dispersion modelling was conducted over a 3×3 km^2 domain centred on the Kandy Clock Tower, using AERMOD (Gaussian plume dispersion model). Semi-empirical estimations showed maximum Q^0_{CO} of 2.215 mg s^{-1} m^{-2} occurring at 07:00 and 13:45 on weekdays. Weekends reported maxima of 1.813 mg s^{-1} m^{-2} and 1.536 mg s^{-1} m^{-2}, respectively at 11:45 (both days) and 12:30 (Sundays). Modelling results revealed that > 90% of the domain experiences $[CO]_{1hr} \geq 0.6$ mg m^{-3}. Five locations exceeded μ_{1hr} up to 37.8 mg m^{-3}. Thirty-two locations exceeded μ_{8hr} up to 24.1 mg m^{-3}. Furthermore, *Mahāmāyā* Primary and Secondary College premises experience elevated μ_{8hr} levels: 5.8 ~ 10.0 mg m^{-3} and 1.4~13.4 mg m^{-3} respectively. This study shows that model estimations of vehicular CO pollution alone exceed gazetted thresholds at several locations, and chronically expose over five thousand students attending two schools adjacent to the route. Also, this study ascertains that dispersion modelling provides viable estimates in the absence of actual measured data and instruments.

Keywords: *Carbon monoxide, population health, traffic*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-069

Plants available in Sri Lanka with anti-viral potential : A review

H.D.T. Madhuranga[1*], P.J. Wijekumar[1], D.N.A.W. Samarakoon[1]

[1]*Department of Biomedical Science, Faculty of Health Sciences, KIU, Battaramulla, Sri Lanka*

[*]*kiu.b56365@kiu.ac.lk*

The available treatments for viral infections are limited, and they tend to be ineffective due to emerging resistant viral strains. Therefore, new anti-viral compounds with high efficacy need to be investigated for future drug development. Herbal plants possess a distinctive efficacy for many diseases. Herbal plant-based medications are effective for viral infections due to several advantages: less expensive, accepted among people due to a long history of use, better patient tolerance, and fewer or no side effects. As well as, there is a huge demand for identifying the therapeutic importance of herbal plants to treat viral diseases since the novel COVID-19 has become a significant healthcare threat to almost all countries worldwide. A literature search was conducted using PubMed® (US National Library of Medicine, USA), Google Scholar, and Hinary (WHO, Switzerland) to provide evidence-based recommendations for these traditional natural plants. This review documents previous study evidence about 30 medicinal plants used as anti-viral herbs in the Sri Lankan community. The most used literature evidence richer plants and their chemical constituents identified in this survey were *Curcuma longa* (curcumin), *Zingiber officinale* (zingiberene, α-farnesene, and β-sesquiphellandrene), *Allium sativum* (Allin and Allicin), *Terminalia chebula* (Chebumeinin A, Chebumeinin B, and Casuarimin), *Citrus aurantiifolia* (Hesperidin), *Mentha spicata/Mentha longifolia* (Piperitenone oxide), *Azadirachta indica* (Nimbidin), *Phyllanthus amarus* (Corilagin), *Aloe barbadensis* (Aloe-emodin and Aloetic acid) and *Andrographis paniculate* (Andrographolide). Among these 30 plants, most plants pointed to *in vivo* activity against Herpes Simplex Virus (HSV-1), Herpes Simplex Virus (HSV-2), Influenza A (H1N1) Virus, and several viruses such as SARS COVID-19 virus (SARS-CoV2). The most documented active biological compounds from these 30 plants were alkaloids, flavonoids, and terpenoids. However, there is a scarcity of knowledge on plant-based medications for viral infections, and the scientific forums lack evidence for most herbal plants. Thus, this review focuses on documenting the herbal plants with recognized anti-viral activity abundant in Sri Lanka and their chemical constituents.

Keywords: A*nti-viral, herbal plants, treatment, viral infections*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-071

Development of sugar-free flavoured instant iced tea

A. Hettiarachchi[1], D.G.N.G. Wijesinghe[1*], L.P.I.N.P. Jayawardene[2], W.L.C.M. Gunathilaka[2]

[1]*Department of Food Science & Technology, Faculty of Agriculture, University of Peradeniya, Sri Lanka*
[2]*Aletek International (Pvt) Ltd., Ranaviru Prabhath Cooray Mawatha, Rajagiriya, Sri Lanka*

[*]*wijeng@agri.pdn.ac.lk*

Tea (*Camellia sinensis*) is a widely consumed beverage with many health benefits. Iced tea is a chilled, ready-to-drink (RTD) tea beverage. The use of instant tea powder as a substitute for black tea extract, the conventional ingredient, is the main difference of this study. The use of instant tea powder is simple, affordable, and has the expected physicochemical and health benefits of tea, along with its high solubility and reconstituting properties. The goal was to create sugar-free iced tea premixes using instant tea (IT) of selected flavours that could be sold on the market. Iced tea premixes were developed using instant black tea powder, ascorbic acid, tri-sodium citrate, citric acid, sucralose, and maltodextrin with four flavours: apple, ginger, bergamot, and cardamom. After several preliminary trials, 2 formulations (F1& F2) were selected for each flavour by slight alterations of the above ingredients. To identify the sensory properties of tea premixes, colour, aroma, mouthfeel, and overall acceptability were determined using a five-point hedonic scale sensory analysis, with thirty in-house semi-trained panellists. Based on the analysis, the best formulation out of the 2 formulations was selected for each flavour. Statistical analysis was done using SPSS 26 statistical software with a $p < 0.05$ level of significance. From the iced tea premixes, panellists preferred formulation 2 (F2) for apple flavour, formulation 1 (F1) for ginger flavour, and formulation 2 (F2) for cardamom flavour but for bergamot flavour none of the formulations was preferred. Out of the four flavours, apple flavour was the most preferred flavour (4.63 ± 0.10), followed by ginger (4.27 ± 0.12), cardamom (4.17 ± 0.12), and bergamot flavour (2.25 ± 0.12), respectively. Based on the sensory analysis, three flavours of apple, ginger, and cardamom were identified for the production of instant iced tea premixes. Before introducing them to the market, premixes need to be examined and improved upon their physicochemical and microbiological qualities during storage.

Keywords: *Physicochemical properties, premixes, ready-to-drink, statistical analysis, sensory analysis*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-088

Enzyme inhibitory, antioxidant and phytotoxic properties of *Pilea microphylla* (Urticaceae)

K.A. Siriwardhene[1], J.M.N. Marikkar[1], L. Jayasinghe[1*], N.K.B. Adikaram[1]

[1]*National Institute of Fundamental Studies, Kandy, Sri Lanka*

[*]*lalith.ja@nifs.ac.lk*

Pilea is the largest genus of the family Urticaceae with over 600 species, and one of the largest genera within the Order Urticales. The plant is mostly distributed throughout the tropics, subtropics, and warm temperate regions. The majority of species are succulent herbs, epiphytes, or small shrubs that could be found growing in heavy shade. In June 2017, during the study of the alien urban flora of Palermo, a remarkable *Pilea microphylla* was discovered. *P. microphylla* is generally known as Angelwood, Joypowder plant, Artillery plant, and/or Brihantina. The present study was carried out to evaluate the bioactivity of *P. microphylla.* The methanolic extract obtained from the plant was screened for antifungal (against *Cladosporium cladosporioides*), antioxidant (against DPPH), cytotoxic (against *Artemia salina*), phytotoxic properties (against root and shoot inhibition of *Lactuca sativa*) and enzyme inhibitory activities on α-amylase (from the porcine pancreas), acetylcholinesterase (from *Electrophorus electricus*) and lipase (from the porcine pancreas). The results showed that the MeOH extract does not exhibit antifungal properties, cytotoxicity, or α-amylase inhibitory activities. IC_{50} values for antioxidant, acetylchlolinesterase inhibitory, and lipase inhibitory assays were 46.69 mg l^{-1}, 132.53 mg l^{-1} and 25.15 mg l^{-1} respectively. Chemical investigations on the active compounds are in progress.

Keywords: *Acetylchlolinesterase, lipase, P. microphylla*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-089

Bioactive metabolite of endophytic fungus from *Manihot esculenta*

H.M.S.K.H. Bandara[1,2], N.R. Amarasinghe[3], N.K.B. Adikaram[1], L. Jayasinghe[1*]
H. Araya[4], Y. Fujimoto[1,4]

[1]*National Institute of Fundamental Studies, Kandy, Sri Lanka*
[2]*Department of Biochemistry, Medical Research Institute, Colombo, Sri Lanka*
[3]F*aculty of Allied Health Science, University of Peradeniya, Sri Lanka*
[4]*School of Agriculture, Meiji University, Kawasaki 214-8571, Japan*

[*]*lalith.ja@nifs.ac.lk*

Fungi are among the most important organisms in the world because of their very important roles in ecosystem functions and power on humans and human-related activities. Since the discovery of penicillin, natural product discovery from fungi has added considerable attention and force. Plant endophytic fungi have been recognized as an important source of natural products with potential applications in industries. In this paper, the chemistry and bioactivity of endophytic fungi in leaves of *Manihot esculenta* were investigated to find the possible application in health and agriculture. Triple sterilized leaf segments of *M. esculenta* were placed on Potato Dextrose Agar (PDA) medium and incubated at room temperature to obtain endophytic fungi. The identification of endophyte is in progress. The pure culture of endophyte was fermented in 12 L of Potato Dextrose Broth (PDB) medium. The medium was filtered and the filtrate was extracted with ethyl acetate (EtOAc) and residual mycelium was extracted using EtOAc and methanol (MeOH). The combined EtOAc extract was chromatographed over silica gel (*n*-hexane-EtOAc-MeOH) followed by PTLC to give 5-methylmellein (**1**), 6-*O*-methylreticulol (**2**), 7-hydroxy-5-methylmellein (**3**) and saccharonol B (**4**). With availability of compounds, only **1** was screened for antifungal activity against *Cladosporium cladosporioides*, phytotoxicity (lettuce seed germination assay), antioxidant activity using DPPH, brine shrimp toxicity (*Artemia salina*) and enzyme inhibitory assays on, α-glucosidase, acetylcholinesterase and lipase. Compound **1** showed brine shrimp lethality at LC_{50}- 10.11 mg l^{-1} and strong antioxidant activity against DPPH at IC_{50}- 0.23 mg l^{-1}. It displayed the shoot inhibition of lettuce seedlings at IC_{50}- 82.53 ppm while root inhibition of lettuce seedlings at IC_{50}- 137.47 ppm. The mild acetylcholinesterase enzyme inhibitory activity was observed at IC_{50}- 815.32 mg l^{-1} and the antifungal activity against *C. cladosporioedes* was observed. Therefore, endophytic fungus from *M. esculenta* can be considered a potential source for the isolation of new therapeutic agents.

