8th ANNUAL RESEARCH SESSION

SABARAGAMUWA UNIVERSITY OF SRI LANKA

19th DECEMBER 2018

Creating a unified foundation for the environmental, cultural and socioeconomic sustainability through research and innovation

Abstracts of the 8th Annual Research Session, Sabaragamuwa University of Sri Lanka

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**8th ANNUAL RESEARCH SESSION
SABARAGAMUWA UNIVERSITY OF SRI LANKA**

Organized by

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Sabaragamuwa University of Sri Lanka

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Message from the Vice-Chancellor

Sabaragamuwa University of Sri Lanka

It is a great pleasure and privilege to welcome you to the 8th Annual Research Session 2018 of the Sabaragamuwa University of Sri Lanka. The Annual Research Session is a major event in the university calendar that provides an ideal platform for university academics and postgraduate and undergraduate students to share their research work and present the findings. I am confident that the young academia of our university will be immensely benefited from this prestigious event.

I take this opportunity to congratulate the organizing committee for taking up the challenge and organizing the 8th Annual Research Session in a very professional manner. I have no doubt that the ARS 2018 will offer our university academia a great opportunity to share their experiences in the national and international arena, latest research findings and insights with their colleagues from different fields of interest.

Finally, I hope that all of you will enjoy the ARS 2018 and experience a very stimulating and interesting session.

Prof. M. Sunil Shantha
Vice-Chancellor
Sabaragamuwa University of Sri Lanka

Message from the Director

Centre for Research and Knowledge Dissemination

Sabaragamuwa University of Sri Lanka

It is with great pleasure that I forward this message on the 8th Annual Research Session (ARS) of the Sabaragamuwa University of Sri Lanka (SUSL) which has been an annual event providing a platform to all academics to celebrate their achievements as a professional community throughout the years. Over the past eight years, ARS has established itself as a symposium for disseminating high-quality research in a multi-disciplinary capacity, networking and fostering interaction and exchange of ideas among the academic staff of the Sabaragamuwa University of Sri Lanka.

With many research activities now taking on a global dimension, the theme of this year's ARS, "Creating a unified foundation for the environmental, cultural and socioeconomic sustainability through research and innovation", has created an opportunity for us to share our thoughts and exchange ideas in reaching new heights of research for sustainable development of the nation.

As the Director of Centre for Research and Knowledge Dissemination (CRKD), I am glad our center could facilitate this symposium emphasizing the commitment of the university to promote research and knowledge dissemination. This 8th ARS highlights 75 selected research findings of award winning research and features the most up-to-date research achievements of young researchers from diverse topics of interest. The keynote speech of the well-known scientist Prof. Rohan Samarajiva (Chairman of Information and Communication Technology Agency of Sri Lanka - ICTA) and plenary dinner speech by the eminent scholar and consultant pediatrician Prof. Sanath P. Lamabadusuriya are greatly valued and would undoubtedly encourage the young scientists to be molded to suit the challenges of future.

I appreciate and acknowledge the leadership and guidance of the Vice Chancellor, Prof. M. Sunil Shantha and the support of the Registrar and the Bursar in making this 8th ARS a success. Hence I extend my appreciation to Dr. Sampath Wahala (Chairman - ARS), Dr. Namal Perera (Vice Chairman - ARS), Mr. R. Dangalla (Secretary - ARS), the editorial board and all the faculty coordinators for their tireless efforts in organizing all sessions, making the 8th ARS a success. I would like to offer special thanks to all of the sponsoring organizations for providing their generous financial support. Finally, I would like to thank all the symposium presenters for their contributions which set the foundation of this conference. While I encourage all researchers to participate actively in the interesting presentations and discussions, I wish everyone a successful and fruitful symposium.

Prof. M. Nirmali Wickramaratne
Director
Centre for Research and Knowledge Dissemination

Message from the Chairman of the 8th Annual Research Session 2018

Sabaragamuwa University of Sri Lanka

It is a great pleasure in forwarding this message on behalf of the organizing committee of the 8th Annual Research Session of the Sabaragamuwa University of Sri Lanka. It has grown to be a major academic event conducted to exchange ideas, information in various academic disciplines. The ARS 2018 has 6 sessions encouraging a multidisciplinary approach to research and generating knowledge. Dissemination of knowledge and making avenues to discuss research findings allow the academic community to enhance the critical and logical thinking and to become productive intellectuals. The theme of this year's session is "Creating a unified foundation for the environmental, cultural and socioeconomic sustainability through research and innovation" which encourages to investigate global issues and suggests strategies to improve quality of life of the people across the world.

There were more than 100 abstract submissions received this year and it was a real challenge for the editorial board and the organizing committee to select the highest qualifying 75 abstracts for this session. I thank the researchers who submitted their abstracts and extend my gratitude to the members of the editorial board and the reviewers for their diligent work to uphold the quality of this publication .I also thank the eminent scholars for accepting our invitations and their presence to deliver valuable keynote address and plenary speeches in this 8th ARS 2018.

Being in par with the theme of our event we are happy and privileged to announce that this event is the Sri Lanka's first certified 'Zero Carbon™' research conference incompliance with the certification and guidelines developed by Sustainable Future Group [SFG] following the PAS 2060 global standard produced and published by the British Standards Institution for carbon neutrality. In order to obtain the certification, carbon footprint of the event was assessed covering all activities under the event and certified/registered carbon-offsets were obtained from Ratnapura and Kandy Small Hydropower Projects in Sri Lanka.

I must thank the sponsors; Analytical Instrument, Carbon Consulting Company, Hemsons International and Sustainable Future Group for their generous support.

The successful organization of this event required talented dedications of the organizing committee and I express my appreciation for their hard work. Last but not least our thank goes to the Prof. M. Sunil Shantha, Vice-Chancellor and Mr. V. D. Kithsiri, Registrar and Prof. M. Nirmali Wickramaratne, Director of Centre for Research and Knowledge Dissemination for their support and encouragement.

I sincerely hope that you will find this symposium enjoyable and valuable and wish you all a fruitful academic experience at the ARS 2018.

Dr. Sampath Wahala
Chairman
8th Annual Research Session

ABSTRACTS

OF THE

8th ANNUAL RESEARCH SESSION

SABARAGAMUWA UNIVERSITY OF SRI LANKA

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  Dr. R. G. Sangeeth Rathnayake
  Mr. A. L. C. Janitha Liyanage

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Keynote Speech

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Prof. Asha Karunaratne

Summary of the Keynote Speech

Contributions from Research to Solving Sri Lanka's Problems

Prof. Rohan Samarajiva

Chairman, Information and Communication Technology Agency of Sri Lanka
(ICTA)

I believe there is broad consensus that we in Sri Lanka face serious problems. We live beyond our means, exporting a few simple items but importing many things worth more than what we earn from the export of goods and services. This results in over-dependence on others, in the form of loans, aid and investment. We expect a lot of services to be supplied by government, including secure and low-stress employment with life-time pensions, but do not support a tax regime that could pay for them. We are growing old before we get rich.

The consensus is much narrower on what the solutions are and whether scholars, within the university and outside and the research they produce, have a role to play. One could even say that ideological positions have hardened on many key issues such as economic strategy to a point where it is not possible even to develop a consensus on a common research agenda.

But before we get to that we must note how much progress has been made in the past four decades.

How far we have come

We have come a long way from when doctors were treating young children showing symptoms of Marasmus and Kwashiokor in Borella in 1973 as a result of misguided economic policies.

We are about to provide grid electricity to all homes. Like many in my generation, I grew up for some time in a home without electricity or a telephone. Those days, for most of our people the most valuable asset was a sewing machine. It's what they took to the pawn shop in an emergency. Since 2012-13, there have been more homes with refrigerators than those with sewing machines. According to the 2016 Household Income and Expenditure Survey, 52.9 percent of households owned refrigerators, versus 39 percent with sewing machines[1].

That's just household assets. A reliable indicator of how well people live is the percentage of their overall expenditure they spend on food. A statistician by the name of Ernst Engel came up with a law (an observed correlation) which said that as people become wealthier the percentage they spend on food declines. Not too long ago, in 1990-91, we were on average spending 2/3rd of our household expenditures, or 64 percent, on food. In 2016, it was 34.8 percent, just over one third[2]. This is irrefutable evidence about a general rise in living standards.

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[1] Sri Lanka Department of Census and Statistics (2018). *2016 Household Income and Expenditure Survey*

[2] Sri Lanka Department of Census and Statistics (2018). *2016 Household Income and Expenditure Survey*

Women now live 78 years on average; men live 72. Back in 1945-47, men lived longer on average than women, to 46.8 years. Women had an average life expectancy of 44.7 years. We are living better and longer, according to the evidence. Having established that we have made progress, I will now turn my attention to some of the challenges we face.

Improving export performance and employment
The British did not bequeath us a dynamic economy. It was, as many in my age group learned in school, based on the export of tea, rubber and coconut. Little value addition was done. Most government revenues came from taxing foreign trade. Reliance on commodity exports made the economy vulnerable to economic cycles. In 1952, a dramatic fall in rubber prices by over 30 percent because of the end of the Korean War led to the Rubber-Rice Pact with China, not some kind of grand gesture of non-alignment.
But today, we are less dependent on commodities. Service exports (if we include remittances from those who work abroad, technically a form of trade in services) yielded USD 14.3 billion in 2017, higher than the USD 11.4 billion earned from goods exports, of which agriculture and mining comprised only 25 percent, according to the 2017 Annual Report of the Central Bank[3]. Remittances, which none other than the families that generate them appear to be proud of, brought in USD 7.2 billion. Contrary to entrenched perception, more men than women are now engaged in this form of service export and the proportion of skilled workers is increasing. Tourism was the biggest source of conventional service earnings, yielding USD 3.9 billion. Most of our rubber now goes out in the form of value-added tyres, gloves and such. It is second in value only to apparel among industrial exports.

Research priorities facilitating global engagement
Our economy has diversified and is less vulnerable to external forces than in the decades after independence. But the momentum achieved in increasing and diversifying exports was lost as a result of the insular policies of the past decade. Lack of attention to exports and the right kinds of foreign investment have led to greater dependence on borrowing, no longer available at concessional rates, leading to a different form of vulnerability that has to be carefully managed. Comparison with Viet Nam, a country that is directly competitive with Sri Lanka in many areas such as apparel, business process management and even tea is illustrative. Viet Nam's distinctly superior performance in exports despite more or less similar increases in FDI over the 2000-2014 period shows that the right kind of FDI is what matters to exports, not just raw numbers.
The unemployment rate among the 20-29 year-olds is roughly three times the overall rate[4]. They are looking for work, but are unwilling to take what is on offer. As the long lines for the Korean language exams showed vividly, they are not unwilling to work, or even wait in line overnight to qualify for work at acceptable rates of compensation. There are many different explanations. Some see a problem

[3]
https://www.cbsl.gov.lk/sites/default/files/cbslweb_documents/publications/annual_report/2017/en/9_Chapter_05.pdf
[4] Department of Census and Statistics (2015). Quarterly report of the Sri Lanka labor force survey. First Quarter. http://www.statistics.gov.lk/samplesurvey/2015Q1report.pdf

of values we have inculcated in our youth. Some blame parents. Others see a structural problem in that the economy does not produce the kinds of jobs that our young people want. Without robust export performance and diversification into high-value-added production of goods and services, it will not be possible to create the kinds of service-sector jobs our young people seem to want.

Table 1: Viet Nam's and Sri Lanka's investment and trade performance 2000-14, compared

	Vietnam (2000)	Vietnam (2014)	2014 amt as multiple of 2000 amt	Sri Lanka (2000)	Sri Lanka (2014)	2014 amt as multiple of 2000 amt
FDI (USD millions)	1,298	9,200	7.1	173	1,616	9.3
Exports (USD billions)	17	161	9.5	5.5	11.3	2.1

Source: Board of Investment of Sri Lanka

The cause is a structural problem in the economy: its inward orientation in the past decades. As a result we are not making available high-quality jobs. I believe we can produce such jobs only if we think bigger than a market of 20 million people with not very high purchasing power. Despite its history, Viet Nam has taken that route, locking in the external orientation through multiple bilateral and plurilateral trade agreements. It is a member of the WTO and of ASEAN, which is on the path to a single market. It is also part of CPTPP (the Trans Pacific Partnership that was resuscitated without the US) and RCEP (Regional Comprehensive Economic Partnership).

Conventional economic analysis, that I subscribe to, would suggest that we integrate our economy through trade agreements with as many countries as possible, especially with the Bay of Bengal region, which has six of the ten fastest growing economies of world: Bangladesh, Bhutan, Cambodia, India, Myanmar and Lao. And China is just on the other side of Myanmar and is a massive and still growing market. Joining the RCEP, which includes China, India and the entire ASEAN should be even better. If we can capitalize on our rightful place as the gateway to the region, we can create the jobs that will keep our children here[5].

But the evidence could be stronger. Vietnam, which has sought to integrate itself into global production networks through trade agreements provides strong evidence[6]. I can show that countries that liberalize trade and create policy certainty

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[5] Samarajiva, Rohan (2017). Sri Lanka and China's Belt and Road Initiative, in *The island of the lion and the land of the dragon: Essays on Sri Lanka-China relations*, ed. H.M.G.S. Palihakkara, pp. 67-80. Colombo: Pathfinder Foundation.

[6] Samarajiva, Rohan (2017 June 14). Considerations for formulating a trade policy for Sri Lanka, *Echelon*. https://echelon.lk/home/considerations-for-formulating-a-trade-policy-for-sri-lanka/

prosper and that those that turn inward do not. But I can only speculate about what our young people really want. If we have this kind of evidence, we may possibly be able to elevate the current discussion on trade agreements above its present unsatisfactory, ideological and post-factual level.

Research priorities based on greater autonomy
However, given the polarized nature of policy discourse in Sri Lanka at this time, it may be useful to also identify research priorities based on different ideological positions. Even those who do not like increased trade and foreign investment, especially within the certainty provided by trade agreements[7], would have to accept that Sri Lanka has to decrease imports, if it is not willing to do what is necessary to increase exports. This import-restricting option was actually tried out by governments from 1960 onward starting with what were considered luxuries such as cars and reaching the peak in 1973-77, when imports of essential items such as building materials and even pulses and dried fish, the principal sources of protein at the time, were curtailed.

In the vastly more complex economy that exists today, the actions of the 1970s are impractical. Consumer goods are a small part of the country's imports, as shown in the Figure below. The largest proportion is intermediate goods, needed for the production of other things, including exports. The reduction that is likely to have the most impact is refined petroleum and crude oil which amounted to 15 percent of the total imports in 2017.

Figure 1: Composition of Sri Lanka's imports, 2017
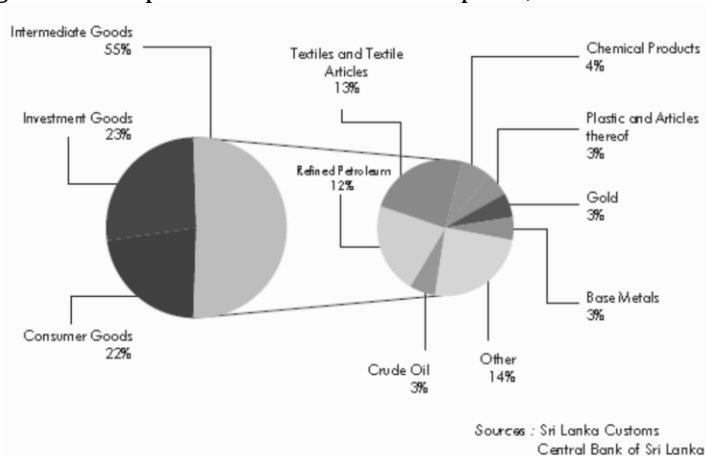
Source: Central Bank of Sri Lanka Report 2018, p. 152.

The two main uses of petroleum imports are for transportation and the production of electricity. As can be seen from Figure 2 below, expenditures on petroleum imports have been rising over the years, with a step change in 2011, shortly after the end of the civil conflict.

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[7] One has to conclude that the objection is to trade agreements, because the same people who opposed the trade agreement with India (a large economy with low wage levels) also opposed the agreement with Singapore (a small economy with very high wage levels).

Figure 2: Expenditures on petroleum imports (USD millions), 2008-2018

SOURCE: TRADINGECONOMICS.COM | CENTRAL BANK OF SRI LANKA

Source: https://tradingeconomics.com/sri-lanka/imports
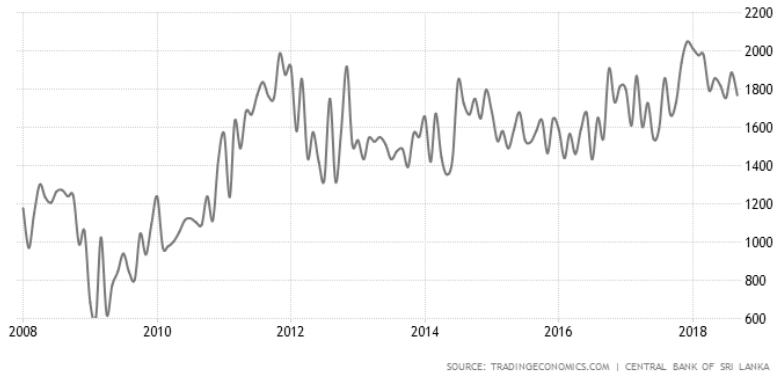
This appears correlated with the spike in motor vehicle imports after the end of the conflict, as shown in Figure 3.

Private vehicle stock, 2009-2016
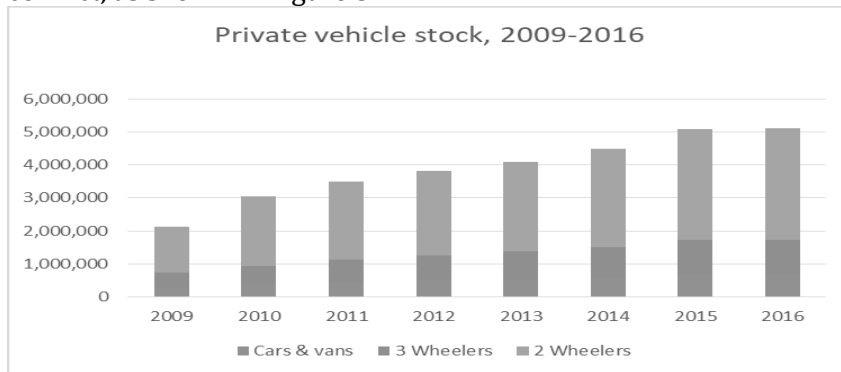
Source: Department of Motor Vehicles

So it would seem that those who want a more insular and independent country would be well advised to conduct research to reduce petroleum imports. The easiest way to do this would be develop transport systems that would rely less on imported petroleum. This could be in the form of vehicles powered by electricity, unless that results in importing still more petroleum products to produce electricity.

So here are research priorities for those wanting a more autonomous Sri Lanka: find ways to move people and goods around that minimize the need for imported fuel; find ways to produce more electricity using renewable sources.

Simply putting in more solar panels and installing wind turbines will not do. Our small grid cannot be balanced if we increase the supplies from these sporadic sources beyond around 25 percent. We will need to rethink the whole electricity system, possibly replacing it with a completely new producer-consumer system unlike any that exists today. That will require much research and innovation.