Keywords: *Antifungal, antioxidant, cytotxicity, Manihot esculenta, phytotoxicity*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-090

Investigation of antioxidant, cytotoxic and phytotoxic activity of plant extracts from *Eichhornia crassipes*

T.M.K.P. Thennakoon[1], D. Yakandawala[2], J.M.N. Marikkar[1], N.K.B. Adikaram[1], L. Jayasinghe[1*]

[1]*National Institute of Fundamental Studies, Kandy, Sri Lanka.*
[2]*Department of Botany, Faculty of Science, University of Peradeniya, Peradeniya, Sri Lanka.*

[*]*lalith.ja@nifs.ac.lk*

Eichhornia crassipes, (Family Pontederiaceae), commonly known as "Japan Jabara", is an invasive aquatic plant found in tropical and subtropical regions. Its origin is the Amazonia basin in South America. It has been used in the past for medicinal purposes such as treatment for cholera, sore throats, and snake bites. The objective of the study was to determine antifungal activity against *Cladosporium cladosporioides*, antioxidant activity against DPPH (2.2'-diphenyl-1-picrylhydrazyl), cytotoxicity against brine shrimps, phytotoxicity against lettuce seed germination, α-amylase inhibitory activity and lipase enzyme inhibitory activity of the crude extracts of the shoot (SH) and root (RT) obtained from *E. crassipes* plant by using solvents which have different polarities. The hexane, ethyl acetate (EtOAc) and methanol extracts of *E. crassipes* RT, assessed for cytotoxicity properties, revealed 100%, 97% and 90% cell death (mortality) respectively. Similarly, EtOAc extracts of *E. crassipes* RT showed substantial inhibition of both the shoot (77.57%) and root (67.52%) while EtOAc extracts of *E. crassipes* SH exhibited good phytotoxic effects on the shoot (70.78%) and root (78.14%) than the other extracts. The lowest DPPH free radical scavenging activity (IC_{50} = 39.94 mg l^{-1}) was found in the SH- EtOAc extract, while IC_{50} of 15.94 mg l^{-1} was found in the RT- EtOAc extract indicating that the root extract has the strongest antioxidant activity. Further, the study revealed the lack of α-amylase inhibitory activity, antifungal properties or lipase inhibitory activity in any of the crude extracts of *E. crassipes* tested. The extracts of *E. crassipes* are a promising source for the isolation of bioactive compounds since it possesses significant antioxidant, cytotoxic and phytotoxic properties.

Keywords: *α-amylase, aquatic plant, Japan Jabara, lipase*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-092

Bioactivity studies of *Bridelia retusa* leave extracts

U. Siriwardhane[1], N.K.B. Adikaram[1], L. Jayasinghe[1*]

[1]*National Institute of Fundamental Studies, Kandy, Sri Lanka*

[*]*lalith.ja@nifs.ac.lk*

Bridelia retusa commonly known as spinous kino tree is widely used as a medicinal plant to treat urinary problems, rheumatism, diarrhea and diabetes. This study was carried out to investigate the bioactivities of different extracts of *B. retusa* leaves. The leaves were air-dried and powdered using a grinder. The powdered sample was sequentially extracted into hexane, ethyl acetate (EtOAc) and methanol (MeOH) using a sonicator. The extracts were evaporated using a rotary evaporator to obtain crude extracts. The extracts were screened for antioxidant activity against DPPH (2,2′-diphenyl-1-picrylhydrazyl), antifungal activity against *Cladosporium cladosporioides,* cytotoxic activity against *Artemia salina,* phytotoxic activity against lettuce seed germination, and enzyme inhibitory assays against α-amylase, α-glucosidase, and lipase. The results obtained showed that all three extracts possess antioxidant activity of which hexane and MeOH extracts showed IC_{50} values of 17.23 ± 7.90 mg l^{-1} and 5.33 ± 4.59 mg l^{-1}. The EtOAc extract showed the highest antioxidant activity of 0.03 ± 0.00 mg l^{-1}. None of the extracts showed inhibition against *Cladosporium cladosporioides.* All extracts demonstrated low cytotoxicity and, none of the extracts exhibited phytotoxicity against lettuce seed germination within 1000 mg l^{-1} concentration. Only the methanolic extract of the leaves showed α-amylase inhibitory activity (IC_{50} = 187.46 ± 4.35 mg l^{-1}). All extracts showed α-glucosidase inhibitory activity where, hexane and EtOAc extracts showed IC_{50} values of 800.31 ± 34.39 mg l^{-1} and 631.44 ± 21.11 mg l^{-1}, while methanol extract showed the highest activity of 0.25 ± 0.18 mg l^{-1}. In the lipase enzyme inhibitory assay, the hexane extract showed an IC_{50} value of 475.80 ± 15.84 mg l^{-1}. EtOAc and MeOH extracts showed IC_{50} values of 718.38 ± 15.01 mg l^{-1} and 457.95 ± 2.43 mg l^{-1} respectively. Activity-guided fractionation of the extracts is in progress. These results suggest that *Bridelia retusa* leaves have the potential to isolate bioactive compounds.

Keywords: *Antioxidants, bioactivities, cytotoxicity, enzyme inhibitors, phytotoxicity*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-093

Bioassays and enzyme inhibitory activities of *Alysicarpus vaginalis* and *Biophytum reinwardtii*

T.D.A.D.K. Kulathunge[1], J.M.N. Marikkar[1], N.K.B. Adikaram[1], L. Jayasinghe[1*]

[1]*National Institute of Fundamental Studies, Kandy, Sri Lanka*

[*]*lalith.ja@nifs.ac.lk*

Sri Lankan traditional medicine utilizes mainly herbal preparations for the treatment of diseases. They have a broad literature on 2000 species, but only a few of these have been examined for bioactivities and chemical compositions. This research is directed towards the discovery of the bioactivities of *Alysicarpus vaginalis* and *Biophytum reinwardtii*. Whole plants of both species were selected for the study. The plants were collected from the Central province of Sri Lanka, washed, air-dried and finely powdered. Extracts obtained using *n*-hexane, ethyl acetate (EtOAc) and methanol (MeOH) were subjected to phytotoxic activity against Lettuce seeds, cytotoxicity against brine shrimp, antifungal activity against *Cladosporium cladosporioides*, DPPH (2,2- diphenyl-1-picrylhydrazyl) radical scavenging antioxidant activity, α-amylase inhibitory activity and lipase enzyme inhibitory activity. None of the crude extracts showed any significant phytotoxicity or cytotoxicity. MeOH extract of *B. reinwardtii* (BM) exhibited the highest antioxidant activity (IC_{50} 43.7 mg l^{-1}) compared to ascorbic acid (IC_{50} 2.21 mg l^{-1}) and other extracts also showed antioxidant activity IC_{50} in the range of (43-665) mg l^{-1}. None displayed any inhibition zone against *C. cladosporioides*. MeOH extracts of both plants showed α- amylase enzyme inhibitory activity where BM (IC_{50} 743.43 mg l^{-1}) and MeOH extract of *A. vaginalis* (AM) (IC_{50} 1015.98 mg l^{-1}). EtOAc extract of *A. vaginalis* (AE) (IC_{50} 332 mg l^{-1}), exhibited lipase enzyme inhibition. This study revealed that both plants contain compounds with adequate properties which can further focus on the isolation of bioactive compounds responsible for these bioactivities.

Keywords: *a-amylase, antifungal, antioxidant, cytotoxicity, lipase, phytotoxicity*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-094

Chemical constituents of endophytic fungus associated with *Citrus aurantiifolia* and their α-amylase inhibitory activity

A.M.N.A. Atapattu[1], N.K.B. Adikaram[1], L. Jayasinghe[1*], H. Araya[2], Y. Fujimoto[1, 2]

[1]*National Institute of Fundamental Studies, Kandy, Sri Lanka*
[2]*School of Agriculture, Meiji University, Kawasaki, Japan*

[*]*lalith.ja@nifs.ac.lk*

Endophytes can act as a reliable source of bioactive compounds. The objective of this study was to investigate the endophytic fungi isolated from the leaves of *Citrus aurantiifolia* which is commonly known as lime, for their chemistry and bioactivity. *C. aurantiifolia* leaves are used as a flavouring agent and mashed leaves are consumed for headaches and colds. Fresh and healthy leaves of *C. aurantiifolia* were collected from the Central Province of Sri Lanka. Small segments (5 × 5 mm^2) of the tripled sterilized leaves were placed on Potato Dextrose Agar plates and were incubated in the dark at room temperature (27 °C) for seven days until the appearance of fungal mycelium. The grown fungus was subcultured to obtain pure cultures. The pure fungus was cultured large scale and kept for 21 days in shakers at room temperature. After 21 days the medium was filtered and the filtrate was extracted using EtOAc. Mycelium was crushed and extracted with EtOAc and MeOH sequentially. EtOAc extract of the filtrate and the EtOAc and MeOH extracts of mycelium were subjected to α-amylase inhibitory assay. EtOAc extract of the filtrate showed the highest activity with an IC_{50} value of 522.45 ± 46.23 mg l^{-1} and EtOAc and MeOH extracts of mycelium did not show any α-amylase inhibitory activity. The chromatographic separation of (silica gel column followed by Sephadex LH-20 and PTLC) of EtOAc extract of filtrate resulted in succinic acid (1, 4-butanedioic acid) and 4-methoxy-4-oxobutanoic acid. The bioactivity studies of pure compounds are in progress.

Keywords: *α -amylase inhibition, Citrus aurantiifolia, endophytic fungus, 4-methoxy-4-oxobutanoic acid, succinic acid*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-097

Synthesis of iron oxide (γ-Fe_2O_3) coated sand for adsorptive removal of arsenic from drinking water

J.M.W.G.T.S. Senevirathne[1*], W.M.A.T. Bandara[2,3], R. Weerasooriya[3,4], I.P.L. Jayarathne[4], P.M.C.J. Bandara[4]

[1]*Department of Environmental and Industrial Sciences, Faculty of Science, University of Peradeniya, Peradeniya, Sri Lanka*
[2]*Department of Chemistry, Faculty of Science, University of Peradeniya, Peradeniya, Sri Lanka*
[3]*China-SRI Lanka Joint Research and Demonstration Center for Water Technology, Ministry of Water Supply, EOE Pereira MW, Peradeniya, Sri Lanka*
[4]*National Institute of Fundamental Studies, Kandy, Sri Lanka*

[*]*s16135@sci.pdn.ac.lk*

In recent years, arsenic (As) contamination of surface and groundwater has become an issue in many countries due to the weathering of As-containing rocks, industrial wastewater discharge, and the utilization of agricultural fertilizers. Ion exchange, coagulation, adsorption, co-precipitation, and microfiltration are the methods used to remove As from drinking water. Adsorption is a widely used method for removing As that exceeds the permissible level (10 µg l^{-1}) as per the drinking water guidelines recommended by the World Health Organization (WHO). Maghemite (γ-Fe_2O_3) nanoparticles (NPs) have gained a lot of interest owing to their ability to remove heavy metals from drinking water. Direct implementation of iron oxide NPs may present issues due to their tendency to agglomerate in aqueous media. Therefore, NPs are coated onto the filter material (sand). γ-Fe_2O_3 coated sand was prepared by a double coating process at 110 and 400 °C temperatures. The synthetic γ-Fe_2O_3 coated sand was characterized by Fourier Transform Infrared (FT-IR) and Raman spectroscopy. Characteristic Raman peak values of γ-Fe_2O_3 are observed in the 670 cm^{-1} and 1330 cm^{-1} band positions, and the IR peaks that were observed in the (450–460) cm^{-1} range can be attributed to Fe–O stretching vibrations. This work revealed that γ-Fe_2O_3 coated sand has a high affinity to remove both arsenite (As (III)) and arsenate (As (V)). The batch experiments showed the maximum adoption with γ-Fe_2O_3 coated sand for both As (III) and As (V) at pH 7.0, contact time of 7 hours, at 27 °C room temperature, and 25 g l^{-1} fixed adsorbent dose at 1.0 ppm initial As (III) and As (V) solutions. Maximum removal efficiency for As (III) and As (V) was 92.0% and 99.3% respectively under the aforementioned optimum conditions. The results indicate that γ-Fe_2O_3 coated sand can be used as an adsorbent for reducing both As (III) and As (V) concentrations from drinking water.

Keywords: *Adsorption, arsenate, arsenite, coating, γ-Fe_2O_3 nanoparticles*

Acknowledgement: *The National Research Council of Sri Lanka (NRC TO 16-015), all the research assistants, and the technical staff of the NIFS and the JRDC are acknowledged for their support.*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-099

Optimization of the solute descriptors for benzyl cinnamate by gas chromatography and liquid-liquid partition systems

K.P. Hewage[1,2], J.A.T.C. Ariyasena[1,2*]

[1]*Postgraduate Institute of Science, University of Peradeniya, Peradeniya, Sri Lanka*
[2]*Department of Chemistry, University of Peradeniya, Peradeniya, Sri Lanka*

[*]*jatca@sci.pdn.ac.lk*

Benzyl cinnamate is an important additive used in the products such as fine fragrances, shampoos and soaps. The worldwide usage of benzyl cinnamate is in the range of 10-100 metric tons per year, yet the studies on the toxicological properties of benzyl cinnamate are minimum. This is because the traditional methods for studying these properties such as LD_{50} determination using animals are time-consuming, costly and difficult. This can be overcome by the use of the Abraham solvation parameter model which is based on the Quantitative Structure-Property Relationships. This model can be expressed as $log\ log\ SP = c + eE + sS + aA + bB + vV$ for transfers between two condensed phases. The transfer from the gas phase to a condensed phase is given by $log\ log\ SP = c + eE + sS + aA + bB + lL$. Here SP is a Free energy-related solute property, simple letters are system constants and capital letters are Solute descriptors. V: McGowans Characteristic Volume, E: excess molar refraction, S: dipolarity/polarizability, A and B: hydrogen-bond acidity and basicity. L is the Gas-Hexadecane Partition coefficient. The gas chromatographic technique was used to optimize the solute descriptors for benzyl cinnamate and this was carried out using the poly(dimethyldiphenylsiloxane) and poly(cyanopropylphenyldimethylsiloxane) stationary phases and organic biphasic partition systems. The stationary phases were calibrated and isothermal retention factor values were determined from 80 °C to 260 °C at 20 °C intervals. Benzyl cinnamate was equilibrated in 20 organic biphasic systems and the partition coefficients were determined. The aforementioned experimental values were combined with the reported retention factor values in the literature to optimize the descriptors using the Solver algorithm in MS excel® such that the standard deviation would be minimum. The optimized descriptor values for benzyl cinnamate are, E = 1.304, S = 1.501, A = 0.000, L = 8.938, B = 0.617 and V = 1.919 respectively. These optimized descriptor values can be used to estimate the distribution of benzyl cinnamate in environmental compartments and to estimate toxicological properties.

Keywords: *Benzyl cinnamate, descriptors, gas chromatography, solvation parameter model*

Acknowledgement: *Financial assistance from National Research Council (Grant no: 20-086) is acknowledged*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-100

Utilization of differently activated charcoal from coconut shells (*C. nucifera*) for textile dye adsorption

R.M.H.Y. Rajapaksha[1], M.F. Nawas[1,2], M.N.M. Farhath[1,2*]

[1]*Department of Chemical Science, Faculty of Applied Sciences, South Eastern University, Sammanthurei, Sri Lanka*
[2]*Science Research Centre, Faculty of Applied Sciences, South Eastern University, Sammanthurei, Sri Lanka*

[*]*mmohamed@seu.ac.lk*

Dye effluents released from numerous dye-utilizing industries are toxic and carcinogenic to both aquatic life and human beings. Before discharging, dye wastewater should be treated to minimize its harmful effects on the environment and other living beings. Numerous studies have demonstrated that the best alternative approach for dye adsorption is the utilization of activated charcoal. In this study, activated charcoal made from coconut shells in three different weight ratios of carbon to sodium hydroxide (NaOH) and three different pyrolysis temperatures were adopted for the adsorption process with four different industrial dyes taken from textile industries. FTIR spectroscopy was employed to identify the functional groups in the adsorbents. Further, the effects of contact time on dye adsorption were studied. The experimental result showed that the best adsorption capacity of activated carbon was AC-9 at a weight ratio of carbon to NaOH, 1:3, and a pyrolysis temperature of 800 °C, for dye adsorption. According to the results, higher pyrolysis temperatures and higher carbon: NaOH weight ratios have a direct impact on adsorption capacity development and changed the physical properties of activated carbon. The greater the quality of the activated carbon produced, the larger the surface area and pore diameter. When investigating the effect of contact time, initially increased rapidly and reached the maximum adsorption capacity after some time. After carrying out rigorous experiments, it was concluded that activated carbon prepared from coconut shells under high conditions can be effective for the removal of textile dye. This would have the potential to use in large-scale processes, due to their low cost, easy synthesis pathway, and ready availability.