If that be too radical, a stop-gap solution would be to connect our small grid to the much larger Indian grid across the Palk Strait. That would allow us to increase the proportion of electricity drawn from sporadic sources without destabilizing the grid

and to buy and sell electricity to and from India. But then, we would be back to Indophobia and fears of loss of autonomy, wouldn't we?[8]

Solutions

We need to have a clear understanding of the principal problems facing our society. I have explored in multiple aspects of the problem I consider the most important. There are others, such as our population growing old before we got rich. Many would argue that education, including higher education, is in crisis. Others would point to ethnic reconciliation or our unacceptable rates of child abuse. Underlying everything are mega issues such as global climate change and environmental degradation.

Once we recognize the challenge best suited to our specific skill sets, we then need to engage in rigorous research. That research then has to be taken into the public discourse that is today dominated by myths and falsehoods.

Given all politicians, according to Keynes, are governed by what they learned when in their twenties, some of us have to engage in the hard job of changing their obsolete mindsets:

> … the ideas of economists and political philosophers, both when they are right and when they are wrong, are more powerful than is commonly understood. Indeed the world is ruled by little else. Practical men, who believe themselves to be quite exempt from any intellectual influences, are usually the slaves of some defunct economist. Madmen in authority, who hear voices in the air, are distilling their frenzy from some academic scribbler of a few years back. I am sure that the power of vested interests is vastly exaggerated compared with the natural encroachment of ideas. Not, indeed, immediately, but after a certain interval; for in the field of economic and political philosophy there are not many who are influenced by new theories after they are twenty-five or thirty years of age, so that the ideas which civil servants and politicians and even agitators apply to current events are not likely to be the newest. But soon or late, it is ideas not vested interests, which are dangerous for good or evil[9].

The President of the United States refuses to accept scientific consensus on climate change, relying instead on what he learned in his twenties. Most of our leaders revert back to the planned economy thinking of their youth. They refuse to accept the overwhelming consensus among economists that protectionism is counter-productive.

We must do these hard things, subjecting ourselves to the highest levels of quality control. Because the only thing worse than not being engaged with the policy process is its pollution by the introduction of bad research into it. Peer review is seen as the gold standard to prevent this, but it has many shortcomings. In the policy arena, it's not always practical to wait for peer review to be completed. The policy

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[8] Samarajiva, R. (2016 January 4). Global value chains: A bridge too far? *Daily FT*. http://www.ft.lk/article/515531/Global-value-chains--A-bridge-too-far

[9] Keynes, J.M. (1936). *The General Theory of Employment, Interest and Money*. Cambridge: Cambridge U Press, pp. 383-4.

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window or opportunity[10] can close before the peer review is completed. Sometimes we have to build peer review into the discourse itself.

In many applied fields we work with open systems. The levels of certainty and exactitude possible with inanimate objects of study within closed systems is not possible in these fields[11]. The questions we ask and the assumptions we make are shaped by who we are and where we came from. Therefore, we must allow room for difference and debate in public discourse, even when based on research findings. Beyond impractical and idealized notions of the public sphere[12], we need to come up with workable alternatives.

Thank you.

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[10] Kingdon, John (1995). *Agendas, Alternatives, and Public Politics*, 2nd ed. New York: Harper Collins, p. 19.

[11] Sayer, Andrew (1992). *Method in social science: A realist approach*. 2nd ed. London & New York: Routledge, p. 121-31.

[12] Habermas, J. (1989). *The Structural Transformation of the Public Sphere: An Inquiry into a Category of Bourgeois Society*, trans. T. Burger and F. Lawrence. Cambridge: Polity.

Session 01
Academic Presentations – Part 01

Effect of Vascular Endothelial Growth Factor 165$_b$ and (VEGF165$_b$) KIT-ligand/Stem Cell Factor (SCF) on Porcine Primordial Follicle Viability In vitro

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Vascular endothelial growth factor (VEGF) is well known for its ability to regulate angiogenesis where it has been reported of playing a crucial role in metastasis of tumors. Stem cell factor (SCF) plays a crucial role in cell viability. Growth of a mammalian oocyte starts with an avascular structure called primordial follicle' and after the ovulation this avascular structure transforms into a heavily vascular corpus luteum. Primordial follicle activation has been regulated by many intrinsic and extrinsic factors of animals many of which have not been studied completely. It has been observed that the VEGF and its isomers have regulatory effects on the formation of the vascular bed in developing follicles and it supports the activation of the dormant follicles. The objective of the current study was to determine the effect of anti-angiogenic VEGF$_{165b}$ and SCF on porcine primordial follicle development in vitro. VEGF$_{165b}$ is known to be an anti-angiogenic factor where SCF is well known for its ability to enhance cell migration, proliferation and cell survival. The tissue samples were treated with VEGF$_{165b}$ with 0ng/ml, 0.1, 1.0, 10.0 ng/ml and day 0 (Negative control) samples were fixed instantly in 10% neutral buffered formalin and each treatment had 6 replicates. Separate three trials were conducted in order to observe the rest of the effects in each treatment. All the treatments were supplemented with 10ng/ml of SCF to stabilize the cell survival. All the treated tissues were subjected to 72hrs of incubation under 5% CO_2 with the humidified atmospheric conditions at 37.5^{0}C and followed by a histological assay to obtain the preliminary data. Out of three different dose regimes in VEGF$_{165b}$ treated tissues, 0.1ng/ml has shown 65.15% of follicle viability. It was numerically the highest recorded viable follicle count whereas 1.0ng/ml and 10.0ng/ml treatments reported 39.61% and 20.20% follicle viability respectively. Although, 0.1ng/ml VEGF$_{165b}$ showed the highest viable follicle count, it was lower than the viability showed in previous study with 0.1ng/ml VEGF$_{165a}$ (92.6%). It was proposed under natural conditions these VEGF isomers and SCF were in an equilibrium which regulated the angiogenesis and anti-angiogenesis. In conclusion it was evident that VEGF$_{165b}$ did not support the follicle viability alone, even with the presence of SCF that stabilized the cell viability. Further studies are necessary for understanding the exact role of VEGF$_{165b}$ and SCF combination effect on cellular viability which may bring new insights into cancer therapy.

Keywords: follicle activation, KIT ligand, VEGF$_{165b}$, anti-angiogenic factor

Immunomodulatory Fungal Polysaccharides: Prospective Candidates for the Development of New Nutraceuticals and Adjuvants

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Naturally occurring complex carbohydrates represent a structurally diverse group of macromolecules which shows a broad range of biological activities. However, their clinical contribution is still limited because of the structural complexity, lack of studies on structure activity relationship and underlying mechanisms of biological activity of individual polysaccharide components. In the present study polysaccharides were isolated from the cold-water extracts of two mushroom species, Antrodia cinnamomea and Auricularia auricula-juadae, to investigate their immunostimulatory potential and mechanisms of action. Polysaccharides were purified by size exclusion and ion exchange chromatography and their chemical structures were elucidated by Gas Chromatography-Mass Spectroscopy (GC-MS) and Nuclear Magnetic Resonance Spectroscopy (NMR). Immunostimulatory properties of each polysaccharide were investigated targeting the proinflammatory cytokines (TNF-α, IL-6) and nitric oxide (NO) producing abilities in selected immune cell models (J774.1A and Raw 264.7). Immunologically active polysaccharide of *A. cinnamomea* (**ACP**; MW>70 kDa) was chemically identified as galactomannan, with branched octasaccharide repeating units, whereas polysaccharide of *A. auricula-ju dae* (**AAPS**, MW>70 kDa) was identified as glucuronoxylomannan with a heptasaccharide repeating units. O-acetyl modification at mannose and xylose residues was observed in **AAPS** while glucuronic acid residues remained unacetylated. Both **ACP** and native **AAPS** activated murine macrophage cells to produce TNF-α and IL-6 in a concentration dependent manner. Toll like receptor 4 was identified as the main receptor involved in **ACP** and **AAPS** mediated macrophage activation. Complete abrogation of immunostimulatory properties was observed in deacetylated and carboxyl reduced **AAPS** indicating the essentiality of both acetyl and carboxylic functionalities in immunostimulatory process. Molecular modelling data further demonstrated the role of acetyl and caroboxyl moieties in receptor binding. Our findings have provided firm scientific evidences for the immunoenhancing properties of two mushroom species and the potential of these two polysaccharides to be strong candidates for the development of new carbohydrate-based nutraceutical supplements and adjuvants in the treatment of immunity related disorders in near future.

Keywords: *Antrodia cinnamomea*, *Auricularia auricula-juadae*, immunostimulatory properties, Polysaccharides

Resource Management Approaches Based on Nature Inspired Algorithms in Cloud Computing

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Cloud computing is an emerging computing platform with flexible computational architecture and an enormous collection of heterogeneous systems. Resource management is an important strategy in enhancing the overall performance of cloud computing. Currently, effective resource management in cloud computing is becoming an inevitable demanding topic and it is very challenging to implement efficient resource management based on QoS demands by optimizing the number of objectives. In this research, resource management problem can be considered from three optimization aspects: single objective optimization, multi-objective optimization and many objective optimizations. We discuss two significant levels in this emerging resource management paradigm: one is task scheduling, that maps tasks to VMs and the other is VM placement, which maps VMs to physical servers. The nature inspired algorithm approaches can obtain feasible solutions than others. Firstly, this research explores the research in the area of resource management in cloud computing to gain an understanding of related work. Secondly, this research proposes single-objective efficient resource management and task scheduling methods in cloud platforms to minimize response time, makespan and data center processing time. Another main target of the thesis is to research multi-objective energy aware, efficiency aware and QoS aware resource management as VM placement mechanism for simultaneously optimizing three objectives. Most of the previous research methods, either single objective or multi-objective, cannot provide suitable solutions when the number of the objectives exceeds three. Therefore, there is a tremendous demand to use the many-objective optimization mechanism to deal with the resource-management problem. Finally, this research proposes a many-objective approach for VM placement to attain equilibrium among five objectives. In summary, we propose energy aware, efficiency aware, cost aware, QoS aware load balancing and utilization aware resource scheduling approaches in cloud computing using nature-inspired algorithms. The performance evaluation from three optimization aspects, i.e., single-objective, multi-objective and many-objective optimizations, demonstrate that the proposed approaches are capable of enhancing the state-of-the-art techniques in the environment of enormous cloud data centers by optimizing different objective functions.

Keywords: resource management, task scheduling, VM placement, multi-objective optimization, many-objective optimization

Production, Purification and Characterization of a Novel Thermostable Alpha-Amylase from *Caldimonas manganoxidans*

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Amylases play a major role as hydrolytic enzymes in starch-based industries. It is desirable for enzymes used in industry to have thermo-tolerant properties to withstand temperatures encountered in industrial processes. Thermophiles are naturally endowed with thermo-stable enzymes which are suited for specialized industrial applications. In the present study we attempted to screen and isolate a thermophilic bacterium that produced a novel thermostable alpha-amylase and to perform purification and characterization processes of the enzyme. Nelum-wewa hot water springs in Sewanapitiya, Polonnaruwa has one of the highest recorded temperatures of a water body in Sri Lanka. Water and soil samples were collected, under sterile conditions, from four distinct sampling sites and were transported to the laboratory in a cold box (0°C). Water temperature and pH were recorded to be 52°C and pH 7 respectively. Samples collected were inoculated on to culture agar plates and broth containing 0.5% (w/v) peptone and 0.2% (w/v) yeast extract, supplemented with a salt solution. Soluble starch (1% w/v) was added to induce the production of alpha amylase. Cultivation of bacteria was done at 50°C under high agitation in shaker water bath and the pH was maintained at 6.9 during the culture. Isolation of bacteria was done by streak plate and dilution plate methods. Amylase producing bacteria were identified by the clearance zones produced on starch agar plates visualized with iodine solution. The bacteria with the highest amylase activity was identified by morphological and biochemical tests and 16s rRNA analysis as *Caldimonas manganoxidans NMS1*. Alpha amylase activity was assayed by the method described by Bernfeld (1955) and the maximum supernatant alpha amylase activity of 56 U/ml was obtained on incubation at 50°C for 20 hours. The extracellular amylase enzyme was purified by ammonium sulphate fractionation and DEAE ion exchange chromatography. The specific activity of the purified enzyme was observed to be 2143U/mg with 21-fold purification and 57% of amylase activity retention. Polyacrylamide gel electrophoresis showed a single band of protein indicating that the enzyme was purified to homogeneity. The purified enzyme had the highest activity at 50°C and was stable up to 60°C. The enzyme showed a pH range of 6 to 9 with maximum amylase activity observed at pH 6.9 and was stable within the pH values of 6 to 9. The K_m and V_{max} values calculated from Lineweaver-Burk plot were 1.7mg/ml and 217μmol/min/mg of protein respectively. The optimum production of extracellular α-amylase was shown in a media comprising of 10% soya powder and 1% soluble starch solution. The enzyme showed a relative enhancement of activity with calcium ions (Ca^{2+}) and manganese ions (Mn^{2+}).

Keywords: amylase, *Caldimonas manganoxidans NMS,* ion exchange chromatography

An Assessment of Land Use Change and Its Contribution to the Climate Change in Selected Sites in the Intermediate Zone of Sri Lanka

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Tropical deforestation and degradation and climate change are highly discussing contemporary phenomena of the globe. Investigating the temporal and spatial variation of deforestation, degradation, climate and interrelationship of the mentioned variables in the intermediate zone in Sri Lanka, which have been regarded lightly in research so far, are the objectives of this paper. Land use change over 56 years was investigated at the district level in the intermediate zone by using Land matrix tool. In order to identify the climate change over 56 years, rainfall, temperature and wind speed were selected as climatic variables and temporal change was detected by time series and spatial changes by kriging analysis. During the period of 1956 to 1981 extent of forest cover has declined by 3% and 54% in Badulla and Monaragala districts where deforestation rates were 48% and 19% respectively during the period of 1981 to 2012. Main contributors to deforestation common to study area were Chena cultivation, home gardens and paddy cultivation. Home gardens and paddy cultivation have increased in every district throughout the time especially within the 50m buffer zone from a dense forest. Proximity analysis identified that low and mid-country had the highest closeness for the above two land uses. Eastern and southeastern part of the intermediate zone had received the highest amount of mean rainfall while it had declined in the northwestern direction. Highest mean rainfall amount was received from second inter-monsoon and the lowest from southwest monsoon during which the amount of rainfall decreased by 0.64mm per year. Nevertheless, northeast monsoon rainfall growth was by 1.74mm per year. The average maximum temperature in the intermediate zone had a positive linear trend that contained a rise in temperature of 0.008 C^o per year. When considering the overall trend of temperature in the intermediate zone, the maximum had a gradual growth trend while the minimum had a declining trend in a geometric manner. Low country (2.8 km/h) showed a prevailing wind with a speed higher than that in the mid country where both recorded high flows in the evenings. The impact of forest cover change on climate variables such as rainfall (p=0.042) and wind (p=0.001) was identified. Further investigation, adopting new methods, is needed on this matter.

Keywords: kriging analysis, land matrix, proximity analysis, tropical deforestation

High Field Magneto Transport Properties in $Y_{1-x}Ca_x(Ba_{1-y}Sr_y)_2Cu_3O_{7-\delta}$ SYSTEM

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It is well known that the inter-grain weak links and poor flux pinning nature reduce the superconductivity and act as limiting factors for the superconducting parameters such as critical current and critical field. However, these superconducting parameters are crucial in practical applications of these High Temperature Superconductors (*HTSc*). Therefore, controlling the inter-grain weak links and poor flux pinning nature is quite vital in enhancing the superconducting parameters. This study aims to investigate flux pinning nature and inter- granular couplings of $Y_{1-x}Ca_x(Ba_{1-y}Sr_y)_2Cu_3O_{7-\delta}$ polycrystalline samples (with nominal composition of x = 0.00 - 0.25 and y = 0.00 - 0.50) and attempts to enhance the critical current density and upper critical field over the pristine sample. Polycrystalline samples of $Y_{1-x}Ca_x(Ba_{1-y}Sr_y)_2Cu_3O_7$ are synthesized through conventional solid state reaction route. The phase formation is determined through *X-ray* powder diffraction, using *Rigaku X-ray* diffractometer (Cu-K$_\alpha$). The *ac/dc* susceptibility (χ-*T*), Isothermal Magnetization (*M-H*) and Resistivity measurements under magnetic field ($\rho_{nor}TH$) are done by Physical Properties Measurement System (*Quantum Design*-USA PPMS-14Tesla). In both series of samples there is a remarkable increase in separation between Field Cooled (*FC*) and Zero Field Cooled (*ZFC*) along with decreasing *FC* signal. This is a clear indication of flux pining which enhance the critical current. The *ac* magnetization measurements of both Ca and Sr doped samples reveal that both doped samples possess enhanced grain couplings which may enhance the critical current. The critical current densities of two series of doped samples are calculated by means of ac susceptibility measurements and isothermal magnetization measurements. Global critical current density (J_C) of Ca doped (in smaller contents) samples and inter-grain current density (J_c^{inter}) of Sr doped samples improves three times more than the pristine sample. The estimation of temperature dependency of resistive upper critical field [$B_{C2}(T)$] is done by means of resistivity data and is also enhanced with Ca and Sr concentration. These observations are in consistent with improvements of inter-grain couplings and enhancement in flux pinning nature in doped samples over the pristine sample.

Keywords: critical current, critical field, flux pinning, inter-grain weak links, superconductivity

Banking Sector Development on Economic Growth: Structural Equation Approach

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Banking sector development (BSD) is deemed to be a fundamental force for the acceleration of economic growth (EG). Financial sector, including banking sector, was dramatically hit by numerous scandals which caused the financial crisis and its consequences have brought a rapid decline in the economic growth of the world during the past decade. Since then financial and regulatory authorities have been focusing on innovative solutions to cope with the negative consequences of the banks' impact on global economy. Empirical findings have showed that BSD and its role in EG are still contradictory to each other. However, endogenous growth model has brought a new perspective for EG which is resulted by investment in human capital, innovation and knowledge within the economy rather than exogenously. With this background, this study explores the determinants of the BSD and its direct and indirect effects on EG for 18 countries during the period of 2006 to 2014. To explore the results, Two-Step System-Generalized Method of Moment (GMM) estimation is used to explore the impact of the determinants on the BSD. Then, a Structural Equation Model (SEM) is developed to represent the direct and indirect relationship among channel variables, economic growth and BSD estimated by Three-Stage Least Squares (3SLS) estimation technique. To investigate the mediating effect of BSD on EG, four channels of physical investment, human capital, technology and good governance are theoretically identified. Further, four indicators of the BSD, bank intermediation (IM), bank broad access (BA), bank profitability (PF) and bank liquidity (LQ), were chosen. The study found that BSD was determined by economic growth (EG), interest rate (IR), trade liberalization (TL), financial liberalization (FL) and governance infrastructure (GVI) explored by the first principal component of the six governance indicators. The results indicate that though bank access (BA) has been improved, economic growth has decreased while other results are statistically insignificant. However, bank intermediation (IM) has caused a mediating effect on economic growth in a negative manner, while bank broad access (BA) has caused a mediating effect on economic growth positively through human capital. Since, bank intermediation and bank access have created credit facilities and hassle-free banking facilities towards the business organizations and individuals out of which they have invested to develop a skilled labour providing trainings and higher education opportunities which have ultimately influenced the economic growth endogenously. The study suggested that governments and monetary authorities must review the policies towards the hassle-free financial access and prioritize the productive investment ventures by banks to become efficient intermediates in the financial systems.