Keywords: *Adsorbents, contact time, pyrolysis temperature, sodium hydroxide to carbon weight ratio*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-101

Effective removal of heavy metals from aqueous solutions by cost-effective adsorbents

R.M.H.Y. Rajapaksha[1], O.H.P. Gunawardene[2], C.A. Gunathilake[3], M.N.M. Farhath[1,4*]

[1]*Department of Chemical Science, Faculty of Applied Science, South Eastern University, Sammanthurei, Sri Lanka*
[2]*Department of Chemical and Process Engineering, Faculty of Engineering, University of Peradeniya, Peradeniya, Sri Lanka*
[3]*Department of Nano Science Technology, Faculty of Technology, Wayamba University, Kuliyapitiya, Sri Lanka*
[4]*Science Research Centre, Faculty of Applied Sciences, South Eastern University, Sammanthurei, Sri Lanka*

[*]*mmohamed@seu.ac.lk*

Heavy metals are detrimental to human health and the environment with, negative consequences. Such as kidney and nervous system disorders, and for plants; inhibition of photosynthesis. Thus, efficient strategies must be applied to eliminate heavy metal cations from contaminated water. Normally, bricks and activated charcoal (AC) are well-known adsorbents in wastewater treatment. In this study, naturally available brick material from the Deegawapi area and commercially available AC were used to remove lead (Pb^{2+}) and cadmium (Cd^{2+}) ions from an aqueous solution. To the best of our knowledge, this is the first attempt at, a comparison of AC and bricks in the heavy metal adsorption process and herein, the best adsorbent among these two was determined. The Langmuir and Freundlich adsorption models were used to analyse the equilibrium adsorption data. As a measure of the fit, the coefficient correlation (R_2) was used. The equilibrium data of Pb^{2+} treated with both adsorbents, better fitted to the Langmuir isotherm exhibited higher correlation coefficients ($R_2 \geq 0.90$). The maximum adsorption capacity of Pb^{2+} on AC was remarkably higher as compared to Pb^{2+} on brick samples, with the 303.03 mg g^{-1} maximum adsorption value. Equilibrium data of Cd^{2+} on both adsorbents were fitted to the Freundlich model with the correlation coefficient (R_2) less than or equal to 0.97 ($R_2 \geq 0.97$). From fitted data, Cd^{2+} on AC showed larger K_F values over Cd^{2+} on brick, indicating AC's higher adsorption capacity and affinity towards Cd^{2+} ions. The adsorption of both metal ions on AC followed the pseudo-second-order kinetic model with a correlation coefficient over 0.97 ($R_2 \geq 0.99$) than the pseudo-first-order kinetic model. The Pb^{2+} and Cd^{2+} treated with AC show the maximum concentration adsorption rate (h) of 1.896 mg g^{-1} min and 1.179 mg g^{-1} min, respectively. According to data, AC was determined as the best adsorbent owing to its higher adsorption capacity, better chemical stability, excellent mechanical properties and well-developed mesopores than bricks. Future researchers must focus on the synthesis of AC, containing functional groups and develop this technique for water purification systems.

Keywords: *Activated charcoal, bricks, cadmium ion, lead ion*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-105

Bioactivity of different crude extracts of *Salicornia brachiata*

H.M.N.P. Herath[1], M.N.F. Ifadha[2], D. Perera[2], N.K.B. Adikaram[1], L. Jayasinghe[1*]

[1]*National Institute of Fundamental Studies, Kandy, Sri Lanka*
[2]*Department of Bioprocess Technology, Rajarata University of Sri Lanka, Mihintale, Sri Lanka*

[*]*lalith.ja@nifs.ac.lk*

Salicornia brachiata is a halophytic herb which can be found primarily in salt marshes. It is commercially grown for food, feed, oil seed, pharmaceutical, and nutraceutical purposes in many regions of the world. Chemically, a wide variety of secondary metabolites of economic interest have been previously reported in many *Salicornia* species worldwide. We screened the bioactivity of extracts of a locally available *Salicornia brachiata*: air-dried and powdered shoots sequentially extracted into n-hexane (NH/S/Hs), ethyl acetate (NH/S/Es), and methanol (NH/S/Ms) and roots extracted into the same types of solvents respectively (NH/S/Hr, NH/S/Er, and NH/S/Mr). The extracts were evaluated for antioxidant activity (using 1,1-diphenyl-2-picrylhydrazyl [DPPH]), total phenolic content (TPC) (using Folin-Ciocalteau reagent), cytotoxicity (using the brine shrimp lethality assay), antifungal-activity (against *Cladosporium cladosporioides*), and phytotoxicity (against *Lactuca sativa*). NH/S/HS showed very low antioxidant properties (DPPH, 861 mg l^{-1}), contained very low TPC (7.14 ± 4.91 mg GAE/g) and mildly toxic ($100 < LC50 \leq 500$ μg ml^{-1}). NH/S/Hr displayed low anti-oxidant (DPPH, IC_{50} 523 ± 2 mg l^{-1}) properties and, highly toxic ($LC_{50} \leq 12$ μg ml^{-1}). NH/S/Es displayed strong antioxidant properties (DPPH, IC_{50} 137 ± 4 mg l^{-1}); contained high TPC (32.12 ± 7.04 mg GAE/g), however, displayed higher toxicity ($LC_{50} > 0$ μg ml^{-1}). NH/S/Er moderate antioxidant (DPPH, IC_{50} 173 ± 29 mg l^{-1}) and inhibited *C. cladosporioides*. NH/S/Ms showed law antioxidant properties (DPPH, IC_{50} 412 ± 112 mg l^{-1}), but displayed low toxicity ($500 < LC_{50}$ μg ml^{-1}). NH/S/Mr is moderate antioxidant (DPPH, IC_{50} 175 ± 30 mg l^{-1}); contain high TPC (29.00 ± 15.81 mg GAE/g); moderately toxic ($12 < LC_{50} \leq 100$ μg ml^{-1}) and showed antifungal activity. The *S. brachiata* extracts were negative for phytotoxicity in root and shoot inhibition. *S. brachiata* extracts examined here are potential sources for developing safe antioxidants.

Keywords: *Antioxidant, antifungal, cytotoxicity, phytotoxicity, total phenolic content*

Acknowledgement: *Asian Development Bank (through Science and Technology Human Resource Development Project, Ministry of Education) [ADB STHRDP] is acknowledged for financial support*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-106

Enzyme inhibitors from an endophytic fungus associated with *Myristica fragrans*

K. Samarakoon[1], T. Heenkenda[1], C. Jayasooriya[1], E.A.I.A. Perera[1], D. Yakandawala[2], N.S. Kumar[1], N.K.B. Adikaram[1], L. Jayasinghe[1*], H. Araya[3], Y. Fujimoto[1,3]

[1]*National Institute of Fundamental Studies, Kandy, Sri Lanka*
[2]*Department of Botany, University of Peradeniya, Peradeniya, Sri Lanka*
[3]*School of Agriculture, Meiji University, Kawasaki, Japan*

[*]*lalith.ja@nifs.ac.lk*

Myristica fragrans (Nutmeg) of the family Myristicaceae is a popular spice used worldwide and known to be rich in bioactive compounds and natural enzyme inhibitors. Endophytic fungi are searched for their potential to produce bioactive metabolites due to their symbiotic association with plants. This study was conducted to isolate and investigate the enzyme inhibitory activities of secondary metabolites of an endophytic fungus associated with *M. fragrans.* An endophytic fungus was isolated from triple sterilized fresh leaves of *M. fragrans* collected from Central Province, Sri Lanka. Pure culture of an emerged fungus was inoculated to Potato Dextrose Broth and kept for 21 days with shaking at room temperature. The broth was filtered and extracted to EtOAc and mycelium was separately extracted to EtOAc followed by MeOH. EtOAc extract was separated using chromatographic techniques (Silica gel column, Sephadex LH-20, HPLC, PTLC) to furnish four pure compounds and their structures were elucidated using NMR spectra and reported data. The endophytic fungus obtained was tentatively identified as *Phyllosticta* sp. by amplification of ITS regions of the fungal rDNA gene. Further identification using other gene regions is in progress. The isolated compounds were aurasperone F (**1**), foncesin B (**2**), rubrofusarin B (**3**) and 4-methoxy-6-(2-methyl-1-oxopropyl)-2H-pyran-2-one (**4**). Compounds were screened for enzyme inhibitory activities against α-glucosidase, acetylcholinesterase and lipase enzymes. Compounds **1**, **2**, and **3** showed high α-glucosidase inhibitory activity with IC_{50} values of 16.13 mg l^{-1}, 15.66 mg l^{-1} and 15.29 mg l^{-1} respectively. Positive control Acarbose showed IC_{50} of 107.76 mg l^{-1}. Compound **3** resulted in high acetylcholinesterase inhibitory activity (IC_{50} 70.29 mg l^{-1}) whereas **2** showed mild activity for acetylcholinesterase inhibition with IC_{50} 310.82 mg l^{-1}. Compound **1** showed very low acetylcholinesterase activity. Positive control Donepezil showed IC_{50} of 0.03 mg l^{-1}. Compound **2** had moderate lipase inhibitory activity with IC_{50} 131.53 mg l^{-1}. Positive control Orlistat showed IC_{50} of 3.125 mg l^{-1}. Results suggest the potential of this endophytic fungus as a source of natural enzyme inhibitors.

Keywords: *α-glucosidase, acetylcholinesterase, Myristica fragrans, secondary metabolites*

Acknowledgement: *Financial assistance from National Science Foundation (Grant No: RG/2017/BS/06) is gratefully acknowledged*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-110

Chemical quality of groundwater with high fluorides in Hambanthota district villages, Sri Lanka

W.G.D. Chathurangi[1], D.M.T.L. Dasanayaka[1], J.A.T.C. Ariyasena[2*]

[1]*Department of Industrial and Environmental Sciences, University of Peradeniya, Peradeniya*
[2]*Department of Chemistry, University of Peradeniya, Peradeniya, Sri Lanka*

[*]*jatca@sci.pdn.ac.lk*

Groundwater is a major drinking water source throughout the world due to little pollution from anthropogenic sources. Due to the long residence time, the groundwater is enriched with high solute concentrations. This effect is critical in tropical regions of the world due to intense weathering. We selected 3 villages from Sri Lanka Hambantota: Medamulana, Galsiyambalayaya and Warayaya known for dental and skeletal fluorosis and as adversely affected by the non-availability of fresh water, to determine pH, electrical conductivity, salinity and fluoride ion concentration for ten months. The pH and EC of the water samples were determined by a multi-parameter detection method. TDS was calculated from EC data. The fluoride concentrations were determined by ion chromatographic method. Atomic absorption spectroscopic method was used for detection of Ca^{2+} and Mg^{2+}. Variations of temperature, pH, TDS, salinity and electrical conductivity (EC) were (24.0 °C to 32.0 °C), (7.50 - 8.90), (68 mg l^{-1} to 1340 mg l^{-1}), (51 mg l^{-1} to 947 mg l^{-1}), and (96 µS cm^{-1} to 1886 µS cm^{-1}), respectively. Fluoride concentration in the Medamulana, Galsiyambalayaya and Warayaya are varied in the range of (0.5 mg l^{-1} to 1.4 mg l^{-1}), (0.5 mg l^{-1} to 3.5 mg l^{-1}) and (1.8 mg l^{-1} to 3.5 mg l^{-1}) respectively, and exceeded the WHO limit of 1.5 mg l^{-1}. Total hardness in the selected areas varied from (250 mg l^{-1} to 670 mg l^{-1}), (100 mg l^{-1} - 700 mg l^{-1}) and (500 mg l^{-1} - 1100 mg l^{-1}) respectively, and almost all the sites exceeded WHO recommended limit of 180 mg l^{-1} in most months. Saltwater intrusion may be the reason for the high salinity and high EC in months of October in 2020 and January, March, April, June, July and October in 2021. Our results show that precautionary measures should be taken in this region by the relevant authorities to prevent people from overexposure to fluoride, calcium, and magnesium ions through drinking water.

Keywords: *Dental fluorosis, groundwater, saltwater intrusion, skeletal fluorosis, Sri Lanka*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-114

Free radical scavenging and metal chelation potential of methanolic extracts of *Annona muricata* leaf and seed materials

N.I.S. Dilshan[1], S.K. Rodrigo[1*]

[1]*Department of Chemistry, The Open University of Sri Lanka, Nawala, Sri Lanka*

[*]*srodr@ou.ac.lk*

Oxidative stress is a condition which leads to numerous pathological issues in the human body and it is accelerated by ferrous ions. All parts of *Annona muricata* are extensively used in traditional medicines. However, the activities of phytochemicals partly depend on the extraction method and type of plant material. In our work, methanol extracts of leaves and seeds of *A. muricata* obtained using Soxhlet, sonicator and bottle-shaker extraction methods were examined for Ferrous chelation activity and antioxidant capacity. 1000 mg l^{-1} concentration of all dried extracts were prepared in methanol. The Ferrous chelation activity is reported as percentage inhibition of 1,10 – Phenanthroline – Fe^{2+} complex using EDTA as the positive control. The antioxidant capacity is reported as the percentage inhibition of DPPH using ascorbic acid as the positive control. The Soxhlet method gave the highest yield percentages for both leaf (20.08%) and seed (32.35%) extracts. Leaf extract obtained using the sonicator method was found to have the highest ferrous chelating capacity (53%) while the leaf extract prepared by the shaker method showed 50% and 47% observed for the leaf extract-soxhlet method. Seed extract obtained using the Soxhlet method showed 39% as the highest activity among seed extracts while the seed extract obtained from the sonicator method showed 32% and 28% observed for the seed extract-shaker method. EDTA showed 85% ferrous chelation activity at 1000 mg l^{-1}. All leaf extracts were found to have a promising antioxidant capacity range within 91-93% while ascorbic acid showed 97% at 1000 mg l^{-1}. But all seed extracts gave weak antioxidant activities and seed extract obtained using Soxhlet showed 55% as the highest activity among seed extracts. *A. muricata* leaf has a significant antioxidant capacity and moderate ferrous chelation potential while the seed has moderate antioxidant activity and marginal ferrous chelation potential. The Soxhlet method is preferable for studies of both extracts in terms of yield percentage and bioactivities.

Keywords: *Annona muricata, antioxidant, iron chelation*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-116

Bioactive secondary metabolites from an endophytic fungus associated with *Gymnema sylvestre*

L. Jayawardana[1,2], K. Samarakoon[1], T. S. Kumarathunge[1], D. Yakandawala[3], M. N. Wickramaratne[2], N.S. Kumar[1], N.K.B. Adikaram[1], L. Jayasinghe[1*], H. Araya[4], Y. Fujimoto[1,4]

[1]*National Institute of Fundamental Studies, Kandy, Sri Lanka*
[2] *Faculty of Applied Sciences, Sabaragamuwa University of Sri Lanka*
[3]*Department of Botany, University of Peradeniya, Peradeniya, Sri Lanka*
[4]*School of Agriculture, Meiji University, Kawasaki, Japan*

[*]*lalith.ja@nifs.ac.lk*

Gymnema sylvestre R.Br. (Masbedda) of Asclepiadaceae family is a medicinally important plant with many therapeutic effects, mainly antidiabetic property. Endophytic fungi live symbiotically within plants, produce secondary metabolites with a broad range of bioactivities and have emerged as alternative sources of bioactive compounds. This study was conducted to isolate and investigate the enzyme inhibitory activities of secondary metabolites of an endophytic fungus associated with *G. sylvestre.* Fresh leaves of *G. sylvestre* were collected from the Central Province, of Sri Lanka. Small segments (5×5 mm) were triple sterilized, placed on Potato Dextrose Agar and incubated at room temperature. Endophytic fungus obtained was tentatively identified as *Colletotrichum* sp. by amplification of ITS regions of fungal rDNA gene. Further identification by other gene regions is in progress. Pure culture of endophytic fungus was inoculated into Potato Dextrose Broth, and kept for 21 days with shaking at room temperature. Then medium was filtered and filtrate was partitioned with Ethyl acetate (EtOAc). Mycelium was separately extracted with EtOAc. Both EtOAc extracts were combined based on similar TLC patterns. Chromatographic separation (silica gel column, Sephadex LH-20, HPLC, PTLC) of EtOAc extract furnished three compounds cytidine (**1**), uridine (**2**) and acropyrone (**3**). Their structures were elucidated by Nuclear Magnetic Resonance. All compounds were screened for enzyme inhibitory activities. Cytidine (**1**) and acropyrone (**3**) showed high α-glucosidase inhibitory activity with IC_{50} 8.75 mg l^{-1} and 6.29 mg l^{-1} respectively. α-amylase inhibitory activity was not detected in any of the compounds. Cytidine (**1**) showed high acetylcholinesterase inhibition with IC_{50} 22.07 mg l^{-1}. Uridine (**2**) and acropyrone (**3**) showed low inhibitory activity against acetylcholinesterase enzyme with 7015.87 mg l^{-1} and 1521.59 mg l^{-1} IC_{50} values respectively. Compounds **1** and **2** showed mild lipase inhibition with IC_{50} of 894.49 mg l^{-1} and 647.89 mg l^{-1} respectively. These findings suggest that this endophytic fungus produces secondary metabolites with enzyme inhibitory activities which can be used as potential drug leads.

Keywords: *Enzyme inhibitors, Gymnema sylvestre, secondary metabolites*

Acknowledgement: *Financial assistance from National Research Council (Grant No: NRC-17-054) is gratefully acknowledged.*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-119

Cytotoxicity and free radical scavenging capacity of aqueous fruit extract of *Dillenia retusa*

H.M.C.K Herath[1], S.K. Rodrigo[1*], N.K.B. Adikaram[2], L. Jayasinghe[2]

[1]*The Open University of Sri Lanka, Sri Lanka*
[2]*National Institute of Fundamental Studies, Kandy, Sri Lanka*

[*]*srodr@ou.ac.lk*

The *Dillenia retusa* (Dilleniaceae), "Godapara", is an endemic plant to Sri Lanka. According to the literature this plant is extensively used in traditional medicines against an array of human ailments and diseases. In this work, a hot aqueous extract of the fruit of *D. retusa* was evaluated for its cytotoxicity and free radical scavenging capacity. The extract was evaluated for its potential free radical scavenging capacity using two different in vitro methods: DPPH (2,2-diphenyl-1-picrylhydrazil) assay in which the antioxidant activity is reported as percentage inhibition of DPPH, total phenolic content was determined with Folin-ciocalteu method. Cytotoxicity was screened against brine shrimp (*Artemia salina*). The extract showed 74% antioxidant activity at 500 mg l^{-1} and the IC_{50} was 180.0 ± 5.3 mg l^{-1} while it showed weak cytotoxicity (LC_{50} = 735.94 ± 8.7 mg l^{-1}). Total phenolic content turned out to be 39 mg g^{-1} gallic acid equivalent (GAE) g^{-1}. The results indicate the presence of free radical scavenging principles with *D. retusa*. Further, low cytotoxicity warrants the use of such extracts in prophylaxis.