Keywords: banking sector development, endogenous growth, financial crisis, generalized method of moment and three stage least square

Shareholders' Responses to the Announcement of the Changes in Executive Directors and Semi-strong Form Efficient Market Hypothesis: Evidence from Colombo Stock Exchange (CSE)

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This study analyses the shareholders' responses to the announcement of the changes in executive directors of the companies listed on CSE. Thereby we provide a test of the semi-strong form efficient market hypothesis of Sri Lanka's share market by using event study mythology. The sample consisted of 66 listed companies, which made 156 public announcements on the changes in the executive director of CSE from 2009 to 2013. The Mean Adjusted Model, Market Adjusted Model and Market Model along with proxy of the CSE All Share Price Index (ASPI) were used in this study in generating abnormal returns surrounding each subsequent announcement. Specifically, the Market model was used by incorporating cluster volatility effect and information asymmetric effects to get a strong conclusion. Apart from that Time Series models such as AR, MA, ARMA, GARCH, TARCH and EGARCH were used in relation to the stylized facts of each company returns within the sample especially to minimize the use of bias of the CSE ASPI as a proxy in generating abnormal returns. Overall results of shareholders' responses to the announcements of changes in directors announcements based on each model along with the proxy of ASPI show a negative reaction to the information subsequent to the announcements of changes in directors in CSE. The abnormal returns appear prior to the actual announcement of the information, as well as after the actual announcement of the information. It confirms that the shareholders responded negatively before and after the actual announcement of the information. In addition, these results confirm that the Sri Lankan Share market is inconsistent with semi-strong form market efficient hypothesis. The findings will be important to the investors, the managers of the companies and the stock exchange regulatory agencies in their decision-making process.

Keywords: ARCH family models, event study, information efficiency, capital market

Session 02 -
First Graduate Colloquium 2018

Assessment of the Contamination of Heavy Metals in Groundwater in Monaragala District, Sri Lanka

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Monaragala district in Uva Province with a geographical area of 5636 km^2 lies in both Dry and Intermediate Zones of Sri Lanka. Most of the people living in this area engage in the agricultural sector as their major occupation. Paddy is the major cultivation crop while vegetables, maize, banana, sugarcane and several grains are also cultivated in the area. Excessive use of inorganic fertilizers and agrochemicals has become a common practice in agriculture hence there is a high risk of contamination of groundwater with heavy metals in agricultural areas. As the majority of people live in this area use groundwater for drinking purposes, there is a greater risk of health hazards caused by heavy metal contaminated groundwater sources. This study aimed at assessing the heavy metal contamination levels in groundwater based on the Sri Lanka standards for potable water, SLS 614, 2013. A total of 78 water samples were collected from dug wells and tube wells which were used for drinking purposes in the area from September 2017 to February 2018. The samples were filtered and acid preserved at the field and were analyzed for Al, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Sr, Cd and Pb using Inductively Coupled Plasma Mass Spectrometer (ICP-MS). According to the results, none of the mean values of heavy metals exceeded their Maximum Permissible Level of Sri Lankan Standards, 2013. Only two samples (1.409, 0.494 ppm) exceeded the MPL of Iron (0.3 ppm) while three samples (0.885, 0.190, 0.105 ppm) exceeded the MPL of Manganese (0.1 ppm). Comparatively Al, Mn, Fe, Sr and Zn showed higher mean concentrations than Cr, Co, Ni, Cu, As, Cd and Pb. The mean concentrations of Cr, Co, As, Cd and Pb recorded were lower than their Maximum Permissible Levels and all of them are below 0.001ppm. These results indicated that groundwater in the study area contained much lower levels of heavy metals and the samples exceeded the Maximum Permissible Levels of Fe and Mn perhaps due to the application of inorganic fertilizers in agricultural fields.

Keywords: contamination, fertilizer, groundwater, heavy metals

Newly Creating Traditions within the Modernist Movements: Reading "*Maname*" from a New Marxist Perspective.

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Eric Hobsbauwm and Terence Ranger, the Marxist critics have studied the colonial conventions and have revealed the fact that many of those conventions which existed as old and classical had been the newly created ones. Depicting those newly created traditions as classical traditions of many centuries is also another significant fact. According to the critics Richard Gombrich, Gananath Obeyesekere and Nihal Perera, Buddhism which exists at present in Sri Lanka is also a modernist movement in the colonial era, yet, it has been pretended to the ordinary man as a classical tradition. Buddhism may have existed thousand years ago, yet, it completely deviates from what is actually exists today. According to the theoretical approach of 'newly creating the tradition', the major goal of this research was studying "*Maname*" by Ediriweera Sarachchandra. As per Sarachchandra, there is no any traditional classical Sinhala drama. But there was a traditional drama culture within the Indian subcontinent. He believes that local drama and theatre can be identified in early Sokari, Kolam and Nadagam traditions as he has recurrently mentioned in his academic studies. He identifies them as cultural elements which mirror the local identity. Yet they are visible all over the Indian subcontinent. Therefore it is problematic whether those traditions actually indicate the local identity. "Stylistic" is a noteworthy feature of sophisticated European drama too and it is an illusion to consider it as an oriental feature. Stage, on which the play was performed, is a platform open to three sides. The audience is able to watch the drama being on a ground floor. This cannot be found in Sri Lankan drama culture. Sarachchandra's stage was either the "Platform Stage" or the "Proscenium Stage" which did not have common features of a real theatre. On the contrary, "*Maname*" mirrors a modernist perspective. Earlier it rigidly signified the concept of criticizing woman's capriciousness as same as the original story. But with the influence of the movie "*Rashoman*" later it attributed a curious and a disputable conclusion. Although the critics recurrently signify "*Maname*" as the pursuit of local drama, it is obvious that "*Maname*" is also a new creation of Modernist movement. The complete methodological approach of the study consisted of qualitative methods of data collection and analysis. Thus, 5 scholars were interviewed and previous research articles, scholarly articles, books, online sources and audible and visual sources were also analysed in order to collect data. Hence it was revealed that "*Maname*" was not a product of local drama but a new creation of modern era. On the other hand the cultural elements used in this creation do not belong to the local background of the country. Thus, "*Maname*" is not a part of an immortal local tradition but a modern drama.

Keywords: *Maname*, modern project, new marxist perspective, invention of traditions

Effect of Maturity Stage of Nutmeg (*Myristica fragrans*) on Its Antifungal Activity against the Growth of *Aspergilus niger* and *Fusarium oxyporum*

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Spices have a great potential to be developed as new and safe antimicrobial agents. The present study tested the antifungal activity of methanol, ethanol, chloroform, hot water extract of nutmeg (*Myristica Fragrans*) seed, mace and fruit peel at different concentration levels (5%, 10% and 20%) against *Aspergilus niger* and *Fusarium oxyporum*. The plant materials were selected at three maturity stages of two months, four months and fully mature stage. The agar dilution technique was used and the effect of different concentrations of plant extracts on radial growth of reference fungi was evaluated. Inhibition percentage was calculated by using the equation of: Inhibition % = [(C-T) / C] X 100, where, C: diameter of the control colony and T: diameter of treated colony. Maximum inhibition of 100% against *F. oxyporum* was found at 10% and 20% concentrations of ethanol and methanol extracts of fully matured seed and mace extracts except fruit peel. There was a clear increase of antifungal activity of all extracts plant materials against *F. oxyporum* with their increasing maturity. Maximum inhibition of 100% against *A. niger* was found at 10% and 20% concentrations of ethanol and methanol extracts of fully matured mace. However, seed extracts showed favorable condition for growth of *A. niger* with increasing maturity while mace and peel showed increasing inhibitory action with increasing maturity. It was found that mace samples showed encouraging results indicating potential use for management of *F. oxyporum* and *A. niger* by showing the highest inhibition at all concentration levels especially at the fully maturity stage.

Keywords: antifungal activity, *Aspergilus niger*, *Fusarium oxyporum*, maturity stage, nutmeg

Effect of Milk Fat and Added Sugar Reduction on the Sensory Properties and Consumer Acceptability of Probiotic Set Yoghurts

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Unhealthy fat (UF) and added sugar (AS) are prominent risk factors that cause diet related non communicable diseases. Hence reshaping the food recipes by reducing, eliminating and replacing UF and AS is a timely requirement. However, this approach may adversely affect the consumer acceptance of food products. Therefore, the objective of this study was to determine the effect of different milk fats (MF, 0%, 1.5%, 3.3%) or AS (0%, 3.5%, 7%) levels on the sensory properties and consumer acceptability of probiotic set yogurts fermented with a symbiosis blend of *Streptococcus thermophilus*, *Lactobacillus acidophilus*, *Bifidobacterium bifidum* and *Lactobacillus delbrueckii subsp. Bulgaricus*. 7% AS and 3.3% MF containing yoghurt was considered as the control. A quantitative descriptive analysis was conducted using 12 semi-trained panelists to evaluate the sensory profile of yogurts by rating the intensity of sensory descriptors on a 10 unit scale. Consumers' preferences were determined by 31 untrained individuals applying the hedonic test for preference. Descriptive data showed significant differences ($P < 0.05$) among the samples for 8 of the 15 attributes including flavor and texture parameters. Overall consumer preference reduces with the AS reduction while MF level has no largely influence on it. Low-fat yogurt is much preferred in taste than the control. Zero sugar is the least preferred sample.

Keywords: added sugar, milk fat, reduction

Investigation of Thickness Dependence of Surface Potential of Evaporated Mixed Films of TPBi and CBP

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Organic light emitting devices have been extensively investigated in many promising applications. Surface potential (SP) is essential in characterizing the fabrication process of Organic light emitting diodes (OLEDs). In the case of OLED fabrication, some organic materials are spontaneously oriented and ordered in the evaporation films in the OLED structure. Although, according to the literature, many organic semiconductor films show such a spontaneous orientation polarization (SOP), the formation mechanism of SOP has not been well understood. Thus, far many studies have been dedicated to understand macroscopic properties of SOP in the single component. However they have not been well characterized in terms of SOP for mixed films which are often used in the OLEDs. Thus, it is essential to characterise the surface potential and its local distribution on mixed films of polar and nonpolar molecules which are commonly employed in OLED fabrication. As the initial step, we have characterized TPBi (polar) - 2,2',2"- (1,3,5-Benzinetriyl)-tris(1-phenyl-1-H-benzimidazole) with CBP (nonpolar) - 4,4′-Bis(N-carbazolyl) - 1,1′-biphenyl via the Kelvin probe (KP) measurement technique in order to verify the surface potential.Organic layers were deposited on half covered (using shadow mask) Indium Tin Oxide (ITO) glass substrate *via* the vacuum evaporation technique at UHV chamber with a base pressure of $\sim 10^{-4}$ Pa in the dark condition. After carefully adjusting the evaporation condition of each molecule using thickness monitor, two molecules were simultaneously deposited on the ITO substrate. Several mixed films with different thicknesses were fabricated under the same experimental conditions in order to identify the surface potential as a function of mixed film thickness. KP measurement was performed for each film and after the KP measurement, thickness of the films was estimated *via* profilemeter and atomic force microscope measurements. The results of the surface potential against film thickness were obtained for each and every film. It is clear from the results that the surface potential of TPBi (polar) with CBP (nonpolar) mixed film increases with the increment of film thicknesses which implies that the molecular interactions decrease with the increment of film thickness. Further, we have compared the SP of mixed film with single film of TPBi and found the values to be 74.75 mV/nm and 57.53 mV/nm for the mixed and the single films, respectively.

Keywords: kelvin probe, organic light emitting diode, spontaneous orientation polarization, surface potential

Hydrothermal Preparation of Nano-TiO$_2$ Pigments from Sri Lankan Natural Ilmenite

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Mineral sand deposits represent a most promising and profitable future resource for the country. The crude heavy minerals at Pulmudai-Sri Lanka contain about 60% to 70% of heavy minerals having composition of 70% to 75% ilmenite (FeTiO$_3$), 10% rutile (TiO$_2$) and 8 to 10% zircon (ZrSiO$_4$). Titanium dioxide is an important inorganic chemical material, especially the best-quality white pigment. Decomposition of ilmenite (FeTiO$_3$) structure into TiO$_2$ is normally done at 850 °C using 70% H$_2$SO$_4$. In this study, the above conversion has been carried out at a relatively low temperature with saturated vapor pressure under hydrothermal conditions. Ilmenite was collected from beach sands in Pulmudai and finely powdered. The powdered material was then treated with Concentrated HCl under hydrothermal conditions at different temperatures and pressures. Ilmenite was decomposed completely and nano-particles of anatse phase of rutile TiO$_2$ were obtained directly from the autoclave with further hydrothermal treatment under basic media, the anatse phase was converted into the rutile phase of TiO$_2$. The effect of pH on the size and morphology of particles in nano-powders were also investigated. Results showed that after the hydrothermal treatment of ilmenite, black-colored granules changed into swelled yellowish-white powder. The X-ray powder diffraction pattern confirmed that the products were well crystalline pure phases of rutile (TiO$_2$) depending on the experimental conditions. The SEM-EDX and XRF analysis confirmed the product contained 100% TiO$_2$. The particles sizes of nano TiO$_2$ produced were between 85 nm to 100 nm. ICPS chemical analysis of the final product indicated 17.50 ppb of Fe which is within the range of acceptable levels when pure TiO$_2$ is concerned. The leachate solution was also colored yellowish, indicating the Fe leaching from the natural source. This phenomenon implies that the hydrothermal treatment for natural rutile can be used not only as a reaction step but also as a semi-purification step. The results demonstrated that the process is inexpensive, environment friendly and promising in preparing high-purity TiO$_2$ from ilmenite with a high content of gangues.

Keywords- hydrothermal conditions, ilmenite, titanium dioxide

M5P Model Tree in Predicting Potato Price in the Intermediate Zone in Sri Lanka

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There are three major climatic zones in Sri Lanka named as wet, intermediate and dry zones according to the average annual rainfall. Potato has become an essential food in Sri Lanka and the potato varieties grown in Welimada are also grown in intermediate zones especially in Badulla district. The intermediate zone's potato highly affects the total local potato production. However, the intermediate potato price is subjected to a price fluctuation within a short period of time and on some occasions the price variation negatively affects the farmers as well as the customers and subsequently farmers are unable to cover up their production cost. This study investigates the factors affecting the variations of production prices of potato grown at the intermediate zone of Sri Lanka, basically in the Badulla area. To that end, M5P model tree algorithms were trained to find out the triggering forces behind this issue and develop a producer price prediction model. Following features are considered as independent variables for predicting the producer price of potato grown at the intermediate zone; imported potato wholesale prices (IPW), producer prices of Nuwara Eliya potato (NPP), rainfall (MxRB), minimum temperature (MinTB), maximum temperature (MxTB), minimum relative humidity (MinRH) and maximum relative humidity (MxRH) in Badulla district, extent (ExBP) and production (PWPMT) of Welimada potato. The data were collected from the Meteorological Department of Sri Lanka, the Hector Kobbekaduwa Agrarian and Research Institute and the Census and Statistics Department of Sri Lanka, for the period from 2005 to 2015. The dataset consists of 574 instances. The data were preprocessed as there were missing values. Then the M5P models were trained and tested using 10 fold cross-validation. The prediction quality of the models is evaluated using the following factors and M5P smoothed model tree gave the best prediction quality; Correlation coefficient: 0.744, Mean absolute error: 8.2511, Root mean squared error: 10.7904, Relative absolute error: 62.6481 %, Root relative squared error: 66.7029 %, out of all the M5P models. The model gave the eleven (11) rules and according to the rules, it shows that the factors: NPP, MxTB and MinRH positively affecting and ExBP, PWPMT, IPW, MxRB, MinTB and MxRH factors negatively affectingthe producer price of intermediate zone's potato. The outcome of this study is helpful for the farmers to increase their profit of potato farming at the intermediate zone by considering these factors for their cultivation planning and it is able to predict the production price of potato in the intermediate zone in Sri Lanka.

Keywords: intermediate zone, m5p, potato, price, prediction

Decision to Going Public: Review of Literature

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Becoming a public company is a significant milestone in the life cycle of a company. There are noticeable factors behind the going public decision of firms. The factors have been identified and then established as theories in literature: cost-benefit hypothesis. The review of literature reveals that companies get the going public decision based on a tradeoff between the cost and benefit of going public. However, some of such benefits can be attainable as being a private company too rather than a public company. This study is intended to critically analyze each benefit outlined in theory to evaluate the viability of the benefit in practice as being a public company. In order to achieve the objective of this study, each benefit stated, in theory, is critically analyzed, whether it can be realizable through being solely a public company rather than a private company based on the findings of previous empirical studies in different markets and in different periods. Therefore, the commonly identified benefits of going public in the previous empirical studies are listed and then each of the benefits is evaluated whether it can be attainable as being a private company or as being a public company. Based on the critical elevation, it was revealed that raising funds from the general public was not the prime purpose of going public decision as stated in the face of Initial Public Offering (IPO). This finding may encourage future research in this area to find interesting facts about IPO.

Keywords: benefits of going public, cost-benefit hypothesis, going public, IPO

Potential of Natural Geo-Sorbents in Neutralizing Soil Cd and Pb

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Forest dieback has proven to be the biggest threat on Horton Plains, one of the most important natural resources in Sri Lank. It serves as a major water catchment for the island creating three major rivers. Crop irrigation and generation of hydropower in the country largely depend on the rivers originated from Horton Plains. Therefore, finding a long-term solution to save this sensitive natural resource is vital. Soil pollution by heavy metals (especially Pb and Cd) has been recognized as one of the foremost reasons for the forest dieback in Horton Plains. This study has focused on identifying the potential of using a natural geo-sorbent (biochar) as a cost-effective solution to remediate the contaminated soils in Horton Plains. A laboratory trial with four (04) treatments as (i) control without biochar (T1), (ii) biochar made from Rubber Nut Shell (RNB), (iii) biochar from Rice Husk (RHB) and (iv) biochar from Horton Plains (HPB) was conducted. The soils spiked with standard Pb and Cd were mixed with biochar and left for incubation at room temperature for 14 weeks. The pH and the Cation Exchange Capacity (CEC) of the soil were 5.4 and 210 c mols kg^{-1} respectively. Soil Organic matter was in an extremely high level at 13.4%. Before the addition of the treatments, the content of Pb and Cd in all different types of biochar were analyzed and were undetectable. The immobilization capacity of RHB for Pb was the highest, followed by RNB (P< 0.0001). HPB has proven to be unsuccessful in immobilizing soil Pb. Immobilization of Cd added to the soil was observed and it was significant (p <0.03). However, the control has also shown its ability to immobilize Cd in the soil. Thus, it appears that the existence of extraordinary level of SOM and active natural sorbents in SOM such as humic acid and fulvic acid have concealed the effect of all the biochar treatments. The amount of Cd used for spiking the soil was 0.1 µg and the minute quantity might have been immobilized by the SOM in the soil. However, the study proved the potential of neutralizing both the Cd and Pb toxicity in soil by using the natural geosorbent biochar.

Keywords: horton plains, forest dieback, natural geo-sorbent, biochar, heavy metal immobilization

Review of Literature on the Determinants of Capital Structure

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Capital structure decision of a firm plays a vital part in maximizing the firm's value. The mix of the diverse funds obtained by the firm defines its capital structure. The problem of how firms choose and adjust their strategic financing mix has attracted a great deal of attention from corporate financial economists and has been a source of intense debate. In the traditional finance theory, an individual is considered to be rational and the effect of the decision maker's personality is neglected. The better management of a firm understands the dynamics of macroeconomic factors on capital structure. Most of the developing countries have become an emerging market with a lot of potential investments that appeal to investors and get managers to rethink about the influencing factors of using debt and their extent of influence over firms. Most of literature reviews on the determinants of capital structure have failed to explain the different viewpoints at once and the purpose of this study is to review the determinants of capital structure. Authors have identified, from the review of literature, that some finance theories (MM theory, Trade off theory, Agency cost theory, Pecking order theory and Market timing theory), economic factors (Inflation, Tax rate, GDP growth, Lending rate), psychological factors (Overconfidence, Optimism, Loss aversion, Anchoring) and firm characteristics (Profitability, Firm size, Tangibility, Depreciation, Growth opportunities, Liquidity) decide the capital structure of a firm. In addition this study will develop conceptual framework for the determinants of capital structure in different perspectives.