Keywords: *Cytotoxicity, gallic acid standard curve, pharmacology, radical scavenging capacity*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-120

Synthesis and characterization of zinc oxide (ZnO) nanorods confined in LTA zeolite by post-synthetic hydrothermal encapsulation approach

M.D.R. Perera[1*], W.M.A.T. Bandara[2], R. Weerasooriya[1], I.P.L. Jayarathne[1]

[1]*National Institute of Fundamental Studies, Kandy, Sri Lanka*
[2]*Faculty of Science, University of Peradeniya, Peradeniya, Sri Lanka*

[*]*dilini.pe@nifs.ac.lk*

Recently, 1D ZnO nanorods have attracted intensive research attention due to their outstanding properties, such as high electron mobility in the growth direction, high surface-to-volume ratio, and good thermal and chemical stability. However, due to the higher presence of active surface atoms, deactivation (dramatic decrease in stability) by secondary nucleation and recrystallization, as well as aggregation during the fabrication process tend to limit their practical applications. Therefore, the stabilization of ZnO nanorods has emerged as a challenging area of research. This study aimed to confine and stabilize ZnO nanorods inside the porous structure of LTA-type zeolites. A modified post-synthetic hydrothermal encapsulation approach was used to synthesize LTA-encapsulated ZnO nanorods where, pre-synthesized LTA zeolites are introduced into the ZnO nanorod synthesis precursor medium, followed by the hydrothermal crystallization. The resulting materials were characterized by scanning electron microscopic (SEM) and powder X-ray diffraction (p-XRD) techniques. The scanning electron micrographs (SEM) revealed the formation of rod-shaped ZnO nanomaterials in the LTA zeolite confinement with much smaller nanorod diameters (~20 ± 5 nm) when compared to those of bare ZnO nanorods synthesized (~200 ± 5 nm). Further, the majority of ZnO nanorods were in a well-separated manner, which implies an increased surface area. Moreover, the p-XRD results confirm the successful synthesis of ZnO nanorods, which are in good agreement with those of the hexagonal symmetry and wurtzite structure. Interestingly, after the ZnO impregnation, the sample still maintains good crystallinity (78%) and the LTA zeolite structure has not been altered. Furthermore, the absence of additional peaks other than LTA zeolite and ZnO nanoparticles in the p-XRD suggests the phase purity of the resulting material. In conclusion, the study suggests the modified hydrothermal confinement approach as a reliable method to synthesize ZnO nanorods confined in LTA zeolites that would have prospective applications.

Keywords: *Confinement, hydrothermal, LTA zeolite, nanorods, ZnO*

SOCIAL SCIENCES

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-019

Evidence of the continuation of gendered space in the modern world: A case of air navigation field in Sri Lanka

K.I.C. Weerawardana[1], L.B. Dunsford[2*]

[1]*Department of Management & Business Organization Studies, Faculty of Management & Finance, University of Colombo, Colombo, Sri Lanka*
[2]*Department of Plantation Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), Sri Lanka*

[*]*dunsfordlb@wyb.ac.lk*

The present scenario witnesses many gender disparities for women in their jobs which are normalized to be operated as masculine. In this gendered space, studies have found that women face many difficulties to succeed in their careers. Aviation is such an industry that was established as masculine and progressively diluted to absorb women into specific jobs. However, Air Navigation is one of the few fields in aviation that witnessed this change at a relatively gradual pace. Consequently, the masculine space is strongly visible in the air navigation field even in the present day. In this study, exploring the gendered space in the air navigation field was done under the qualitative approach as a case study from an interpretive epistemology. The findings of the study are based on the in-depth interviews of nine participants - selected purposively, and reflexive accounts of the researcher's over 25 years of experience in the air navigation field. Through the theoretical lenses of gendered organization and the production of space, results show that gender inequality, lack of empowerment of women, lack of social support from the division, managers, and family, and stereotyping are the current situations and challenges faced by women in air navigation field, often leading them to frustration and quit. This study contributes to the debates on gendered organizational space from a non-western context. The findings of the study will have implications for managers in the way they view organizational space from women's point of view, the policies and practices that would garner the support of female employees, through human resource development, career enhancement, and recruitment policies of the organization.

Keywords: *Gendered organizations, imaginary space, organizational space, physical space, production of space*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-020

Performance management of agriculture research in Sri Lanka: Organizational dynamics in operationalizing key performance indicators (KPIs)

K.B. Madhushani[1*], P.C. Abeysiriwardana[2], U.K. Jayasinghe-Mudalige[1]

[1]*Department of Agribusiness Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP)*
[2]*Ministry of Education (Research and Innovation), Sethsiripaya Stage I, Battaramulla, Sri Lanka*

[*]*stcmadushanik@gmail.com*

Key Performance Indicators (KPIs) play an essential role in evaluating a set of Key Performance Drivers intended to achieve the vision of an organization that depends on the targets established through SMART objectives. The focus of this study was to assess the current status of the implementation of KPIs in agriculture-oriented research institutes in Sri Lanka and to identify the gaps in relation to the efficient execution of such a performance management system. The top administrative officers attached to those research institutes were approached via semi-structured personal interviews supported by an Online Video Conferencing Facility. Qualitative research methods were applied to the thematic analysis of data, where the MAXQDA 2022 software was operated in particular to evaluate respondents' expressions obtained in the form of attitudinal statements to reflect 15 inquiries covering some important aspects of KPIs (e.g. formulating, establishing, measuring). The outcome of the analysis revealed significant relationships exposing several conclusive themes, i.e., "Technology Integrated Performance Management Systems"; "Research for Society"; "Institutional Research Management"; "Research Collaboration", and "Research Commercialization". These imply that technology adoption is a key to improving the performance of Sri Lanka's agricultural research system, and warrants stimulating associations among the conclusive themes emphasized in such an attempt to generate more policy directives on research performance management.

Keywords: *Commercial agriculture, key performance indicators (KPIs), organizational dynamics, research management*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-038

Assessment of nutrition literacy and accuracy of nutrition journalism in selected social segments of Sri Lanka

C.H.M.Y.R. Chandrasekara[1], M.A. Jayasinghe[1*], M.A.D. Mallikarachchi[1], S.P.A.S. Senadheera[2], S. Weerasinghe[3], S.M. Zahra[4]

[1]*Department of Food Science and Technology, Faculty of Applied Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka*
[2]*Department of Biochemistry, Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka, Saliyapura, Sri Lanka*
[3]*Department of Sports Science, Faculty of Applied Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka*
[4]*Department of Environmental Design, Health and Nutritional Sciences, Allama Iqbal Open University, Islamabad, Pakistan*

[*]*madhurasci@sjp.ac.lk*

The level of nutrition literacy is often discussed as a factor in maintaining health and preventing non-communicable diseases. Written articles in newspapers, magazines, and the internet are common sources for nutrition information and the scientific accuracy of the majority of these articles is problematic. People's cognitive ability to understand nutrition literature is a potential factor for nutrition literacy. The primary objective of the study was to determine nutrition literacy, cognitive ability to understand nutrition information and nutrition reporting accuracy in Sri Lanka. Electronic questionnaires were used to assess the nutritional literacy and the cognitive ability to understand the nutrition information of the study population (N = 123, 80 respectively). Associations between the variables (generation, using media) were assessed statistically using Pearson's chi-square test, Mann-Whitney U test, and Kruskal-Wallis's test. The scientific accuracy of selected articles was evaluated by a committee of 4 experts having PhD or above qualifications. Not enough evidence was found to suggest an association between generations and the nutrition literacy levels, ($p = 0.209$) and there was no evidence to support a difference between the nutrition literacy scores of the two generations ($U = 1115.00$, $N1 = 96$, $N2 = 27$, $p = 0.264$, two-tailed). A significant difference was found between the nutrition literacy scores for frequent and occasional blog readers ($U = 1246.00$, $N1 = 75$, $N2 = 48$, $p = 0.004$, two-tailed). No significant difference was found in overall scientific accuracy between the article groups (Kruskal-Wallis's statistic = 5.17, $p = 0.395$). There was a significant difference in unbiased reporting between the article groups (Kruskal-Wallis's statistic = 11.286, $p = 0.046$). Not enough evidence was found to suggest an association between generations and cognitive ability to understand and answer the questions based on the provided nutrition information ($p = 0.200$). Nutrition literacy as well as the cognitive ability to understand nutrition information are non-associated with the generations among the population. The scientific accuracy of the nutrition literature was non-associated with the concerned article category groups.

Keywords: *Food literacy, nutrition journalism, nutrition literacy, nutrition reporting*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-040

Youth empowerment on climate action in Sri Lanka: Addressing challenges and opportunities

A. Suresh[1*], K. Suresh[2]

[1]*Ocean University of Sri Lanka, Colombo 15, Sri Lanka*
[2]*Open University of Sri Lanka, Nawala, Sri Lanka*

[*]*ahalyaa@ocu.ac.lk*

As youth are at the forefront of climate change impacts, it is vital to understand their awareness, capacity and willingness to address the issue. The research aims to identify the opportunities and challenges youth face to engage in the climate action agenda in Sri Lanka. This research used a mixed methods approach that allows the study to build upon the strengths and compensate for the weaknesses inherent in different strategies. A cohort of 239 youth of ages 18 - 35 were invited to an online webinar on capacity-building on climate action and was asked to fill out an online survey. Focus group discussions contributed towards qualitative data collection regarding the status of Sri Lankan youth engagement in climate action. Participants of the webinar represented youth from all 9 provinces, with the majority from the Western province (17%). Most respondents (42%) were between 18-25 years of age, with the sex distribution relatively similar with 51% of females and 48% of males. The findings from the survey revealed, an overwhelming majority (96%) found it is important for youth in Sri Lanka to engage in climate action. While 42% of the participants are currently involved in climate action, 55% of the remaining respondents stated they are willing to get involved. Awareness creation and outreach (23%), climate education (19%), and training and capacity building (17%) were the key opportunities highlighted by youth to be played in climate action. Further, during the discussion, they pointed out multiple challenges faced and opportunities available for them across four key areas including awareness and climate education (30%), environmental factors (26%), access to finance (23%), and technical factors (21%). The outputs from the study can be used by respective stakeholders to develop training and capacity building for youth to fight against climate change.