Keywords: capital structure, economic and psychological factors, finance theory, firm characteristics

A Study on How Social Values and Attitudes of Sri Lankans Affect the Communication of Sinhala Learned JICA Volunteers Working in Sri Lanka

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Japan International Cooperation Agency (JICA) dispatches Japan Overseas Cooperation Volunteers (JOCV) for various fields in Sri Lanka. A pre-dispatch training is given for the JOCV s, which consists of a Sinhala language course. Before starting their profession in Sri Lanka, they experience a one month homestay with a Sri Lankan Family and follow another Sinhala language course. Yet, some usage errors are still visible in their daily Sinhala conversations. Furthermore, they encounter many problems and misunderstandings with Sri Lankans due to the difference of working style and attitudes. The objective of this research was to identify the reasons behind these barriers in communication. It would also be a portrayal of the differences in language usage according to the social values, working styles and attitudes of both nations. This research was based mostly on primary data collected through face to face interviews with 10 JICA volunteers currently working in Sri Lanka, as the main sample. The structured interview was based on Sinhala language text books which were being used in the Sinhala language courses at JICA. According to the analysis of data, most of the volunteers had pointed out that the language they had learned through text books was significantly different from the language used in daily conversations. Some volunteers had experienced uneasiness due to the lack of understanding of Sri Lankan working style and behaviour. The author has listed up some common situations where the misunderstandings occurred. The author expects to introduce the findings to the JICA Sri Lanka office to propose them a reconsideration of their Sinhala language courses. They may introduce a "Culture note" section for the Sinhala text books of JICA. Besides, the author recommends an orientation program for the Sri Lankan office workers as well, on how to deal with the new Japanese members. Both languages have their endemic features in the usage which are determined on complexed cultural parameters. Without a knowledge of so called complexities, the volunteers are unable to capture the naturally engraved language usages in Sinhala. This research recommends the importance of a thorough cultural awareness program for the said volunteers and for the Sri Lankan counterparts who will be assigned to work with JICA volunteers for a certain period of time.

Keywords: attitudes, communication, culture, Japanese language, Sinhala language

Investigation of Changes in Body Composition of Sport Sciences Undergraduates in Sabaragamuwa University of Sri Lanka

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Body composition provides information on health related behaviour of an individual. Variations related to body composition are directly correlated with the involvement of an individual in physical activities such as leisure time activities, sports and exercises and physical activities related to daily living. Therefore it is important to investigate the body composition of the undergraduates involved in Sports Sciences and Physical Education degree programmes in relation to the activities they carry out during their undergraduate programme. The information obtained through this study will provide us the nutrition level and the physical activity level of the undergraduates. We investigated a student population of 255 with 125 females and 130 males for their body composition using Bioelectrical Impedance Analyzer (Tanita, MC-780MA). The student participation for the research was entirely voluntary and the females who were pregnant or menstruating when taking the measurements were omitted from the evaluation. All the subjects were instructed not to take alcohol or do excessive exercise for 12 hours and not to eat or drink for 3 hours before the measurement. A total of 133 students, 77 females and 56 males voluntarily participated in the study. Information such as weight, height, body mass index (BMI), fat free mass, fat mass and visceral fat level were obtained from each individual. The results revealed that the females had the mean weight increased (47.12 kg, 49.28 kg, 57.83kg) with the year of study (1st year, 2nd year and 3rd year) while males had the mean weight decreased (61.00 kg, 59.86 kg, 56.42 kg) and both groups maintained their height approximately constant (female 157.53 m, 157.87 m, 158.27 m; male 70.30 m, 168.89 m, 166.69 m). The BMI substantially enhanced in females by 4.59% by the second year 6.25% by the third year, while the changes in males were 0.38% and 3.09% respectively. Similarly both fat mass and fat free mass increased in females by 10.75% and 39.15 % respectively and those of males increased by 2.49% and 8.89%. The visceral fat level of both males (4.06, 4.00, and 6.59) and females (1.64, 2.00, and 6.41) increased with their year of study. Further investigations and correlation with the physical activity level & nutritional intake must be carried out to obtain conclusive information.

Keywords: body composition, body mass index, fat free mass, fat mass

Session 03
Academic Presentations – Part 02

Functional Study of MUDENG using ScFv Antibody and Its Knockout Cells

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MUDENG (Mu-2-related death-inducing gene, MuD) is revealed to be involved in cell death singling. MUDENG can be an attractive target for cancer therapeutic intervention. However its function(s) has not been fully discovered yet. It had been first suggested that MuD was involved in the death-inducing mechanism as assumed from the nomenclature of this gene although a recent report claimed that MuD might function as an anti-apoptotic gene. Therefore, the real function of this gene has still remained to be elucidated. Here the function(s) of MuD has been demonstrated by using anti-MuD scFv (single chain fragment variable) and its knockout cells. It has been supposed that MuD encodes two different isoforms, alpha and beta. The alpha form has 103 extra amino acid residues at the N-terminus compared to the beta isoform. The remaining 387 amino acid residues are the same as each other. Two different scFvs (scFv - C22B3 and scFv - M3H9) against MuD were constructed using anti-MuD monoclonal antibodies C22B3 and M3H9. The scFv - C22B3 and scFv-M3H9 recognized amino terminal domain of MuD and middle region of MuD respectively. That is, the scFv - C22B3 targets only alpha isoform and scFv-M3H9, both alpha and beta isoforms. Each scFv was ectopically expressed in U251-MG cells. The cells expressing anti - MuD-scFv - C22B3 showed resistance to TNF - related apoptosis-inducing ligand (TRAIL), on the contrary, scFv-M3H9 neither U251-MG cells made sensitized nor resistant to TRAIL treatment significantly. In order to confirm these results, two kinds of MuD knock out cells using the CRIPR/Cas9 genome editing system were made: the alpha KO cells that knock out (KO) for only alpha MuD isoform and the beta KO cells which target both the alpha and beta isoforms of MsuD. TRAIL induced cytotoxicity was not altered in the alpha mutant cells, while beta mutants were significantly sensitized to TRAIL treatment, indicating that deletion of both isoforms enhances the cytotoxic effect of TRAIL treatment. Taken together, this study indicates an anti-apoptotic function of MuD during the TRAIL mediated death signaling in glioblastoma multiform (GBM).

Keywords: anti-MUDENG, scFv, CRISPR/Cas9, TRAIL, Isoform, GBM

Impact of Micro-plastics on Microbial Activity in Soil

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Particulate plastics (i.e., 'micro-plastics' or 'nano-plastics) are synthetic polymer particles measuring less than 5 mm in diameter. These particles have extensively been used worldwide as primary constituents (i.e., in cosmetics) and secondary constituents (i.e., breakdown of plastic mulch). Therefore, particulate plastics are widely found in aquatic and terrestrial environments and also identified as causing severe pollution. Because their impact on microbial functions in terrestrial environment remains largely unclear, an incubation study was conducted to examine the impact of particulate plastic contamination on microbial activity in soil. In this study soil samples were mixed with particulate plastics at the ratio of 6.4% (w/w) in soil. Two types of contaminants, perfluorooctane sulfonate (PFOS) at 1000 µg kg^{-1} soil and copper (Cu) at 500 mg kg^{-1} soil, were also used. After two weeks of the incubation period, soil respiration, microbial biomass carbon (MBC), dehydrogenase activity (DHA) and bioavailable Cu were measured. Results indicated low basal respiration, DHA and MBC in contaminated soil treatments. Although Cu toxicity caused a 30% decrease in DHA in soil, the toxicity caused by both Cu and PFOS was more profound. The microbial activities in the contaminated soils were higher in the presence than absence of particulate plastic addition. Our experimental evidence suggests that the particulate plastics interact with organic and inorganic contaminants and modulate their toxicity to soil microbial activities.

Keywords: ecotoxicity, microbeads, per - and poly - fluroalkyl substances, trace elements

The 3D Biomechanical Model of Gymnast on Parallel Bars to Promote Highly Difficult Gymnastic Movements

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The long swing gymnastic movements under the parallel bars are highly difficult movements compared to other the movements on parallel bar apparatus. To minimize the verity of execution errors, introduced by the Federation of International Gymnastics, such as lack of extension at horizontal regrasping after saltos and uncontrolled regrasping, with around 75% shoulder injuries based on these elements in China, the 3D biomechanical model of gymnast has been introduced as a coaching tool. Standard Lagrange dynamic equations are used to derive the dynamic equations of hands, upper arms, lower arms, head, 'upper Torso+lower Torso', thighs, shanks and feet as 14 segments models. Standard Chinese anthropometric measurements are considered to find the characteristics of 14 segment body models. Gleno-Humaral joints of gymnast are used as a model with massless spring-dampers. Hence the kinematics on the frontal frame of gymnastic-parallel bars system are observed. The 3D mathematical model was designed using four massless spring dampers and two point masses to observe the dynamic properties of wooden bars. The Kene's procedure was used to derive the system's dynamical equations. Finally, the simulation of the 3D biomechanical model of the gymnast on the parallel bars was designed to predict technically accurate movement patterns of the long swing gymnastic movements with all necessary kinetics: maximum muscle torques for 58 kg gymnast (Shoulder 18.11 N.m, Hip 378 N.m, Knee 111.3 N.m), kinematics of the gymnast-parallel bars system (angular velocities are arm 400.01 deg.s^{-1}, thighs -452.35 deg.s^{-1} and shank 352 deg.s^{-1}) and maximum displacement of Acromion from Cervical Vertebra (7th) 0.0349 m on sagittal plane in the dynamic situation. Similarly, these values have been predicted for physically prepared newcomers for long swing gymnastic movements (for 70 kg player: Shoulder 20.10 N.m, Hip 424 N.m, Knee 132.4 N.m). According to these findings, movement pattern of the long swing movements was adjusted to minimize the execution errors and injuries. This 3D biomechanical model can demonstrate the role of elastic energy of parallel bars to promote highly executed long swing gymnastic movements. Hence, coaches and players can use this 3D biomechanical model of gymnast for their coaching-training process of highly difficult long swing gymnastic movements on parallel bars.

Keywords: 3D biomechanical model of gymnast, dynamic strain, bars of 'parallel bars', long swing gymnastic movements, shoulder joint

The Relationship between Hamstring Flexibility and H: Q Co Activation Ratio, Pelvic Alignment and Lumbar Range of Motion of Recreational Athletes with Non-Specific Low Back Pain

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Low back pain (LBP) has become one of the most widespread public health concerns and majority of the worlds' population (80%) suffer from LBP at any point in their lives. Only 8-15% of patients with LBP are identified through patho-anatomical diagnosis while the majority (90%) of LBP cases is diagnosed as "non-specific low back pain" (NSLBP). Nevertheless, among athletes and physically active population NSLBP is one of the most common complains thus accounting for 1% to 30% of athletic injuries. Etiology of NSLBP is multifactorial and complicated. Impaired bio-mechanical factors of lower limbs and pelvis are the known causes for development of NSLBP. This study was conducted to identify if hamstring flexibility had an impact on the hamstring to quadriceps co activation ratio, pelvic tilt, lumbar flexion and extension range of motion for developing NSLBP among recreational athletes. This experimental cross-sectional study consisted of a convenient sample of thirty five (35) collegiate recreational athletes from Tongji Medical College. 18 NSLBP athletes {(Female = 10(age =23.2±3.05 years, BMI= 23.26± 2.8) ; (Male= 08) (age =24.88 ±2.9 years, BMI= 22.56± 2.11)} who engaged in recreational sports for more than six (06) months and had LBP for more than 4 weeks without any patho-anatomical origin and a pain score of > 2 on a 0 to 10 cm visual analogue scale (VAS scale) were recruited to the NSLBP group. 17 asymptomatic healthy counterparts { (Female = 09(age =23± 2.59 years, BMI= 22.96± 1.77)}; (Male= 08(age =28.25±4.33 years, BMI= 24.97± 3.65) who engaged in recreational sports for more than six (06) months in the absence of lower limb injuries were in the healthy group. Demographic data were gathered and functional disability level was rated using self-administered questionnaire and Oswestry disability index respectively. Anthropometric measurements (height, limb lengths and body weight) were measured. Clinical tests were performed to identify the deformities, neurological lesions and muscle strengths of Gluteus maximus, Gluteus medius and abdominal muscles. Active lumbar extension and flexion range of motion were measured using modified schober method. Active Knee Extension (AKE) test was performed to measure the hamstring flexibility of both limbs. Static pelvic alignment was assessed using phogrammety technique by Global Postural System (GPS). Maximum Voluntary Isometric Contractions (MVIC) of Hamstrings, Quadriceps and Erector Spinae, MVIC H:Q ratio, H: Q co activation ratio and Erector Spinae activation were assessed by surface electromyography. According to the results, a strong positive and a moderate negative linear relationship of AKE angle with functional disability level (cc = 0.7941) and lumbar extension (cc = - 0.5379) among NSLBP men respectively were seen. There was a moderate negative linear relationship between pelvic tilt and lumbar flexion (-0.4295) in NSLBP women. Moreover, AKE angle showed a significant variation (p < 0.05) among NSLBP and healthy subjects (p=0.0198), NSLBP women and healthy women (p=0.0128), NSLBP men and healthy men (p=0.039), NSLBP women and men (p=0.0079) and healthy women and men (p= < 0.0001). There was a significant difference of lumbar extension (p=0.0409) among NSLBP women and healthy women. Within the confines of this study, Hamstring flexibility had an association on the development of NSLBP and reduction the lumbar extension range of motion in male athletes. When the hamstring flexibility was higher, lumbar extension ROM decreased in male recreational NSLBP athletes. Moreover, level of hamstring flexibility significantly varied among female and male recreational athletes despite having NSLBP.

Keywords: Hamstring flexibility, H: Q co activation ratio, Lumbar Range of Motion, Non - specific low back pain, Pelvic tilt, Recreational athletes

Evaluation of Anti-Proliferative Action of a Poly Herbal Formulae 'Le Pana Guliya' and Assessment of Its Mechanism of Action

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'Le Pana Guliya' (LPG) is a polyherbal formulation which is used to treat different types of cancers in traditional medicine of Sri Lanka. The present study describes *in vitro* efficacy and biochemical mechanism of action of LPG on $HepG_2$, HeLa, MCF-7 and RD cell line compared to a healthy CC1 cells. MTT, LDH and protein content assays were carried out to evaluate the antiproliferative activity of LPG on tested cancer cells compared to the CC1 cell line. NO synthesis and GSH content were assayed to determine the oxidative stress exerted by LPG. Rhodamine 123 staining, caspase 3 activity, DNA fragmentation and microscopic examination of cells stained with EtBr/AO were used to identify the apoptosis mechanisms associated with LPG. The MTT assay demonstrated significant antiproliferative activity ($p<0.05$) against $HepG_2$, HeLa, MCF-7 and RD cells after 24 hour exposure of LPG compared to CC1 cells and EC_{50} values were 2.7 ± 0.4, 19.0 ± 2.6, 24.9 ± 2.0 and 17.6 ± 2.8 µg/mL respectively. In contrast, CC1 cells showed an EC_{50} value of 213.07 ± 7.71 µg/mL. Similar results were observed with LDH release where there was a significant ($p<0.05$) dose and time dependent increase in the LDH release in cancer cells. A dose dependent decrease in protein content was shown in all cancer cell types compared to respective untreated cells after 24 hour exposure. However the decrease in protein content of CC1 cells treated with LPG (2.5 -10 µg/mL) was lower than that of all cancer cell types and the values were less than 20%. There was a significant increase in NO production and decrease in GSH production ($p < 0.05$) in all cancer cell types treated with LPG compared to their respective untreated cells as well as with CC1 cells. The exogenous GSH was able to increase the cell viability significantly ($p < 0.05$) in the presence of LPG in all cell types investigated. Rhodamine 123 assay showed the mitochondrial involvement in cell death by depletion of MMP. The decreased MMP in turn led to the increase in caspase-3 activity. Thus a prominent increase in caspase 3 activity was observed in $HepG_2$, HeLa and RD cells between the concentrations of 0.25 and 25 µg/mL. The MCF-7 and CC1 cells did not show an elevation in caspase 3 activity. $HepG_2$, HeLa and RD cells showed typical apoptotic morphological changes and fragmented DNA in contrast to the MCF-7 cells and in CC1 cells even at high concentrations of LPG (500 µg/mL). The present study proves that LPG is able to induce apoptosis *via* oxidative stress mediated caspase 3 dependent pathway in $HepG_2$, HeLa and RD cells. Even though the LPG exerts oxidative stress in MCF-7 cells by elevating the NO levels and decreasing the GSH levels, the absence of typical apoptotic features indicate that MCF-7 cells follow an alternative cell death pathway. Results of brine shrimp and CC1 cells prove that LPG does not exert cytotoxicity on healthy cells.

Keywords: MTT assay, LDH, Rhodamine 123, MMP

Hydro-Geochemical Variations of Ground Water in Different Types of Land Use in Belihuloya Mini Catchment

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The characteristics of surface and underground water are dependent on natural factors in the drainage basin and vary with seasonal differences in runoff volumes, weather conditions and water levels. Human interventions also have significant effects on water quality. This study examined the spatial distribution of hydro-geochemical characteristics of groundwater under different types of land use in Belihuloya mini-catchment area. To investigate spatial variations of hydro-geochemical parameters the water samples were collected during North Eastern Monsoon (NEM) and First Inter-monsoon (FIM) seasons in 2014. 20 water samples were selected containing 10 from springs and 10 from the selected wells. Spatial variation of pH and Ca in sample wells and spring water showed different patterns when comparing of NO_3, SO_4, K and Na in the area. According to the WHO guidelines lower levels of pH (4.5-5.5) were observed of wells located in the western part of the middle catchment area and pH levels of all spring water were within in the recommended level (6.4 to 7.4). Ca concentrations of wells (Ca; 14.4-19.1 mg/L) located in the eastern part of the middle catchment area and of springs (16,2-20.1 mg/L) located in down catchment area were higher than those in the study area. However, all parameters of water samples were less than the WHO recommended limits. The spatial variation of NO_3, SO_4, K and Na in the area showed similar variations with the land use pattern in the area. Higher concentrations of NO_3 (2.2-2.9 mg/L), SO_4, (1.0-1.9 mg/L), K (4.7-9.3 mg/L) and Na (7.3- 9.3 mg/L) were detected in well water along the Eastern part of the middle catchment area associated with paddy, home garden and built-up area. Higher levels of NO_3 (1.6-1.9 mg/L), SO_4, (1.6-1.9 mg/L), K (3.3-3.9 mg/L) and Na (4.4-5.3 mg/L) were detected in spring water along western part of the upper catchment, eastern part of the middle catchment and lower catchment area associated with paddy, home garden, pines, tea, built-up and scrublands in the area. This study attempted to examine the spatial distribution of hydro-geochemical characteristics of groundwater under different types of land use in the Belihuloya mini-catchment area. However, the spatial variation of NO_3, SO_4, K and Na in the area showed similar variations with the land use pattern in the area. Higher concentrations of nutrients due to fertilization were noted along the paddy lands, home gardens, tea and built-up areas, particularly in the middle catchment area where the earliest land use type as forests was found. Lower levels of nutrients in groundwater were observed along forested, scrubland and grasslands. The use of high yielding varieties, intensive agricultural practices and changing the economic mode of production since 1956 have considerably change the water quality. Hence continuous monitoring of ground and surface water quality in the study area is necessary to avoid the potential impacts to the water resources.

Keywords: hydro-geochemical variations, ground water, water quality, land use change

Telework and Creativity of Professional Employees: A Study in Software Developing Industry in Sri Lanka

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Employee creativity is imperative in pursuing organizational aspirations in a dynamic business environment. Consequently, scholars and practitioners continuously investigate the avenues of augmenting creativity of employees. Creativity is defined as the generation of both novel and useful ideas by individuals. Organizational studies have long recognized that interpersonal relationships, frequent face to face contacts, interactions, mutual trust, support and reciprocity are the important determinants of individual creativity. However, with the development of information technology many organizations have begun to implement teleworking as an alternative job design which enable employees to carry out job activities at a distant location. Intriguing the curiosity, a recent study has found a positive relationship between telework and individual creativity suggesting the distinct benefits associated with reduced interactions in enhancing creativity. Though this piece of evidence provides basic insight about telework and creativity relationship, how teleworking impacts on the individual creativity remains unanswered. Addressing this gap and based on the insights of Identity Theory, this study examined the effect of telework on the novelty and usefulness dimensions of creativity through personal and social identity. Being in positivist paradigm and followed by deductive reasoning approach, the researchers collected data through a questionnaire survey. The sample was comprised of 246 professional employees who engaged in telework in software development companies in Sri Lanka. We conducted a multi mediator analysis by using Structural Equation Modelling (SEM) and PROCESS macro. This study found two important results. First, extent of telework had a positive effect on personal identity which in turn had a positive impact on novelty dimension of creativity. Second, extent of telework had a negative effect on usefulness dimension of creativity as a result of reduced team identity. The present research adds new knowledge to the existing literature by unearthing the mechanisms through which telework impacts on individual creativity. In addition, the present study has important implications for the practitioners. The study informs that teleworking is a strategy to enhance personal identity which is in turn important in developing novel ideas. Also, the finding of teleworking reduces the usefulness dimension of creativity suggesting the importance of working in collocated context in order to enhance the knowledge sharing and representation in the organization. In summary, these findings imply the importance of maintaining the balance in between working at collocated context and teleworking to foster both personal and team identities that will enhance the overall creativity.

Keywords: telework, novelty, usefulness, personal identity, team identity

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Academic Presentations – Part 03

Association among Anthropometric, Physiological and Physical Fitness Variables of Male Footballers in Sri Lanka

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The present study aims at finding out the association of anthropometric, physiological and physical fitness variables with the playing ability of male footballers in Sri Lanka. The study was conducted for men aged from 18 to 28 years representing the 41st National Sports Festival of Sri Lanka in 2015. The players (180 players) who took part in football from nine provinces were identified as subjects for this study. The football playing ability was chosen as the dependent variable and assessed by subjective rating. The Muscular Strength, Muscular Endurance, Cardio Respiratory Endurance, Flexibility, Agility, Elastic Power, Height, Weight, Upper Arm Relaxed Girth, Fore Arm Girth, Chest Girth, Wrist Girth, Waist Girth, Thigh Girth, Calf Girth, Angle Girth, Acromiale Raiale Length, Raialesylion Dactylion, Midstylion Dactylion Length, Foot Length, Leg Length, Forced Expiratory Volume in One Second and VO_2 Max were selected as the independent variables and tested by the standardized procedure. Data were collected for playing ability and other selected independent variables. In order to examine the association between playing ability and selected independent variables, simple correlation was calculated (P>0.05). The results of the present study show significant association of football playing ability with the selected variables among Sri Lankan football players.

Keywords: anthropometric, physiological, physical fitness, football, playing ability

Internal Textures and Geochronology of Zircon and Monazite as Indicators of Multithermal History of Southwestern Highland Complex, Sri Lanka

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Constituent rocks of the Southwestern Highland Complex (SWHC) of Sri Lanka is thought to have experienced multithermal events during the Gondwana amalgamation. However the lack of evidence of these events has motivated this study. Behavior of internal textures of zircon and monazite is considered as an important factor before the chronological analyses. Therefore, interanl textures of zircon and monazite in garnet-biotite gneiss, garnet-biotite-cordierite gneiss, hornblende-bearing charnockitic gneiss and charnockitic gneiss were studied in detail. U-Pb ages of zircons and Chemical U-Th-total Pb Isochron MEthod (CHIME) dating of monazites were used as conventional methods of geochronology. Zircons show detrital cores and overgrowths with two to five growth stages. Detrital zircon cores are rounded or euhedral to subhedral in shape and show transgressive internal textures or oscillatory zoning. In minor cases, zircons consist of rounded or skeletal cores containing inclusions and/or voids and overgrowths showing two or three generations. Ages of detrital cores are in the range of 3.3–1.7 Ga, implying source ages of 3.3–1.7 Ma. Most of the overgrowths gave ages from 2730–500 Ma. Especially, zircons with ages in the ranges of 1900–1700 and 630–500 Ma have Th/U-ratios less than 0.1, implying formation by metamorphic events. Zircons with ages in the range of 630–500 Ma imply the generation at the latest metamorphic event stage. The monazites have core-rim zoned, inherited core-bearing, complexly zoned and oscillatory zoned type internal textures. The determined isochron ages are grouped into four clusters: group I of 1830–1648 Ma, 1766±140 Ma, 1788±30 Ma; group II of 803±99 Ma, 679±99 Ma; group III of ages with 550–485 Ma, 533±22 Ma, and481±42 Ma; and group IV of ages with 470–430 Ma, 470±45 Ma and 433±14 Ma. The ages of the group I may imply either magma emplacement ages or depositional ages of sediments. The ages of the group II correspond to the stage of the most prominent thermal event recorded in the region. The groups III and IV can be identified as post-peak thermal events. However, the groups III to IV can be considered as one group or event within the error ranges of the ages. The internal textures and the age data of the zircons and monazites prove the repeated thermal events which signify the complex evolution process of the SWHC. Several growth stages of overgrowths observed in some zircons and Group I ages of monazite suggest much more complex thermal events than those have been considered in the recently published simplified models and seem to be consistent with the previous published crustal model.

Keywords: EPMA, Geochronology, LA-ICP-MS, Monazite, Zircon

User Emotion and Behaviour as Contextual Parameters with Contextual Pre-Filtering and Contextual Modeling in Travel Recommendation

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Emotion-based recommendation is widely used in many recommendation domains and has been discussed in context-aware recommendation. Adapting emotion is mainly followed by the notion of the different role of emotion in the process of recommendation as users interact with the system. Ample researches have been suggested in the domains of music and movie recommendation but very few studies are found on travel recommendation. Thus, the proposed study used emotion and user behavior as contexts and used pre-filtering and contextual modeling approaches to find the effectiveness of travel destination recommendations. In the filtering approach, the system recommendation was implemented in contextual pre-filtering paradigm and used the contextual information to select the most relevant item and user data for generating recommendations by using item-item collaborative filtering. Top five destinations were generated as recommendations to trace the effectiveness of the recommendation by using Loglikelihood similarity and Simple Weighted Average predictive rating calculation algorithm. In contextual modeling, CANDECOMP/PARAFAC(CP) Tensor Factorization model was adapted, which used ratings from M users for N items under Q types of contexts as a three-dimensional tensor and generated the top five recommendations for each context. As the contexts, both emotion and user behavior details were incorporated in recommendation engine for the comparison. A new corpus with emotion context for place recommendation was developed by using Semantic Analysis techniques due to the lack of properly recorded dataset and the derived dataset used in the implementation. In the process of deriving emotion tags, we used the text reviews collected from TripAdvisor and defined an emotion tag for each selected destination based on lexicon-based semantic classification. Both approaches with contexts outperformed with the selected contextual parameters and results of tensor factorization approach with user emotion and user behavior proved higher effectivity in tourist destination recommendation compared to other approaches (Mean Average Precision = 81.59 %). Our study focused on a challenging field, such as tourist destination recommendation while selecting the emotion and user behavior as contextual parameters and the selected contextual parameters proved user satisfactions towards the recommendation generated by the system.

Keywords: context-aware recommendation, collaborative filtering, tensor factorization, sentiment analysis

Effects of Gender, Food Habits and Physical Activity on Body Mass Index (BMI): An Empirical Study among a Selected Group of Medical Students

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According to World Health Organization (WHO) obesity is one of the major health issues and yet the most neglected among the populations world over. According to WHO recommendations BMI (Body Mass Index) is a simple, practical and epidemiological measure of identifying overweight and obesity among individuals. The aim of the present study was to determine the relationship between BMI and other factors such as gender, dietary habits, physical activity, geographical location and family history, among the selected group of medical students. The sample consisted of 157 healthy second year medical students, aged between 20 and 23 years, out of which 63 were male and 94 were female. The study was carried out to assess the obesity among the selected group of students by calculating BMI and to determine the factors correlated with BMI. In order to achieve the stated objective, we assessed the obesity among the selected group individuals by calculating BMI (kg/m^2) and analyzed the factors correlated with BMI. The results are presented as mean±SEM. ANOVA test and t test were performed to determine the significant difference. All the statistical analyses were done using SPSS version 19.0 and Microsoft Excel 2007. Based on the BMI cutoff value of the WHO classification, 30.76% of the male students and 34.1% of the female students were found to be overweight or obese. The t- test results indicated that the mean BMI values for male and female were not significantly different (p- value =0.836). As per the ANOVA test results the mean BMI value of subgroups of non- vegetarians, regular consumers of meat, fish and egg, were significantly deferent (p value= 0.001). The mean values of the two groups, consuming fast food regularly and not consuming fast food that regularly were significantly different (p value=0.000). There was no significant deference between the two groups, consuming fruits regularly and not consuming fruits regularly (p-value= 0.061). Among two groups engaging in physical activities regularly and not engaging regularly, the difference in mean BMI values was statistically significant (p-value= 0.000). However there was no significant difference (p-value =0.115) between the urban and suburban groups. The mean BMI of the subjects in two groups i.e. parent's have at least one from the following disease (CHD, DM and HT) are not statistically significant (p value = 0.043). With the findings taken into account, BMI value was significantly affected by vegetarian diet, regular fast food consumption and engaging physical activity. However there was no significant deference between the mean BMI value and other factors such as gender, regular fruit consumption, geographical location and family history.

Keywords: body mass index, dietary habits, family history, geographical location and obesity

Returning to the Past from the Postcolonial Trauma: Evidence from V.S. Naipaul

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This study investigates the postcolonial condition of returning to the past as a symptomatic alternative to escape from the traumatic experience of the colonial drama. The evidence for the above phenomenon can be derived from V.S. Naipaul's *The Mimic Men* (1967), *Among the Believers* (2003) and *A Bend in the River* (1979) where the 'hurt ego' of the postcolonial subject seeks the psychological comfort of tradition against modern secularism. The textual analysis of those texts shows that the nostalgia for re-actualizing the past takes a totalitarian turn in both *Among the Believers* and *A Bend in the River*, when postcolonial rulers deviate from universal democratic values and embrace the discourse of the tradition in order to heal the hurt postcolonial ego. However, though they deny the western lifeworld and poetically turn to Islamic faith, according to Naipaul, there are queues in Pakistan to migrate to America for a better life escaping from the failure of decolonization. This paradox becomes evident when those who become physically 'de-territorialized' from the postcolonial world to advanced nations, desire to return to their former territories. Ralph Singh in *The Mimic Men* shows the embarrassing truth that he does not belong to any territory; the native Caribbean or new metropolitan London and becomes a psychological cripple. Similarly, characters such as Prasojo, Shafi and Sitor in *Among the Believers* show the same symptom when they are not fully detached from their origin and psychologically live like 'natives' wherever they go. A character such as Sitor in Indonesia finds his ultimate psychological comfort in discovering the lost code of his nativity which was initially destroyed by the colonizers who later re-emerge in a spectral presence to re-discover it for him. Naipaul detects that this recovery of native essence finally heals the hurt soul of the postcolonial subject. The attempt to re-actualize the nostalgia of the pre-colonial lifeworld that is confirmed by the above code is evidenced by Naipaul through a political symptom of totalitarianism in *A Bend in the River*. Synchronizing the evidence in the above three texts, this paper concludes that no psychological stability is possible for the postcolonial man unless if he chooses to do the 'impossible' in achieving more innovative goals to become 'more master than master'.

Keywords: V.S. Naipaul, historical nostalgia, totalitarianism, postcolonial situation

Variation of Microbial Biomass Carbon in paddy growing soils in Northern and Southern Sri Lanka

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Paddy cultivation plays the most important role in food production of Sri Lanka. In order to sustain paddy production, soil fertility should be managed properly. Microbial biomass plays an important role in maintaining soil fertility. The present study examines the Microbial Biomass Carbon (MBC) variation in paddy growing soils in Northern and Southern Sri Lanka in relation to some soil parameters. Twelve locations each from Southern and Northern Provinces were sampled for soil using conditional Latin hypercube sampling (cLHS) design to study the variation of MBC in the two different agro ecological zones. Soil MBC was determined using chloroform fumigation and extraction method. Soil pH, Electrical Conductivity (EC) and moisture content were also examined. The results revealed that, MBC content of the soils from the Southern Province was significantly higher than that from the Northern Province. Moreover, MBC showed a significant positive correlation with moisture ($r = 0.58$) and EC ($r = 0.50$), while a significant negative correlation with pH ($r = 0.50$) at 5% probability level. Study identified that soil pH, EC and moisture content controlled the MBC in soils. Further, the study concluded that an increased MBC can be maintained by managing the above soil parameters in the Northern Province.

Keywords: microbial biomass carbon, paddy soil, soil moisture, soil pH

Promoting Voluntary Employee Green Behaviour: A Multi-Theory Model

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Corporate greening is a contemporary discourse in business context. Consequently, Green Human Resource Management (GHRM) is emerging as a new branch of Human Resource Management. One of the key challenges in GHRM is to generating, promoting and sustaining voluntary employee green behaviour (VEGB). In this study, grounded on social exchange theory, self-determination theory and theory of normative conduct, we tested the impact of leader's support for environment (LSE), autonomous motivation for environment (AME) and perceived group's green climate (PGGC) on VEGB in an integrated model. Being in positivist paradigm and pursuing deductive reasoning approach, researchers employed quantitative survey strategy by using a multi-item questionnaire. The sample consists of 313 executive level employees who work in 68 workgroups in five (5) green implemented Textile and Apparel Manufacturing factories in Sri Lanka. Researchers performed exploratory and confirmatory factor analyses before testing the hypotheses by using Structural Equation Modelling (SEM) and PROCESS macro. We found direct positive impacts of leader's support for environment, autonomous motivation for environment and perceived group's green climate on voluntary employee green behaviour. Markedly, autonomous motivation for environment and perceived group's green climate were found to be partial mediators for the relationship between LSE and VEGB. In addition, LSE was an antecedent of both autonomous motivation for environment and the perceived group's green climate. This research also found that AME, as a solo construct, had a higher impact on voluntary employee green behaviour than that of LSE and PGGC. This study contributes to GHRM field by developing a theoretically rigorous model which uncovers the mechanisms through which LSE leads to VEGB and maidenly, unearthing the role of perceived group's green climate in determining VEGB. We recommend the followings to practitioners in promoting VEGB; designing and execution of environmental supportive leader development programmes, reinforcing enterprise's green strategy and leadership's environmental commitment, organizing of group green training for executive-level employees, facilitating group led environmental sustainability projects, implementing green recruitment and selection and developing autonomous motivation for environment of existing employees. Future researchers are recommended to add further mediating mechanisms and moderating mechanisms to the model. Also, embarking on longitudinal mixed methodology studies to establish causal relationships among antecedents of VEGB and in-depth understanding of dynamics of VEGB would advance GHRM body of knowledge.

Keywords: Autonomous Motivation for Environment, Green Human Resource Management, Leader's Support for Environment, Perceived Group's Green Climate, Voluntary Employee Green Behaviour

Session 05
Presentations on Research Grant

Current Status of Taxonomy and Biogeography of Family Channidae (Snakeheads) of Sri Lanka

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The freshwater fish family *Channidae* comprises only one genus; *Channa* with five species native to Sri Lanka which includes *C. ara, C. striata, C. orientalis, C. punctata* and *C. gachua* (*C. kellartii*). All members of this genus are restricted to freshwater habitats. Some members are commercially harvested in significantly large numbers as food fish (*Channa striata*) and for aquarium trade (*C.ara and C. orientalis*). The objectives of the current study are to, (1) examine the current status of taxonomy of Channidae of Sri Lanka (2) explore the current knowledge on the biogeography of Channidae in Sri Lanka. According to available literature on Sri Lankan Channidae, three species of snakeheads are endemic to the island namely; *C. ara, C. orientalis and C. kelaartii.* However, in global literature on family Channidae, the taxonomic validity of *C. ara* remains ambiguous. Further, repeatedly published records morphologically presumed by authors as *C. orientalis,* from the Indian subcontinent questions its endemic status in Sri Lanka. Interestingly, the name *C. kelaarti* is reported as available for the concurrent synonym for *C. gachua* after a DNA barcoding study, on which a proper taxonomic review is pending. A distribution review on recent field surveys in Sri Lanka (since 1980), including our preliminary work have recorded *Channa ara, C. striata, C. punctata and C. gachua* (*C. kellartii*) from the South-western, Dry zone and the Mahaweli icthiological zones. However, the current study reinstates the distribution of Channidae with previous findings where *C. ara, C. orientalis* and *C. punctata* were only recorded from the south–western ichthyological zone of Sri Lanka. Our preliminary findings show that a critical taxonomic review using both the morphological and molecular evidence is essential in determining the species status and endemicity of Sri Lankan Chaniindae while their biogeographical affinities would reveal an interesting evolutionary history.

Keywords: biogeography, Channidae, sneakheads, Sri Lanka, taxonomy

Diversity of Leaf Morphology among *Syzigium cumini* (Madan) Trees from Different Regions of Sri Lanka

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Syzygium cumini (L.) Skeels (Madan), commonly known as Jamun or black plum is a large evergreen multipurpose tree belonging to the family Myrtaceae. Though the world production of *S. cumini* fruit is estimated at 13.5 million tons, it is considered as an underutilized fruit crop. In Sri Lanka there is a vast potential for this fruit crop to upgrade its status from underutilized to well utilized level. The *Syzygium cumini* fruits are known to be a good source of iron and are used as an effective control agent against diabetes, heart and liver trouble in Ayurvedic and other folk medicines. Therefore, it is worth exploring its contribution to the healthy life of consumers. Further, wide variation of the tree in nature could potentially support in reinforcing the food security even in the face of global climate change scenario by identifying trees with the best characters. Leaf morphological variation could potentially indicate possible taxonomic variation and is central to plant taxonomy and systematics. In order to explore the leaf morphological variation across different geographical locations in Sri Lanka, leaf samples of *S. Cumini* were collected from seven sites namely Kalpitiya, Batticaloa, Ampara, Hambanthota, Udawalawa, Knuckles region and Belihuloya. Twenty five trees were randomly selected from a site and leaf area, leaf length, leaf width, petiole length, internode length and angle of leaf vain to the mid rib were measured using the Image J software. Leaf morphology measurements varied highly among the selected regions. Especially average leaf area of *S.cumini* was recorded as 31.23cm^2 with the smallest from Hambanthota (12.11cm^2) whereas the highest was from Batticaloa (82.23cm^2). When leaf parameters are considered, tree population in Batticaloa and Belihuloya are highly deviated from each other as well as from the rest of the regions sampled. Based on leaf morphological parameters, three clusters were identified where trees falling to all three clusters were observed in Ampara and Batticaloa. This indicated higher morphological elasticity of plants found in those areas. Trees in cluster two were found restricted to Ampara and Batticaloa Districs which was regional specific. Cluster three was common in all the areas. This study confirms there exists a high variation of leaf morphology among *S. cumini* trees in selected regions in Sri Lanka hence providing the potential for identifying unique plants with favorable characters for varied conditions in the face of climate change.