Keywords: *Capacity development, climate action, climate change, empowering youth, Sri Lanka*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-058

The portrayal of physical disability in selected Jataka Tales: a critical analysis

P.V.S.S. Ranthilini[1*]

[1]*University of Ruhuna, Matara, Sri Lanka*

[*]*ranthilinivithanage@gmail.com*

Religious texts such as Buddhist Jataka Tales (BJTs) hold a dominant position in their respective cultures and often serve a didactic purpose. The literature shows that BJTs have been studied by multiple scholars focusing on various aspects such as the maritime imagery and the woman figure in BJTs. However, a lacuna exists regarding studies focusing on disability in BJTs. This research addresses the said lacuna by studying the portrayal of physical disability in BJTs. Accordingly, the research objective is to critically analyze the depiction of physical disability in BJTs. The research adopts a qualitative methodology and a textual analysis of the selected BJTs was conducted. Mile's annotated bibliography (2013) was used to identify the BJTs featuring characters with physical disabilities. Out of the identified BJTs, seven were randomly selected as primary data. They were interpreted using a theoretical framework comprising models of disability and ableism. The research suggests that BJTs present disability as caused by sins committed in past lives, thereby promulgating the religious understanding of disability. The Jataka storyteller characterizes people with disabilities (PWDs), with the notable exclusion of the Bodhisatta character, as incapable and requiring assistance, highlighting disability as a personal tragedy arising from individual deficits. The research further finds that the exclusion of disability from the ableist society that mandates compulsory able-bodiedness is portrayed through the BJTs. The liberation of disabled sexuality from the binary conception of asexuality and hypersexuality can be understood as the progressive element in BJTs. However, this liberation is contested in itself as it contributes to a larger narrative relating to the immorality of PWDs. Thus, the research concludes that the BJTs portray physical disability in a negative light and suggests the exploration of disability in BJTs with regard to the construction of the disabled Bodhisatta character for future research.

Keywords: *Buddhist Jataka tales, Pansiya Panas Jataka Katha, physical disability, textual analysis*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-061

The trend of fertilizer usage by paddy farmers in Ampara district, Sri Lanka

A.M.M. Asmath[1*], M.N.F. Nashath[1]

[1]*Department of Biosystems Technology, Faculty of Technology, South Eastern University of Sri Lanka*

[*]*mohamedasmath@seu.ac.lk*

Paddy farmers have abandoned the systematic method of fertilizer application and inappropriate usage of fertilizers has challenged human and environmental health. Hence, it is vital to comprehend the trend of fertilizer usage by farmers to prevent excessive application. Therefore, a survey was conducted from April to August 2021 among 296 commercial male paddy farmers in the Ampara district to study their fertilizer usage trend. There were four distinct methods that farmers used to fertilize their farms. During seed sowing 58% of farmers applied TSP, followed by NPK mixture, cow and goat dung, while 32% of the farmers did not apply any fertilizer and instead of it they increased tillage, burned their fields, and created water ponds to retain moisture in their fields. Very few farmers took no action at this point. Most of the farmers (67%) applied only urea while the remaining applied different varieties of fertilizers with urea 14 to 21 days after sowing. Farmers used varieties of fertilizer mixtures depending on the state of the rice plant. Additionally, farmers who did not use TSP during the sowing period did so now. After 28 to 30 days of sowing, 73% of the farmers added urea, while others used a mixture of urea with discovery/ microvee/TSP/Ammonium sulfate. During 35 to 40 days following sowing, 92% of the farmers used a mixture of urea with MOP, whereas the remaining used different varieties of mixtures with urea. In addition to these, wealthy farmers applied additional urea to raise production, while some used TSP sparingly throughout the aforementioned times. Based on this study, most of the farmers applied a higher amount of urea and TSP than the recommended level. Hence, it is suggested to educate the farmers about the importance of fertilizer usage efficiency compared to fertilizer usage intensity.

Keywords: *Ampara district, fertilizer, paddy farmers, seed sowing*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-079

Association of environmental stressors and perceived stress of undergraduates: A cross-sectional study

M.V.N. Gunawardhana[1], H.G.G. Rathnamali[1], M.H. Mohamed[1], K.M.W.M.L. Meerigama[1], S.W.S.S. Jayalath[1], K.M.H.H. Kulatunga[1*], D.L.N.L. Ubhayawardana[2]

[1]*Department of Biomedical Science, Faculty of Health Sciences, KIU, Sri Lanka*
[2]*Department of Basic Science, Faculty of Nursing, University of Colombo, Sri Lanka*

[*]*hiroshani@kiu.ac.lk*

Undergraduates are exposed to different types of stressors including environmental stressors. These include environmental challenges that are not directly related to academics, namely automotive or transportation, computer problems and crowded traffic, messy living conditions, etc. These factors were highly altered during the COVID-19 pandemic, and they influenced the students' lives immensely. Therefore, this study was conducted to examine the level of perceived stress and its association with environmental stressors among undergraduates at Kaastu International University (KIU). A descriptive cross-sectional study was conducted enrolling 235 undergraduates from KIU. Ethical approval was obtained from the ethics review committee of KIU and informed written consent from each participant. A pre-tested self-administered questionnaire consisting of a perceived stress scale and selected environmental stressors was circulated online with a simple random sampling approach. The majority of the participants were females (67.65%) and 96.17% were between 18-30 years. Seventy percent (70%) of the respondents reported having mild to high levels of perceived stress. Fifty percent of the participants reported having high levels of environmental stressors while 45% and 4% reported moderate levels and low levels of environmental stressors respectively. It was found that there was a significant association between environmental stressors and perceived stress ($p = .0001$). Environmental factors have significantly affected the perceived stress of KIU undergraduates. It is vital to implement stress management strategies.

Keywords: *COVID-19, environmental stressors, perceived stress, undergraduates*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-087

Development of Sunflower (*Helianthus annuus*) oil and Kithul (*Caryota urens*) treacle incorporated set yoghurt

A.S. Hettige[1*], S.H.P. Malkanthi[1], S.H. Karunarathna[2]

[1]*Department of Agribusiness Management, Faculty of Agricultural Sciences, Sabaragamuwa University of Sri Lanka*
[2]*Milco Private Limited, Digana, Kandy*

[*]*sandamini178@gmail.com*

Recently, there has been a growing interest among consumers to try out innovative products with natural, nutritious ingredients and additional health benefits. Thus, this is an attempt to develop a new variety of set yoghurt using vegetable oil as a milk fat replacer and with low added sugar. The main objectives of this study were to develop a sunflower oil and Kithul treacle incorporated set yoghurt with higher organoleptic acceptability and determine the shelf life by evaluating its physicochemical and microbial properties. The study was conducted in 3 phases. In phase 1, yoghurt samples with 50%, 60%, 70%, and 80% sunflower oil out of the final fat percentage (3%) were developed to determine the best sunflower oil incorporation. The sample with 50% (w/v) sunflower oil was chosen as the best percentage with highly acceptable organoleptic properties from the sensory evaluation. In phase 2, five yoghurt samples were developed with 0:1, 1:1, 2:1, 1:2, and 1:0 sugar: Kithul treacle ratios to determine the best ratio to incorporate into set yoghurt by a sensory evaluation using 20 panellists. The sample with a 0:1 (sugar: Kithul) ratio was chosen as the best, with the highest mean values for all the organoleptic attributes. In phase 3, those five samples were analyzed for their physicochemical and microbial properties during refrigerated storage at 4 °C for 20 days at five days intervals. Physicochemical properties were significantly different ($P < 0.05$) among the samples. The shelf life of the samples was determined as 15 days with the microbial parameters. The sample with 50% (w/v) sunflower oil and 0:1 (sugar: Kithul treacle) ratio was chosen as the best sample from all evaluated attributes as the main finding of this study. The product was successful at the laboratory level. Therefore, a consumer survey has to be conducted before commercial-level production.

Keywords: *Microbial parameters, milk fat replacer, physicochemical properties, product development, sensory properties*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-108

Biodynamic farmer's perceptions of biodynamic farming

K.M.R.M. Navoda[1*], G.H.I. Anjalee[1], P.G.W. Dutuwewa[2], W.A.L.S. Boyagoda[3]

[1]*Wayamba University of Sri Lanka, Makandura, Sri Lanka*
[2]*Bio Foods (Pvt)Ltd, Kandy, Sri Lanka*
[3]*University of Peradeniya, Peradeniya, Sri Lanka*

[*]*madushi.m.navoda@gmail.com*

Biodynamic farming is an advanced organic farming technique that increases crop yield and quality in a sustainable manner. Biodynamic farmers play a major role in increasing foreign exchange in developing countries such as Sri Lanka, as most foreign buyers give a premium for certified biodynamic products. Demeter is an international certification label that use to verify biodynamic farming in many countries including Sri Lanka. Although a lot of benefits are associated with this, at present most biodynamic farmers tend to detach from biodynamics. Most of them got disqualified for their certifications due to their different levels of knowledge and perception of biodynamic farming. Thereby, this study aims to identify their demographic factors, preferred information sources, and perceptions of biodynamic farmers in relation to their knowledge of specific biodynamic farming strategies. A simple random sampling technique was applied to select 65 biodynamic farmers in the Kandy district, Sri Lanka. The data were analyzed using descriptive statistics and Chi-Square Test. Chi-Square Test was used to find whether there is a significant relationship between the biodynamic farmers' knowledge of biodynamic farming and their perception of biodynamic farming. Results show that biodynamic farmers in the study area are mostly male, married, above 51 years, and without formal education. Their most preferred sources of information are NGO representatives, family members who have biodynamic experience from previous generations, and farmer associations. Farmers with high knowledge of biodynamic farming have a favourable perception of biodynamic farming. Results further show that significant relationships exist between knowledge of biodynamic farming and biodynamic farmers' perception of biodynamic farming. According to the results, it can be suggested that biodynamic farmers should be motivated through knowledge-based training and mechanisms to exchange farmers' knowledge using their most preferred information sources to ensure retain biodynamic farming in the future.