Keywords: leaf area, leaf length, leaf morphology, leaf width, *Syzigium cumini*

Effect of Vascular Endothelial Growth Factor 165$_a$ and 165$_b$ on Porcine Primordial Follicle Viability *In vitro*

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Understanding how oocyte morphogens regulate folliculogenesis and how their actions and interactions are integrated into the overall processes in physiology and pathophysiology of reproductive systems of mammals is an existing challenge. Growth of an oocyte in mammal starts with an avascular structure called a 'primordial follicle' and subsequent to ovulation this avascular structure transforms into a heavily vascular corpus luteum. This primordial follicle activation is a complex process and it is not yet completely understood. Vascular endothelial growth factor (VEGF) is well-known for its ability to regulate angiogenesis from the existing blood vessels. Studies on VEGF play a pivotal role in understanding the primordial follicle activation and progression of their growth. The objective of the current study was to determine the effect of VEGF$_{165a}$ and VEGF$_{165b}$ on porcine primordial follicle development *in vitro*. VEGF$_{165a}$ is known to be a pro-angiogenic factor where VEGF$_{165b}$ is anti-angiogenic. The tissue samples were treated with VEGF$_{165a}$ and VEGF$_{165b}$ with 0ng/ml, 0.1, 1.0, 10.0 ng/ml and the day 0 (Negative control) sample was fixed in 10% neutral buffered formalin instantly. The preliminary data were obtained from short-term (72 hours) *in vitro* culture of porcine ovarian cortical stripes and tissues were incubated under 5% CO_2 with the humidified atmospheric conditions at 37.5^0C. Out of three different dose regimes in VEGF$_{165a}$ treated tissues, 0.1ng/ml resulted in the highest viable follicle count (92.6%) while 1.0ng/ml and 10ng/ml had shown 65.3% and 24.8% viable follicle count, respectively. The highest VEGF$_{165a}$ concentration recorded the highest follicle degeneration. Among the VEGF$_{165b}$ treated tissues, 0.1ng/ml, 1.0ng/ml and 10.0ng/ml have shown 65.3%, 43.7%, 17.3% follicle viability respectively. As VEGF$_{165b}$ is an anti-angiogenic factor, it contributed to the increase follicular degeneration in all treatments. It showed a pattern of follicle degeneration where higher concentrations had accelerated the follicle degeneration. In conclusion it was evident that the lowest VEGF$_{165a}$ concentration (0.1ng/ml) improved the follicular viability, where 1 and 10ng/ml VEGF$_{165a}$ increased the follicular degeneration. Also VEGF$_{165b}$ has a negative effect on follicular viability *in-vitro.* In animal's body both VEGF$_{165a}$ and VEGF$_{165b}$ coexist while showing equilibrium. It needs to be further investigated to find the ideal concentrations of VEGF$_{165a}$ and VEGF$_{165b}$ that promote cell viability *in vitro.*

Keywords: angiogenic factor, follicle activation, porcine primordial follicle, VEGF$_{165}$

Geology of the High Altitude Niyendigala Landslide, Belihuloya, Sri Lanka

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Niyendigala landslide is a 'skewed' debris flow (width, 10-50 m) of more than 1.6 km in length which originated ∼1260 m above MSL on 3rd May 2016 in Paraviyangala Mountain, Belihuloya. Although landslides are most common in mountainous areas, geology beneath is deterministic. In this report, we present the geology of the Niyendigala landslide. Spatial analysis and mapping of the landslide were done using Google Earth and the *ArcGIS™ 10.3 software*. Field investigations were carried out to confirm the spatial distribution and mapping of the landslide. Representative rock samples were collected at seventeen locations from different layers of the newly exposed bedrock on the slip surface. Dip and strike of foliation and joint planes were measured using geological compass at these locations. 'Geo rose' was used to plot the attitude of foliations and joints. A Fracture lineament (FL) map of the area was prepared based on the field data and aerial photo interpretation. Slopes along the entire landslide path vary between 7° - 33°. Slope at the crown is 25° - 27°. The bedrock along the landslide consists of interbanded quartzite, pelitic gneiss, garnet- biotite gneiss, garnet bearing charnockitic gneiss, metagranitoid and gabbroic gneiss dipping mainly NW with a strike variable between N75°W to N40°E. Landslide axis can vary between S25°E to S30°W. Bedrock at the crown is weathered and highly fractured. Many joint planes are highly inclined while some are parallel to the slip surface. It shows at least five joint sets (090°/65°S, 45°/90° 115°/67°SW, 180°/70° E and 040°/63°SE) with joint intensities of 3-6/m. Fracture lineaments in Panniloya catchment where the landslide occurred are mainly oriented from NNW to NNE. The catchment shows ∼5 km/km^2 of FL density while that of adjacent catchments are ∼3-6 km/km^2. Soil profiles along the slide show gradual weathering or sharp contacts towards the bedrock. The slope of the main scarp before initiation of the landslide is within the optimum angle of repose for unconsolidated materials, 25° - 40°. The landslide falls along a scarp slope that consists of a folded package of inter-banded rock layers with high joint intensity. Its axis is oblique to the strike of the foliation. Fractured and weathered bed rock at crown helped initiation while many joint planes at the body of the landslide contributed to the failure. However, FL density is not the highest among adjacent catchments. Debris flow took place along a slip surface developed between partially decomposed bedrock and overlying soil overburden at places and soil overburden and the bedrock at other places.

Keywords: fracture, joint, landslide, Niyendigala, soil

Impact of Sustainable Supply Chain Practices on Buying Firm Performance related to Manufacturing Companies in Sri Lanka

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The history of the world reveals a pattern of development in human life. Nonetheless, current industrial growth is increasingly jeopardizing the future sustainability of the earth and its natural resources and environment. One of the most observable trends in countries such as Sri Lanka where the open market economy is dominant in all the areas in socio cultural spheres is that the management of private sectors attempts to maximize profit in their businesses without caring much for its environmental and social conditions. But the true development of a country depends not only on economic growth. The achieved development to be sustainable, in parallel with economic development, they have to consider about the environmental and social factors of an economy. Sustainable development meets the needs of people today without compromising the ability of people in the future to meet their needs. Therefore, it is very clear that the concept of sustainability is the most appropriate tool for preventing or minimizing the jeopardy created by the industrial growth in the world. This study is carried out as a survey related to manufacturing firms in Sri Lanka. Manufacturing is a one cog of the whole supply chain wheel. All supply chains can be optimized using sustainable practices. Sustainability in the supply chain encapsulates a number of different priorities: environmental stewardship, conservation of resources, reduction of carbon footprint, financial savings and viability and social responsibility. Since suppliers are the key component in any supply chain, supplier selection is a very crucial decision that has to be taken by particular managers. Due to a small mistake done by a supplier, whole chain can be paralyzed. It may be a problem of quality, order fulfillment, cost or price, profit, customer relationship or even more than them. Therefore, this survey study focuses on identifying the impact of sustainable supply chain practices on buying firm performance considering manufacturing companies in Sri Lanka. The firm's success is basically explained by its performance over a certain period of time. Researchers have extended efforts to determine measures for the concept of performance as a crucial notion. Finding a measurement for the performance of the firm enables the comparison of performances over different time periods. Sustainable supplier selection criteria are used as sustainable supply chain practices in this study. For the purpose of measuring the success of sustainable supply chain practices financial and market performance will be measured using the data which will be gathered from all listed manufacturing companies under the Colombo Stock Exchange in Sri Lanka. Further, return on assets (ROA) and return on equity (ROE) will be used to measure the financial performance and Tobin Q will be used to measure the market performance in this study. Since this study will identify supplier selection criteria implemented by the manufacturing companies in Sri Lanka and measure firm performance related to sustainable supplier selection criteria, these findings will give a novel contribution to the body of knowledge.

Keywords: Jeopardizing, Sustainability, Performance, ROA, ROE, Tobin Q

Maternal care and Midwifery Service in Rural Sri Lanka

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The decrease of infant mortality rates (IMR) and maternal mortality rates (MMR) in Sri Lanka has shown a remarkable improvement of healthcare over recent decades. This attainment is almost equivalent to that of some developed countries. Since Sri Lanka is still in the developing status, usually the credit of this success goes to the established medical system of the country and welfare based economy. Although there is no argument on this over emphasized assessment, this research attempts to reveal the role of midwifery service which has been the key stakeholder behind this success. This paper is a part of a research on infant mortality trends in Sri Lanka that has been conducted covering five districts namely: Anuradhapura, Badulla, Hambantota, Kandy and Ratnapura. Relevant primary data were generated through the process of interviewing 80 mothers who have given birth to mortal infants during the period of 2016 to 2018. Some useful information was carried out from informal interviews with 10 midwives representing relevant districts. Personal observations on visual anthropological sources were also utilized as primary data sources. Previous researches, journal articles and published statistical documents of government organizations were used as secondary facts. This research reveals that the most important relationship at pre delivery, delivery and post delivery periods for mothers as, Midwife 48.3 %, Doctor 31.7 %, Family members 18.3 % and others 1.7 %. Moreover, the sample figures show that receiving basic knowledge of hygiene, nutrition and family planning were obtained highly from doctor or midwife 71.7 %, digital media 32.6 %, Printed media 27.3 %, friends or neighbors 19.4 %, formal education 15.2 % and 22.2 % from other sources. Based on these figures this research continued with scrutinizing the history of midwifery service in Sri Lanka. Although, the health care service appeared in Sri Lanka from kings' age up to now in different stands of the process of institutionalizing, it does not say all these facilities equally catered to all remote areas of the Island. This paper also argues that, even though a number of development programmes have been introduced, a seldom of their outcomes have effectively reached to the less developed areas. However, with the implementation of the systematic midwifery service throughout every administrative division it has shown a remarkable attainment even in the remote geographical destinations reporting such low rates of IMR and MMR cases in Sri Lanka.

Keywords: community health, infant mortality, maternal care, midwifery service, rural Sri Lanka

Organic Farming in Sri Lanka: Farmers' Point of View

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Organic farming is an environmentally compatible, ecologically sound and human and animal friendly production system. It is gaining world-wide attention with its ability to reduce environmental pollution while enhancing sustainable development in many aspects. It is obvious that organic farming is capable of reducing the negative impacts of conventional agriculture on human beings and the environment while enhancing rural economic development. However, most of the Sri Lankan farmers (about 85%), are still engaged in conventional or inorganic farming. Moreover, it is hard to find literature on the farmers' perception of organic farming at present. With this kind of context, the study was purposively focused on exploring the Sri Lankan farmers' perception of organic farming. Thus, the main objectives of this research were to investigate the Sri Lankan farmers' attitude towards organic agriculture, existing potential and challenges to continue with the organic farming in Sri Lanka. Badulla and Ratnapura districts were purposely selected as study areas because of their adaptability to organic farming. A sample of 300 farmers, 150 from each district was randomly selected to conduct the field survey during July 2017 to April 2018 while using a pre-tested structured questionnaire. Few descriptive statistical methods were used for the data analysis. Results revealed that the majority of the farmers (74%) had a significant level of indigenous knowledge about organic farming which was passed from their parents. As per the mean analysis, farmers had a positive attitude towards two factors; health enhancing aspects and environmental protection aspects of organic agriculture. However, they had a negative attitude towards two factors; the complexity of organic farming and unavailability of a proper market for organic products. Moreover, the presence of indigenous knowledge about organic farming including seeds, planting materials and favorable climatic condition was the main potential while labor intensiveness and loop holes in quality certifications of organic products were the major challenges. The study can be concluded as, if necessary conditions are provided to farmers in these two districts, they can be motivated towards organic farming. Therefore, promotion of organic farming and sustainable development of these two districts can be done by developing better marketing facilities for organic products, providing required facilities for the production of organic food as well as processing and value addition of organic foods.

Keywords: farmers' attitude, organic farming, organic products, Sri Lanka

The Impact of Health Care Cost on the Living Conditions of Farmers Suffering from CKDu: A Case of *Keselpotha* Village in *Redimaliyadda* Area in Sri Lanka

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Many data sources confirmed that more than 15 percent of the farmers in North Central and Uva provinces in Sri Lanka are affected by the Chronic Kidney Disease of uncertain aetiology (CKDu). However, dearth of empirical evidence regarding the present state of the living condition of farmers who suffer from CKDu and how their health care cost affects the living condition represents a significant gap which is a limitation to formulate policies. Therefore, this study attempted to explore the impact of health care cost of farmers who suffered from CKDu on their living conditions. The study mainly employed survey method to gather data. *Keselpotha* village in *Redimaliyadda* area located in *Uva* province in Sri Lanka, where a large number of farmers who suffered from CKDu lived, was selected as a case. There were 132 farmers who suffered from CKDu living in this village and data were collected from all the patients conducting face-to-face interviews on a structural questionnaire. The data were analysed using multiple regression method. Results revealed that direct financial cost of treatments had a negative significant impact on the farmers' living conditions which was measured using the index develop by Gaur (2013) (β = - 0.499 and t-value = 5.99). Costs for traveling to participate in the clinic in government/private hospitals and expenses on laboratory testing and medicines were the main cost items that they bore. Further, the study assessed the indirect cost for treatments considering the manpower cost. The regression results showed that the indirect cost for treatments had a negative significant impact on the living conditions of farmers who suffered from CKDu (β = - 0.338 and t-value = 3.92). The direct cost reduced treatment ability of farmers who suffered from CKDu showing significant negative effect (β = - 0.122 and t-value = 1.72) and indirect cost also had a powerful impact on reducing the treatment ability of farmers who suffered from CKDu (β = - 0.299 and t-value = 3.52). Finally, the results confirmed that the health care costs negatively correlated with the living conditions thereby decreasing the treatment ability of farmers who suffered from CKDu (β = 0.746 and t-value = 17.14). Thus, the study has provided sufficient empirical evidences to conclude that the health care costs of farmers who suffered from CKDu had a significant impact on the treatment ability thereby diminishing the living conditions. Implementing supportive measures (health care insurance, subsidy etc.) would help to improve treatment ability thereby improving the living conditions of farmers who suffer from CKDu.

Keywords: CKDu, farmers, health care cost, living condition, treatment ability

Recreational Values of Tourism in Sustainable Development of Indigenous Landscapes in Sri Lanka

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Prehistorically and historically valued indigenous community, their landscapes and heritage have become significant resource base for sustainable tourism development in many parts of the world. Unexceptionally Sri Lanka is one of the great nations holding a number of indigenous community bases in this small island. The country has comprises with a number of ethnically diverse indigenous community villages in Uva, East, North-Central and Northern provinces. Indigenous community villages have been recognized as valuable resource bases to expand the tourism into rural regions and beyond while empowering the indigenous community and their local development. However, prevailing tourists visits to indigenous community villages do not show consistent and considerable contribution for sustainable development of indigenous community landscapes. Staged authenticated tourism in indigenous landscapes has led to misperception and misinterpretation of tourism among the tourists and hosts, indigenous communities. This study embraces with the objective of studying the consciousness and recreational values perception of tourism in indigenous community landscapes to ensure sustainable development. The multiple case study methods have been adapted to elucidate the naturalistic interpretation of the community members and tourists over the prevailing tourism. In depth semi structured interviews of indigenous community leaders in Dambana, Ppllebadde, Vakarai, Henanigala, Rathugala, Nilgala, Kuchchaweli and Kanniyai interpret history, habitats, heritage, developmental challenges and deprivation and tourism as panacea. The finding of the study revealed that the indigenous community in all the villages have failed to identify the recreational potential and generate the appropriate recreational values through their heritage, culture, habitats and livelihoods to ensure authentic tourist experience and enjoyment. Meanwhile, tourists also visit indigenous community landscapes without consciousness and appropriate recreational value perceptions. The study emphasizes the indigenous community to rediscover and repurpose their heritage, culture, livelihood and habitats through recreational values for tourists while preserving their socio-culture and environment. The marketing arm of the indigenous tourism should enhance the consciousness and appropriate recreational value perceptions among the tourists before they visit. This will lead to ensure the sustainable development in indigenous community villages, while enriching the authentic experience and enhance satisfaction.

Keywords: indigenous community, sustainable tourism, consciousness, recreation values

Gender Sensitive Value Chain Selection: Which Provide Best Opportunities for Women, Fish, Banana or Cinnamon?

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Our main focus was to compare three selected value chains (fish, banana and cinnamon) to identify women's status in each value chain as the chain actor, activity integrator, chain partner and chain co-owner. The specific objectives were to select gender sensitive value chain(s) and to develop empowerment strategies to enhance women's status in each value chain. Rapid market chain analysis was adopted and interviewer administered pre-tested questionnaires, in-depth interviews with key informants and focus group discussions were used as key data collection tools and research was conducted in the Embilipitiya, Matara. Ratnapura and Kalutara districts. Producers (farmers/fishermen) and intermediaries (auctioneers, traders, collectors, wholesalers, different retailers, consumers etc.) of each value chain were considered for the sample as follows; 50 banana farmers and 50 intermediaries, 40 cinnamon farmers and 40 intermediaries and 25 fishermen and 75 intermediaries. Chain Empowerment Matrix was developed based on the activities and power within the value chain, on activities and power within the household and within society as a whole. Chi-square test confirmed significant associations between gender and income for fish and cinnamon value chains. There was no significant association found between gender and income for banana value chain. Female involvement in the fishery value chain was identified as chain actors and activity integrators while females attached to cinnamon value chain were recognized as activity integrators. Female participation in banana value chain was poor and consequently their status was not clearly defined. Fish and cinnamon value chains were discovered as gender sensitive value chains. Transformation of the traditional household caretaker role of women to business caretaker role through strong capacity building programs, developing chain partnerships through sensitization of men, encouragement of women's participation in decision-making through strengthening the organizational capacity of women's group, creating opportunities to co-own enterprises through building direct linkages with other chain actors (including consumer markets) were identified as the empowerment strategies to enhance women's position in the respective value chains.

Keywords: gender, value chain, opportunities, women

Session 06
Undergraduate Poster Presentations

A Study of the Factors Those Affect the Smartphone Usage of the Age Group of 40 to 60 (With Special Reference to Colombo District)

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As people who live in a technological era, we all have witnessed so many mind-blowing innovations which ease our day to day activities. The advancement of the technology has spread across all fields, especially among infrastructure facilities. As we speak about the technological encroachment in the communication field, introduction of the smartphone has become a turning point in communication. A smartphone is a device which gives more functions than a computer. Due to its user friendly interface and applications, demand for smartphones has increased worldwide. According to the Recode (Molla, 2017), two third of the world adult population is expected to own a smartphone by the end of 2018. As a developing country, even though Sri Lanka is moving along with new trends and technology, the smartphone usage of the adult population of Sri Lanka is not as significant as in other countries or in Sri Lanka we cannot see the smartphone usage among the age group of 40 to 60, as higher as the youngster's usage. Therefore the purpose of this study was to identify the factors that affect the smartphone usage of the age group 40 to 60. The multi-stage cluster sampling technique was employed to draw a sample from Colombo district and primary data were collected using structured questionnaires. Binary logistics regression was used to identify the factors that affect the smartphone usage. Research results indicated that, the attitude was the main factor that affected the smart phone usage causing a rise in the usage by 32.14%, whereas with respect to a person who was educated up to grade 8, smart phone usage of a graduate and Advanced Level qualified person was greater by 1.37% and 1% respectively. The study further discovered, in relation to a person who was self-employed, smart phone usage of a person working in the private sector was 10.2% higher. Results also emphasized that, compared to a person living in rural areas, the smartphone usage of a person living in a semi-urban and urban areas were greater by 5.2% and 1.8% respectively. Consequently, it was concluded that attitude played a foremost role in smartphone usage of the age group of 40 to 60. The main suggestion was to consider their motivations, to promote their smartphone usage, since it would ease the loneliness in their later lives and improve the Sri Lankan standard of living.

Keywords: binary logistics regression, attitude, age 40 to 60, motivations

A Study of the Use of Chinese Idioms by Chinese Special Students (With Special Reference to Students of Sabaragamuwa University of Sri Lanka)

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Owing to the rapid development of China's diplomatic relationships with South Asia, tendency of foreign students to learn Chinese language has equally increased. Among the Chinese language learning institutes in Sri Lanka, University of Kelaniya and the Sabaragamuwa University of Sri Lanka are the only government universities which provide the four year special degree in Chinese language. Chinese language is rich with a large amount of various phrases and expressions of socio-cultural backgrounds. Chinese idioms could be identified as some of the key components of such phrases. The purpose of this study is to evaluate the use of Chinese idioms by Chinese language special students of the Sabaragamuwa University of Sri Lanka and to bring forth pedagogical implications governing the teaching of Chinese idioms. A questionnaire and worksheet were distributed among 36 students in order to collect primary data. Secondary data were collected through extensive reference of relevant research articles, books, HSK mock test materials, the Advanced Level Chinese syllabus and websites published in both China and Sri Lanka. 24 idioms were tested in the worksheet under five questions representing five levels in order to test the knowledge of idioms of students. Idioms taught in the translation course unit and commonly used idioms were used in order to create questions in the worksheet. The study has identified that although students have obtained some knowledge of idioms taught in the class, it is not enough for a student who reads for a special degree in Chinese language. Furthermore, students have recognized idioms as a sentence but not as a phrase with cultural and historical values. Major suggestions the researcher has brought were making more study materials available for students, including idiom stories for comprehension passages, show cartoons related to idioms within the classroom in order to improve idiom knowledge of students and delivering more opportunities for students to interact with native speakers besides the classroom.

Keywords: Chinese idioms, knowledge evaluation, Chinese specialized students, Sabaragamuwa University of Sri Lanka

An Assessment of Visitor Satisfaction at the Main Site Attributes of Dehiwala Zoological Garden, Sri Lanka.

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The number of visitors to zoological parks around the world has increased during the past few decades and it is applicable to Sri Lanka's National Zoological garden as well. The visitor count at Dehiwala Zoo has been constantly booming since peace in 2009. It is also considered as the mostly visited zoological garden in Sri Lanka. However there have been only a few studies measuring the visitor satisfaction at zoological gardens, globally and in Sri Lanka. Therefore we set out to investigate and identify the visitor satisfaction at different park attributes of the National Zoological Garden and inspect their level of impact. The "mixed methods" was employed for the study and both questionnaires and interviews were utilized for data gathering using the convenience sampling technique. Six destination attributes were used in the study and a set of questions were used to measure the level of visitor satisfaction of different attributes and most influential elements under each attribute. The variables developed were based on the items traditionally used in tourism research on site attributes such as attractions, amenities, accessibility, activities, available packages and ancillary services. The results of the study show that visitors are happy with the prevailing amenities, attraction and accessibility while they are desperate for activities, packages and ancillary services. However, the study further suggested a few recommendations to enhance the visitor satisfaction and uplift future visits to the Zoo.

Keywords: visitor satisfaction, site attributes, zoological garden

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

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

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

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

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

Keywords: forest dieback, lead, immobilization, bio char

Automatic Classification of Raw Lidar Point Clouds into Ground and Non-Ground Points

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LiDAR (Light Detection And Ranging) is a modern remote sensing technology which can provide accurate elevation data for both topographic surfaces and above ground objects. Derivation of accurate digital terrain models is one of its important applications. Because for many applications such as generation of contour lines for topographic maps, road engineering projects and flood modeling, it is required to derive accurate DTMs from the ground points. DTM can be produced by resampling extracted ground points from LiDAR data. The extraction of points representing the bare earth from point clouds acquired by airborne laser scanning is the most time consuming and expensive part in the production of digital elevation models. In recent years, many different approaches have failed at object complexities or require excessive computational time. This study presents a new rule based approach for automatic separation of ground and above ground points from raw LiDAR point clouds. The method entirely relies on the coordinates of points i.e is X,Y and Z of LiDAR data. Basically ground is a continuous surface. The main thing that can be recognized between ground points and objects points is their height difference which is larger than that from the ground points themselves. The point clouds are separated into 2D cells. The cell size was fixed (0.5m). Minimum Z value of each cell was stored and cells were replaced by 'NaN' string where the difference between minimum Z values of two neighboring cells were higher than the given threshold. The cell with higher Z value was replaced with 'NaN' string. Then these bounded objects were removed by replacing 'NaN' string. Ground points were extracted in four steps. In the 1st step, height threshold 5m above objects were removed and in the 2nd step height threshold 4.5m above objects were removed and then in the 3rd step 2.0m above objects were removed. All non-ground points were removed by considering height difference between objects and neighboring ground points. Finally, height difference more than 0.3m objects such as bushes were also removed from ground points. Both test sites i.e. Hermanni and Sennatti were classified accurately and efficiently. Five samples of Hermanni test site and two samples of Senaatti test site were used to check the accuracy of the classification. Each samples were taken with more than 90% accuracy in classification when grid size changed from 0.5m to 0.1m. Processing time increased when decreasing the cell size from 0.5m to 0.1m. By considering the processing time and accuracy of the classification, 0.5m cell size was the optimum for classification of LiDAR point clouds having density 7-9 points/m^2.

Keywords: classification, DTM, LiDAR, point clouds

Determinants of University Students' Attitudes toward Online Video Advertisements: YouTube as a Platform

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Today Online Video Advertising is one of the most important advertising tools within the growing importance of technology. Success or failure of any advertising campaign depends on the effectiveness of the selected marketing tool. According to several studies 75% of online video advertising campaigns tend to fail. The researcher identified that online video advertisement creation without having clear view about consumers' attitudes towards the advertisements is the major reason for that. By reviewing the literature, the researcher identified that entertainment, informativeness, irritation and credibility are some of the most important factors which impacts on consumers' attitudes toward online video advertisements. This study aimed to find out whether each variable affect consumers' attitudes toward online video advertisements. The population of the study was university students at five state universities. Data were collected through a survey method using online distributed questionnaires. A multiple regression analysis was applied to find out the impact of each variable on consumers' attitudes toward online video advertisements. Data were analyzed by using the SPSS 21.0 soft-ware package. Results indicated that the entertainment, informativeness, irritation and credibility had positive impacts on consumers' attitudes toward online video advertisements. This study provides practical recommendations to marketing and brand managers in understanding customer attitudes when designing their advertising strategies regarding online video advertisements.

Keywords: consumers' attitudes toward online video advertisements, entertainment, informativeness, irritation, credibility

Determination of Metformin Levels in Human Blood via LC/MS/MS

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Metformin is an anti-diabetic drug which belongs to biguanide class. It is the most prescribed oral anti-hyperglycemic agent used in managing the type II diabetes mellitus. It works by decreasing glucose production by the liver and increasing the insulin sensitivity of body tissues. Since metformin is a high polar compound, the extraction of metformin from human blood is somewhat complicated. Thus, a quick and high-through liquid chromatography mass spectrometry (LC/MS/MS) method has been developed and validated for the estimation of metformin in human blood with a simple sample extraction technique. Solid-phase extraction was used for sample preparation. Hereafter, it was followed by liquid chromatography tandem mass spectrometric analysis and an electrospray-ionization interface. The compound was analyzed using a shim-pack XR-ODS III (1.6 μm, 2.0 mm I.D. x 50 mm) column with the mobile phase consisting of 10 mmol/L ammonium formate in 0.1% formic acid in methanol as solvent A and acetonitrile as solvent B with gradient elution mode at a flow rate of 0.3 mL/min for 10 min. A retention time of 0.387 min was observed for metformin. The method was validated as per the guidelines of Scientific Working Group for Forensic Toxicology (SWGTOX) for linearity, precision, accuracy, limit of quantification, limit of detection and recovery. All the results obtained were found to be within the acceptance limit. Hence, the developed LC/MS/MS method was successfully applied for the determination of metformin in human blood. Further, it was successfully employed to measure qualitatively metformin level in a sample obtained from a deceased person who had committed suicide by overconsumption of metformin.

Keywords: human blood, LC/MS/MS, metformin, method validation, solid phase extraction

Development and Characterization of Nano Laminated Fish Oil Emulsions Using Chitosan Nanoparticles

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Fish oil is the main commercial source of omega-3 fatty acids. Application of fish oil in food formulations is limited due to its rapid oxidation and ensuing organoleptic changes. Encapsulation of fish oil using emulsification technique and creating layers around the lipid droplets using layer-by-layer (Lbl) electrostatic deposition technique can effectively solve these problems. Chitosan, obtained by the N-deacetylation of chitin, is a suitable bioencapsulation agent. In this study three emulsions were prepared using high speed homogenization of fish oil extracted from Indian oil sardine (*Sardinella longiceps*), sodium caseinate, chitosan extracted from shrimp (*Penaeus monodon*) shell waste and pectin at pH 5. Sodium caseinate was selected to stabilize the primary emulsion. In secondary and tertiary emulsions, chitosan and pectin were evaluated as the secondary and tertiary layers for emulsions. Zeta potential and particle size of emulsions and chitosan nanoparticles were measured. Scanning electron microscopy (SEM) and Fourier-Transform infrared spectroscopy (FTIR) were done for the emulsions and creaming stability and peroxide value of emulsions were compared. Extracted chitosan was analyzed for its physicochemical parameters. The results revealed a 20% chitosan yield with 3% of moisture, 4% of nitrogen, 52% of crystallinity index, 542% of water binding capacity, 419% of fat binding capacity, 79% of degree of deacetylation and 95% solubility of extracted chitosan. FTIR spectra confirmed the structure of chitosan compared with commercial chitosan. Average particle size of three emulsions and chitosan nanoparticles were 0.727, 1.230, 0.813 and 0.830 μm respectively. The zeta potential of emulsions and chitosan nanoparticles were -13, -5.46, -29 and + 48 mV respectively. SEM images revealed the structural arrangement of powdered emulsion with a rough surface and pores on the walls of capsules. Bonds between wall material of nanocapsules and functional groups were also confirmed by the FTIR spectra. There was a significant difference ($p < 0.05$) between the peroxide value and creaming index of all three emulsions. This study revealed that three-layered fish oil droplets could be produced by Lbl deposition, incorporating caseinate, chitosan and pectin with stability against particle aggregation, creaming and oxidation. It can also be suggested that chemically extracted chitosan can be used with protein to encapsulate and stabilize the fish oil.

Keywords: Chitosan, encapsulation, emulsification, fish oil, oxidation

Early Marriage among Muslims in Sri Lanka

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Early marriage means a marriage which takes place before the age of maturity. It can be found in each and every society. The occurrence of early marriages can also be seen among the Muslims in Sri Lanka. Therefore, this study attempted to analyze the current situation regarding early marriages in Muslim community and how it differs from Sharia law as well as how Muslim Marriage and Divorce Act influences such situations. Also this study focused on the reasons, impacts and socio-economic background of the families. This study was conducted with eighty people such as women who got married at the young age, husbands, parents, officers, federation people, Quazi judges, psychiatrists and students, using both probability and non-probability sampling. The research is mainly based on primary data collected through interviews, questionnaires and case studies and secondary data collected from documents such as books, journals and web sites. Some of the key findings of this research were the reasons for early marriages and their impact. The reasons for early marriage were poverty, educational status, traditions and customs, immoral relationships, affairs, separation between parents etc. Their impacts such as divorce, disease, no right to refund the properties, frustration on life, psychological issues and blaming of society were significant findings of this research. Apart from these, reasons were found for the problems occurring after marriage as a consequence of early marriages. This study has also explored the ideas of Sharia law which emphasizes the maturity as a condition for marriage, how Muslim Marriage Divorce Act fixed the age of marriage to twelve in 1951 and how it differs from the contemporary period's maturity. Moreover this study proposes that the age limit for marriage should be changed according to the present period and maturity. Finally, some recommendations are laso mentioned in this study as solutions for early marriages and to promote healthier and happier family life among the Muslim community in Sri Lanka.

Keywords: divorce, early marriages, Muslim community, Muslim marriage and divorce act, sharia law

Economics of Ergonomics: A Case of Cinnamon Industry in Sri Lanka

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The goal of ergonomics is to fit the task to the individual, not the individual to the task. The Ceylon cinnamon is native to Sri Lanka. Traditional processing with weak quality maintenance and poor intention on processor health and safety were common evils hindering the progress of the cinnamon industry. The present approach attempts to investigate the economics of ergonomic practices in the Ceylon cinnamon industry, to identify and measure the ergonomic hazards of cinnamon processing, to evaluate cinnamon processor's performance in 3 different scenarios; traditional, semi-mechanized, GMP+ mechanized system, to identify the attitudes of cinnamon processors on mechanization, to measure the economic returns of ergonomic practices in cinnamon processing and to determine the appropriate ergonomic solution and its cost. Two hundred and forty processors from four main cinnamon cultivating districts, Galle, Matara, Kaluthara and Rathnapura, under each processing method, were the sample. Key analytical tools were Welch's test of ANOVA and Cramer's V Chi-square test. Body and GPS located maps were also developed. Results revealed that modernized processing systems showed a low level of prolonged health problems and low health costs. Both mechanized and semi-mechanized systems were positively significant in terms of productivity and efficiency (85 sticks per labor per day and 60% efficiency). Majority of processors showed positive attitudes towards the mechanization. Higher benefit/cost ratio (1.8), lower payback period (one and half years), higher IRR (90%) and higher ROI (79.9%) values were the positive signs of mechanized processing. The study pointed out that both mechanized and semi-mechanized system had a significant impact on higher performance level. Healthy, safe and comfortable working environment which encourages the processors to retain, attractive to both male and female youth, renders higher economic returns for the Ceylon cinnamon value chain. Best ergonomic practices produce safe and quality cinnamon which caters for the demands of the international market.

Keywords: Ceylon cinnamon, ergonomics, economics, Sri Lanka

Effect of Good Governance on Bank Lending: Evidence from Commercial Banks in Sri Lanka

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This study primarily aims at investigating the effect of good governance on bank lending in Sri Lanka. In this regard, the direct effect of governance on bank lending and how governance mediates bank deposits in influencing bank lending are studied. The sample includes data on 13 commercial banks and worldwide governance indicators from 2011 to 2016. When estimating the direct effect, two step system-GMM dynamic panel model is used. Meanwhile, Three Stage Least Squares model is employed in estimating the mediation effect. Results for the system-GMM model show that, good governance indices have significant impact on bank lending. Control of corruption and government effectiveness have significant negative effect on bank lending and political stability, rule of law, regulatory quality, voice and accountability show significant positive relationship. Further, Three Stage Least Squares result indicates the presence of a significant mediation effect through bank deposits. However, the common component developed from the six governance indicators, to represent overall governance, depicts an insignificant result.

Keywords: bank deposits, bank lending, good governance, macroeconomic stability

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

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Kithul jaggery is a natural sweetener made by the concentrated phloem sap of *Caryota urens* (Kithul) with no chemical additives. According to folkloric knowledge, Kithul sap based products such as jaggery possess health promoting properties and health benefits. However, these functional properties of Kithul sap based products have not been scientifically investigated. There are no reports available on the important properties such as antioxidant activity, Total Polyphenolic Content (TPC) and Total Flavonoid Content (TFC) of traditional pure Kithul jaggery (TPKJ). *Cinnamomum zeylanicum* (Cinnamon) bark is widely used as a flavoring ingredient in several foods. The major flavoring components of this bark, as often reported, include cinnamaldehyde, cinnamic acid, cinnamyl alcohol and eugenol. Cinnamon bark is also known for its antioxidative, antimicrobial and anti-carcinogenic properties owing to the presence of phenolic compounds. Cinnamon bark powder incorporated Kithul jaggery is an ideal value added product that utilizes cinnamon bark powder (CBP) as a nutrient rich and healthy sweetener with good flavor, color, odor, texture and overall acceptance compared to traditional Kithul jaggery. Kithul jaggery samples were prepared according to the traditional method and they were analyzed by the determination of ash percentage, TPC, TFC, total reducing sugar, antioxidant activity and moisture percentage. A combination was analyzed for the above properties between TPKJ and cinnamon incorporated Kithul jaggery (CKJ). TPKJ and CKJ products were evaluated through an untrained sensory panel. Accordingly the product that incorporated 4.0%w/w of CBP was selected as the product with the best flavor characteristics and it was used for following analysis. CKJ and TPKJ were analyzed for their reducing sugar. Reducing sugar content was not significantly different between TPKJ and CKJ (4%w/w). Moisture percentage was significantly different in CKJ compared to TPKJ and ash percentage was not significantly different in CKJ compared to TPKJ. Extracted percentage was not significantly different in CKJ compared to TPKJ in 80% ethanol, a solution for dried sample preparation to determine TPC, TFC and ABTS radical scavenging assays. But, extracted percentage of CBP was significantly different compared to both of the jaggery variations. TPC, TFC and ABTS radical scavenging assays were evaluated and these were not significantly different in CKJ compared to TPKJ. Solution rate was not significantly different in CKJ compared to TPKJ. The most appropriate method should be used for the extraction of CBP. Sap should be boiled to a temperature of 110 ℃. Cinnamon bark powder consists of 1.5, 3.0, 4.0 and 5.5%w/w percentages those could be incorporated at a temperature of 80-90 ℃ to boiled thick juice. Moisture content was higher in CKJ than TPKJ.

Keywords: cinnamon, jaggery, kithul, physiochemical

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

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

Keywords: Irrigation interval, *Piper betle* L., super absorbent polymer, water scarcity

Effect of the UV–Ozone Exposure on Fluorescent OLEDs by Displacement Current Measurements and Morphology Measurements

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Organic light emitting diodes (OLEDs) have been a great interest of research recently. A number of modifications are carried out for the development of OLEDs. Charge accumulation at organic heterointerfaces studies using displacement current measurements (DCM) have been already demonstrated. Extending these studies to evaluate the effect of the UV-Ozone treatment on a hole-injection layer (HIL) of poly(3,4-ethylenedioxythiophene): poly(styrenesulfonate) (PEDOT:PSS) is demonstrated. A simple green emitting OLED structure was used with tris (8-quinolinolato) aluminum (Alq_3) as emitter. Two devices were fabricated to differentiate the effect of the exposure on the PEDOT:PSS. DCM measurements were followed by current-voltage-luminance measurements. PEDOT:PSS was spin casted on to two slides of SiO_2 and then controlled UV – O_3 exposure to measure the morphology changes. The study shows improved luminance levels up to $\sim$25 cd/m^2 from the treated device. Interface charge was calculated under the 100 V/s sweep rate as -0.86 mA/m^2, where $\sim$ 1.1 mA/m^2 of interface charge for the non-treated. Above results corresponds to the quasi static state of the device. Transient state of the device was analysed using sweep rate dependence in order to acquire data about contact resistance, which was not visible. AFM results suggested a reduction in the PEDOT:PSS layer, etched which must be resulted upon the exposure. The exposure is reported for work function tuning of the PEDOT:PSS and here it is revealed that exposure will reduce the interface charge at the interface, which leads to the improvement of efficiency.