Keywords: *Demeter, information sources, knowledge, organic*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-115

The emergence of water management in farming systems in the early world: Maya, Aztec and Mesopotamian civilizations

S. Kulathunga[1*], U. Perera[1], C. Udawattha[1]

[1]*Department of Estate Management and Valuation, Faculty of Management Studies and Commerce. University of Sri Jayawardhanapura*

[*]*sadani.kulatunge@yahoo.com*

Due to the lack of food in metropolitan areas, urban gardening is becoming more prevalent and it is seeing a popularity resurgence that started decades ago. It is now widely recognized and regarded as a way to achieve several environmental, financial, and social benefits. With limited resources available to the urban population, obstacles to urban farming are prevalent, including space, water, and fertilizers. In recent years, due to insufficient rain, desertification, and other climatic changes, many agricultural activities are depleting. However, ancient civilizations managed these resources efficiently to produce necessary crops. Therefore, it is crucial to record the many urban agricultural methods that early civilizations used. The objective of this study is to understand how civilizations have to manage their agricultural management systems to keep up with the rising urban population. The Urban farming and civilization-related words and keywords were separated into 3 groups, Mayan Civilization, Aztecs Civilization, and Mesopotamian Civilization to organize the database. Following that, a set of various keyword combinations for both "history" and "Urban farming" were searched using the online databases Scopus, ScienceDirect, and ISI Web of Science (WoS) were chosen. 60 papers were curated and gathered. According to the resulting literature, early civilizations not only had all the necessary tools for urban farming but also had a deep understanding of water and soil management. The majority of early civilizations had various techniques for carrying out urban and communal farming in constrained areas.

Keywords: *Water management, urban agriculture, urban farming*

Acknowledgment: *This research was financially supported by the Research Council, University of Sri Jayewardenepura, research grant no: ASP/01/RE/MGT/2022/43*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-121

Study on the attitudes towards sexually transmitted diseases among undergraduates of KIU, Sri Lanka

M.F.S. Minnath[1], M.G.P.A. Gunarathne[1], W.L.M. Alwis[1], M.F.F. Fasmila[1], R.M.S. Fernando[1], V.D.R. Tharindu[1], M.K.A. Sampath[2], K.M.H.H. Kulathunga[1*]

[1]*Department of Bio Medical Science, Faculty of Health Sciences, KIU Sri Lanka*
[2]*Sri Lanka institute of Bio Technology-Colombo, Sri Lanka*

[*]*hiroshani@kiu.ac.lk*

WHO predicted more than 1 million STDs (Sexually Transmitted Diseases) were asymptomatic in 2020. The young adult population (18-30 years) of the Colombo district is at a higher risk for STDs compared to the older population. It is due to the influence of peer pressure and the urge to experiment with sexual activity. To prevent the condition from spreading among young adults, it is important to evaluate the level of attitude toward STDs. At KAATSU International University (KIU), a descriptive cross-sectional study was done, enrolling 390 undergraduates. Data was collected using a self-administered questionnaire. Ethical approval for the study was obtained from the ethics review committee of KIU (KIU/ERC/2021/2022). The SPSS Software, Version 25.0 was used for statistical analysis. The levels of attitudes were determined using Bloom's cutoff values. A total score of 22-24 was considered, a good level of attitude while 20 to 22 is moderate and below 20 a poor level of attitude. 265 of the 390 participants were female, and 125 were male. Most females had a favourable attitude about taking precautionary measures to avoid STDs. (n = 118, 44.5%) and male (n = 53, 42.4%) undergraduates had a good level of attitude. Moderate level of attitudes was observed in 29.4% (n = 78) of females and 30.4% (n = 38) of males while poor level of attitudes was observed in 26% of females (n = 69) and 27.2% of males (n = 34). Statistically, a significant association was not observed between the attitude levels of male and female participants and between the faculty of health sciences and non-health sciences students ($p < 0.05$). Religion, marital status and academic year showed a statistically significant association with attitude. Additional awareness of STDs is required for male young adults and non-health science students to prevent the future spreading of STDs by enhancing their attitude level.

Keywords: *Attitudes, STD, undergraduates*

Acknowledgement: *Authors would like to acknowledge the KIU, Sri Lanka*

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2022
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
10th November 2022

Paper ID: CMT-122

Secret scars and bitter truths of being sub-fertile: Confessions of men on their impaired fertility experience and therapeutic negotiations

J.A.P.S. Perera[1*]

[1]*The Open University of Sri Lanka, Nawala, Nugegoda, Sri Lanka*

[*]*japer@ou.ac.lk*

Having children is highly desirable in the context of Sri Lanka due to strong gender and pronatalist norms. Further, having genetically related progeny is a significant element of Lankan family life. Consequently, impairment in fertility becomes a frantic circumstance for both men and women, and they tend to go to any extent of diagnostic and therapeutic options available to conceive a child. Although male-factor infertility (MFI) is a major cause of childlessness, scholarship on infertility primarily focuses on women, from women's perspective. Hence, there is a paucity of efforts to understand the infertility experience from the perspective of men. Therefore, from a qualitative approach, this study explored the MFI from the perspective of men with impaired fertility. Ten men from two state sector subfertility clinics in Colombo were purposively chosen for in-depth interviews, and a thematic analysis technique was manually used to analyse data. Analysis recognized five key themes: a) awareness of men on MFI, b) defensive and dismissive reactions to a diagnosis of MFI, c) coping with MFI, d) secretive and manipulative therapeutic pursuits, and e) implications for fertility care service providers. Results revealed that men were defensive and dismissive of the diagnosis of MFI, devastated by a deep feeling of emasculation and losing vigour, attempting to conceal fertility impairment from their kins and social networks. Denial and concealment of MFI have negatively affected timely fertility treatment seeking which has consequently affected their women. Men confessed that they were manipulative in their therapeutic pursuits from folk therapies to new procreative technologies by avoiding diagnosis tests, deliberately delaying treatments, and attempting to negotiate with hospital staff to manipulate treatment procedures such as changing or mixing sperm samples without the consent of wives. Hence these findings are insightful from a fertility care service provision perspective in terms of fertility counselling and making fertility awareness.

Keywords: *Gender, male-factor-infertility, procreative technologies, Sri Lanka, subfertility*

.

AUTHOR INDEX

.

.

.

V

W

Y

Z

මොකක්ද මේ "BOC SmartPay" කියන්නේ?

මුදල් භාවිතයෙන් තොරව Smart Phone එක මගින් QR Code Scan කර ඉතාම පහසුවෙන් ගෙවීම් කරන්න පුළුවන් Mobile Payment Solution එකක්.

ලියාපදිංචි වන්නේ කෙසේද?

- Smart Phone එකෙන් Google Play Store හෝ Apple App Store හරහා BOC SmartPay App එක download කරගන්න
- Sign Up මගින් app එකට ඇතුළු වී Mobile Number එක, නම, NIC Number එක සහ e-mail එක ඇතුළත් කරන්න
- Verification code එක නිවැරදිව ඇතුළත් කරන්න
- Security Questions වලට පිළිතුරු දෙන්න
- අංක 4ක රහස් PIN අංකයක් ඇතුළත් කරන්න
- ඉන්පසු app එක තුළ ඇති PAY button එක මගින් ඔබගේ බැංකු ගිණුම් app එකට ලියාපදිංචි කරන්න

ගෙවීම් කරන්නේ කෙසේද?

- "Lanka QR" සමග ලියාපදිංචි වී ඇති ඕනෑම වෙළඳ ආයතනයක දී Smart Phone එක භාවිතයෙන් QR Code එක scan කර ගෙවීම් සිදු කිරීමට හැකි වේ

"BOC SmartPay" භාවිතයේ වාසි මොනවාද?

- බැංකු ශාඛාවකට නොගොස් ඕනෑම තැනක සිට ඉතා පහසුවෙන් ලියාපදිංචි වීමේ හැකියාව
- ගාස්තු කිසිවක් නොමැති වීම
- Username, Password භාවිතයෙන් තොරව PIN number එකක් මගින් පමණක් ගනුදෙනු කළහැකි වීම
- රු. 10/- සිට රු. 25,000/- දක්වා ඕනෑම වටිනාකමක් ගෙවීමේ හැකියාව
- දිනකට ඕනෑම වාර ගණනක් ගෙවීම් සිදු කළ හැකි වීම
- ගනුදෙනුව සිදු කළ මොහොතේම ඒ බව තහවුරු කරමින් ලැබෙන Notificaton පණිවුඩය
- ඕනෑම ගනුදෙනුවක් පිළිබඳ සවිස්තර වාර්තාවක් ලබාගත හැකි වීම
- තම බැංකු ගිණුම්වල ගිණුම් විස්තර විමසීමට ඇති හැකියාව

* කොන්දේසි සහිතයි.

ලංකා බැංකුව
BOC
ජාතියේ මහා පහන් ටැඹ
www.boc.lk

ISSN 2815-0260