Keywords: DCM, PEDOT:PSS, charge accumulation, interface charge

Estimating the Recreational Demand of Diyatha Uyana Park in Sri Lanka

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Diyatha Uyana Wetland Park has proven to be an important recreational site in the greater Colombo area in Sri Lanka. Availability of food stalls, meeting points, walking paths, daily fairs based on different items, boutiques and different shops for purchasing day to day needs and relaxation places are the major attractions. In addition, this is a place for the urban crowd to spend their leisure time moving away from the hustle of the city life. At present an entrance fee is not charged from visitors and municipal council has allocated a considerable amount of funds for maintaining a clean park for the visitors. This study estimated the recreation related welfare benefits that visitors derived from Diyatha Uyana Wetland Park. Under the Individual Travel Cost Method, Zero Truncated Poisson Regression Model was applied to estimate the welfare benefits of Diyatha Uyana Wetland Park. Further, there are few studies done in Sri Lanka applying ITCM. The welfare benefit per visitor per trip was LKR 555.55 (1USD = LKR 158.00). The study also evaluated the changes in welfare benefits if the Government of Sri Lanka would impose different entry fees (i.e. LKR 10.00, 20.00, 30.00, 40.00- and 50.00-) to the park. The total recreational value was LKR 1013.88 million per year and the present value of non-market benefit from preserving the park was LKR 10138.80 million (USD 60.42 million) per year. Therefore the findings of the present study could be applied in decision making to preserve the site and introduce an entrance fee in order to properly manage the park.

Keywords: welfare benefits, recreation, entry fee, Wetland Park, travel cost method

Impacts of Psychosocial Factors on Sport Performance across Career Stages of Olympic Athletes in Sri Lanka

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This research study has taken a step further to study and combine both factors 'psychosocial' and its impacts on sport performance. The psychosocial factor is relating to the interrelation of social factors and individual thought and behavior. There has been a majority of explorations of the social dimension and psychology aspect in Sri Lanka. But limited investigation was carried on the relationship with psychosocial factors and sport performance. In the recent past, psychosocial factors were mostly used in studies in medical and health sciences. This investigation which was carried out with the Olympians is unique since they were not interacted on a similar study before. The objective of this study was to investigate psychosocial factors and their influence in successful and poor sport performance across career stages of Olympic level athletes. The theoretical framework for the research was based on the 'developmental model on transitions faced by athletes'. The study population was selected from athletes who represented Sri Lanka during 2000 Sydney to 2016 Rio Olympic Games. Ten Summer Olympic athletes (N=10) have taken part in the study sample representing five individuals and one team sport. Semi-structured interviews were conducted to collect data. Thematic analysis was used to analyze data and focus on examining themes within data. The collected information was preferred into three parts and eight categories. The research has revealed that the psychosocial factors contributed to the successful sport performance and poor sport performance evenly during initiation, development, mastery phases and maintenance stages. The impact of parents, family, coach, peers, siblings and other factors were studied among career stages. The results presented that the psychosocial factors play a different role in the different career stages. For instance, supportive family and parents were the most important factors to Olympic athletes' successful sport performance on the initiation stage and the lack of family and coach support was a more important factor to poor sport performance during the maintenance stage. The research was recommended for future research and implication.

Keywords: developmental model, psychosocial factors, sport performance, career stages

MRF Super Resolution Approach for Mapping Gravity from Grace Satellite Data

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The gravity field of the Earth is the most important measurement that provides it's inner and outer mass balances. The problem with homogenous gravity data coverage used to measure the gravitational field is the cost and effort required in such observations with the use of expensive gravimeters. Hence the possibilities of using open source gravity data for such studies could be handful. Yet the spatial resolution of gravity data represented in regular tessellation structures adds on limitations. This study attempts to sharpen the resolution (super-resolution) of the GRACE (Gravity Recovery and Climate Experiment Satellite Mission) open source gravity data, based on the principles of the Markov Random Fields (MRF) for the Sri Lanka region. It further stresses the importance of the prior probability estimation for the gravity data classification and super resolution. Three datasets have been used for this study; the GRACE only gravity field models GGM05s, BGI Gravity database (both open source data) and the CG-6 gravimeter observation especially for the "Balangoda" region for validation purposes. Mathematical relationships between different parameters were executed in the study and are presented. The Markov Neighborhood Normalization was applied to the gravity data and further the maximum likelihood classification (MLC) with prior and without prior estimations was applied to the data separately. It was observed that better results could be obtained with the prior estimations in the classification process using the MRF neighborhoods. Trend analysis between gravity and elevation shows that the southern part of Sri Lanka has lower gravitation than the northern parts. Further the central hill region shows the lowest gravity readings in the island. It is obvious that for these trend analyses the resolution of the gravity is a concern. Finally it has been observed that according to the theoretical relation between gravity and the elevation, the results for the southern parts of the island obtained by the study had certain deviations from the rest. The final super resolution gravity map was compared with EGM2008, GECO, EIGEN-6C4-2014 and Tongji-Grace02s gravity models and it preserved the same pattern carried out by the original data and it showed a minimized mean error of 2.4090 mGal with the Tongji gravity model. Further the CG-6 observation was also compared with BGI land gravity data to validate the BGI open source data.

Keywords: gravity, GRACE and BGI Gravity data, super resolution, MRF

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

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Among the essential plant nutrients, potassium (K) is considered as a major nutrient that affects most of the biochemical and physiological processes in plants. Supplying naturally available K to plants through a special compost mixture would eradicate the requirement of chemical fertilizers such as Murate of Potash. This study is focused on producing a special compost mixture (Super Compost) that contains a significantly higher amount of potassium in available forms. The study was carried out according to the Randomized Complete Block design, using farm waste inoculated with rich natural microbial cultures extracted from virgin soils. The treatments used are: compost, compost + 10% feldspar, sterilized compost + 10% feldspar (control), compost + 10% feldspar + microbial culture from Sinharaja soils, compost + 10% feldspar + microbial culture from Kalthota soils, compost + 10% feldspar + microbial culture from Sri Pada soils and compost +10% feldspar + compost tea. To each mixture, feldspar was added at a rate of 10% of the weight of the compost pile. Available K was analyzed by a flame photometer using the digestion method. A pot experiment was conducted with nine treatments for the MICH3 variety of chilli and the BG250 variety of rice to evaluate the effect of different compost mixtures on plants. It was clearly evident that the potassium feldspar and natural microbial cultures significantly increased the available K content in compost ($P<0.001$). The highest level of available K was detected in the treatment with the microbial culture from Sinharaja (50g/l) followed by the treatment with the microbial culture from Kalthota natural forest (5g/l). The response to the microbial cultures from Sri Pada (50g/l) was late. However a jump in available K was observed in the 12th week, for this compost with feldspar. Chilli yield was significantly increased by the compost treated with feldspar (3Kg/30Kg) and microbial culture from Sinharaja (50g/l). Both panicle formation and tillering of rice were significantly increased by the same compost. Microbial cultures taken from Sinharaja (50g/l) and Kalthota (50g/l) natural ecosystems are effective microbial cultures in solubilizing potassium from feldspar.

Keywords: agrochemicals, microbial cultures, potassium feldspar

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

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

Keywords: Biochar, Cadmium, forest dieback, Horton Plains, soil remediation

Spatial and Temporal Distribution Patterns of Dengue Cases in Colombo District.

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Dengue has become the most versatile virus in latest human history that has caused thousands of deaths all around the globe. It is an epidemic disease caused by a flavi-virus transmitted via an *Aedes* mosquito specie. Prediction of numbers of potential casualties allows us to get medically prepared for allocating limited medical resources in outbreak situations. The main objective of the study was to identify whether the previous dengue cases, climatic factors *viz*. temperature and precipitation are major determinants of the current dengue incidents and if so, to develop a cost effective but highly sensitive system based on those relationships to predict the future numbers, as a measure of early preparation. We selected Colombo district which is the highest dengue hot zone of the country. Here we have identified the most affecting lag week terms or lag ranges of serial correlation, temperature as well as precipitation separately and used those lag terms to develop a multivariate regression for prediction with notified cases data and climatic data from 2010-2015. Then we calibrated the sensitivity of model with data of 2016-2017. We have used population demography data and land use data from ecological perspective to spatially locate and compare the severity of the situation. As results we found strong relationship between previous cases, temperature, precipitation and current cases. Through this, we were able to develop a strong and high sensitive prediction model for Colombo district. The weekly values predicted were 99.87% accurate to actual figures with only 0.13% deviation when averaged. It was capable of predicting 6458 cases out of 7104 cases that truly happened from 2016-2017 which was around 91% accurate. Further we identified the dengue hot zones such as Colombo central, Kaduwela and Maharagama at divisional level based on ecological relationships. It is concluded that still weather based models can play a major role in successful dengue forecasting and further, ecological concepts play a major role in understanding the behavior of the vector mosquito.

Keywords: dengue, forecasting, ecology, demography, land use

Supervisors' Leadership Style and Job Satisfaction with Special Reference to Camso Loadstar (Pvt.) Limited, Ekala

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Job satisfaction is one of the most important job related feelings that has drawn attention in the fields of Organizational Behaviour and Human Resource Management. Building a satisfied workforce is crucial for any business organization to improve quality and customer satisfaction. Most importantly, customer satisfaction is largely affected by job satisfaction of the employees. Apparently, job satisfaction should be at a higher level for an organization to achieve the excellence and to survive in the highly competitive business environment. Yet, job dissatisfaction continues as an issue calling for more investigations about the phenomenon. Hence this study is intended to find out the determinants of employees' job satisfaction in order to overcome the job dissatisfaction issue. Based on the literature, the researchers hypothesized the effect of two important leadership styles; transformational and transactional styles on job satisfaction. The context of this study is based on Camso Loadstar (Pvt.) Ltd and the respondents were operational level employees since they contributed enormously towards the success of the organization. Data were collected from 214 operational level employees by using simple random sampling technique. Whilst Survey method was used as the research strategy a standard and validated questionnaire was distributed to collect data. Hypotheses were tested through multiple regression analysis by utilizing SPSS 21.0 and Minitab 16.0 statistical software packages. Results revealed that transformational leadership has a significant positive impact on employee job satisfaction whereas transactional leadership has a negative impact on employee job satisfaction. This study provides empirical evidences to support the argument that transformational leadership is more significant in improving job satisfaction of operational level employees. The present study contributes new knowledge to the selected context and specifically to the operational level employees which have been overlooked by previous researchers. In addition, our research informs the practitioners the importance of building transformational leaders in their organizations in order to enhance job satisfaction of operational level employees.

Keywords: job satisfaction, transactional leadership, transformational leadership, operational level employees

The Impact of Tourist Harassment on the Quality of Tourist Experience: A Case Study of Hikkaduwa Beach Site

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Tourism industry is one of the largest and growing industries in the world. It has become one of the major income generation industries around the globe and it is the third highest foreign exchange earner in Sri Lanka. Sri Lanka has become a renowned tourist destination of the world because of its natural and man-made attractions and scenic beauty. Especially Sri Lankan beach sites are the major spots that tourists visit. Among the beach sites, Hikkaduwa beach is one of the main tourist destinations in the country. Therefore, many tourists who visit southern Sri Lanka make sure not to miss Hikkaduwa. Yet, the tourists are unable to get leisure experience as they hope due to harassment by locals at the attraction. Therefore this study investigates the types of harassments faced by tourists at Hikkaduwa and how harassments impact on destination experience of tourists. The data for this study were collected at Hikkaduwa itself. A total of 100 survey questionnaires were collected from tourists and 14 interviews have been conducted including the interviews from 8 foreign tourists, 2 tourist guides, 3 community members and 1 security officer. The mixed methods approach has been used. The study is conceptualized using the tourist harassment (independent variable) and destination experience of tourists (dependent variable). The first objective of the study was to identify the nature of tourist harassment at Hikkaduwa beach site. Findings of the study show that 66 percent tourists have experienced some form of harassment. They were harassed mainly by different parties like vendors, tuk-tuk drivers, some beach boys etc. The study also reveals that the major tourist harassments are exorbitant charging, cheating, begging, vendor persistence, sexual harassment etc. The second objective of the study is to identify the impact of harassment on destination experience of the tourist. According to the results, the tourist harassment had significant impact on the destination experience of the tourist. The tourist harassment conduces to dissatisfaction among tourists and also diminishes the image of the destination as well. This will reduce the future arrivals of tourists due to negative word-of-mouth. The study also observes the possible and pragmatic suggestions to overcome the tourist harassment and most of the local respondents' opinion was that the involvement of responsible parties is necessary for issuing IDs for tuk-tuk drivers, beach boys and beach sellers for recognizing them as important stakeholders in the value chain by making them aware to become tourist-friendly service providers.

Keywords: destination experience, tourist harassments, beach tourism, Sri Lanka

The Relationship between Qualities of Sport Events and Customer Satisfaction: A Study of President's Gold Cup Volleyball Tournament – 2017

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This particular study titled "The Relationship between Qualities of Sport Event and Customer Satisfaction" was accomplished with special reference to President's Gold Cup Volleyball Tournament- 2017. This study was undertaken by focusing on the matter that was recognized from the National Volleyball Convention -2017 and through records of Sri Lanka Volleyball Federation. There were four objectives constructed and achieved by this study which included the key objective namely which was to identify the relationship between quality of sport event and customer satisfaction and three specific objectives which were to determine relationship between service quality and service satisfaction, to determine the relationship between core product quality and game satisfaction and to provide strategies to eliminate or minimize the impact of the given challenges to improve the quality of services and core product. In-depth literature assessment was accomplished to offer a conceptual model to formulate hypotheses for the study. A quantitative research design was applied to examine customer satisfaction. The questionnaire survey was the main data collection method and 100 volleyball players and 50 spectators were selected as the sample by using random sampling method. The questionnaire consisted of 33 items with two subsections as service and core product quality. One dependent variable, particularly customer satisfaction and two independent variables, service quality and core product quality were selected to the study. The study provided conclusions after wearing out detailed scientific analyses of data using suitable statistical tools. The conclusions are indicated separately in players' and spectators' perspective, as well as all the main stakeholders'. The course setting resulted in service quality being weak positively correlated with service satisfaction and the core product quality being strong positively correlate with game satisfaction. Moreover the results indicated a significant strong positive relationship between quality of sport event and customer satisfaction. The results of this study will be able to be used to tailor advertising messages as well as it will be important to different affiliated parties in the sports sector.

Keywords: service quality, core product quality, service satisfaction, game satisfaction, customer satisfaction

The Use of Twitter and News Online for Enhancing Post Disaster Management Activities

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A natural disaster is an event which causes damage to both lives and properties. The detection of natural disasters is an important issue. Social media is a powerful source which can be used to improve managing disaster situations. Post-disaster management can be largely improved by proper social media mining since social media are capable of sharing information in a real-time manner. After identifying the importance of social media for post disaster management, Twitter posts were fetched from the Twitter API using predefinedKeywords relating to the disaster. At the second stage these posts were cleaned and the noise was reduced. Two-level filtering of non-relatedKeywords was used. Then at the third stage, the geolocation and the disaster type was identified. The Named Entity Recognizer library and the Google Maps Geocoding API were used to obtain the geolocation. The same three steps were carried out for the news, which was fetched from the News API. Finally, each datum from the Twitter API was compared with the relevant datum from the News API to give a rating for the trueness of each post. The rating of "More accurate" was obtained by 24% of the posts. The ratings of "Moderately accurate" and "Less accurate" were obtained by 15% and 13% of the posts respectively. Remaining 48% posts obtained the rating of "No correlation". This model can be used to alert organizations to carry out their activities of disaster management in a timely manner. The future development steps are as follows: to integrate the other social media to fetch data, to integrate the weather data into the system in order to improve the precision and accuracy for finding the trueness of the disaster and location and the use of some sophisticated machine learning techniques to reduce the noise.

Keywords: social media, disaster management, data mining, twitter, news

Web-Based Decision Support System to Evaluate Living Conditions: A Case Study of Colombo City

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Colombo city hosts almost eight hundred thousand people from various parts of the world and it is one of the fastest growing city in the Asian continent. The city subjects to heavy migration because of urbanization. Due to this reason, the living conditions vary from place to place in the city. The immigrants are often concerned about their mobility and accessibility to different civic services. Hence, selection of a living area becomes an important factor for an inhabitant physically, mentally and financially. However, systematic methodology has not been implemented to evaluate these living conditions. This study explicates utilizing of hotspot analysis and network Analysis extension of ArcGIS to extrapolate crime and the accessibility to six fundamental civic services including education, healthcare, public parks, shopping centres and emergency response (firefighting and ambulance) from different neighbourhoods of the city. Weighted overlay approach is utilized to aggregate above criteria and to find the most inhabitable neighbourhoods in the city. The study indicates the best area as "neighbourhoods with least crime and easiest accessibility to all mentioned fundamental services". Accessibility to each civic service is calculated by service area and converted to a raster data which further aggregates them into a single raster using above mentioned weighted overlay approach. After exporting the graphical model as a python script, the system is further developed to handle and return dynamic influence rate based on the user inputs and ultimately the user obtains results for the best area. Then, the generated map automatically gets uploaded into the geoserver and the users can view final liveability map on a dedicated web platform. Based on the approaches such as network analysis, multi criteria evaluation and decision support system, this study assists in selecting a neighbourhood on the basis of the selected criteria by a particular user and also helps urban planners to identify design gaps in urban areas related to each criterion.

Keywords: accessibility analysis, decision support system, living conditions, urban planning, web GIS

Women's Role in the Hotel Industry - An Exploratory Research with Special Reference to Waskaduwa Citrus Beach Hotel'

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Tourism industry is one of the fastest growing industries in the economy of Sri Lanka. It has an aim to reach its target of 2.5 million tourist arrivals by 2018. Tourism industry has witnessed a rapid growth after the 30-year civil war in north and east. Tourist arrival has doubled during the period, thus expanding tourism industry. Therefore, the hotel sector which has been a major component of the hospitality industry is required to show a rapid development in Sri Lanka. Hotels, catering and tourism is a large and fast-growing service sector, with an average female participation of 55.5 per cent at global level and up to 70 per cent at regional level. The major objectives of this research is to study the women's role within the hotel industry in Sri Lanka with a special reference to Waskaduwa Beach Hotel in Kalutara. This research also focused to identify the gender labour division that is present in the hotel industry, social concept on female hoteliers and barriers for women employees. Both primary and secondary sources have been utilized in generating data. As the source of primary data, hundred female hotel workers were selected purposively and they were interviewed by using semi-structured interview method to a sample of women employed in the hotel industry, specifically in Waskaduwa Beach Hotel in Kalutara. Five case studies and information from key informants also provided the need of primary sources. This study argues that the contribution of females is low and their social and economic status is comparatively backward within the hotel industry in Sri Lanka as a result of gender stereotyping, "glass ceiling effect" unfavorable social attitudes, stressful working schedule, security factor, sexual harassment and male dominated working environment. Certain women friendly policies like flexible timings, part time work options, daycare facility at work place, grievance redressal cell, counselling cell for women, training programmes, succession planning programmes, pick up and drop facility are few of the suggestions that can be provided to assist them and encourage them to make this Industry a better environment.

Keywords: Hospitality industry, Gender Stereotype, Role model, Glass ceiling effect, social attitudes

E-Commerce Solution for ABC Supermarket

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ABC e-commerce solution is the foremost online shopping mall developed by the Four Corners for the ABC Holdings (Pvt) Ltd in 1999. Before that, people have not had a methodology to purchase goods online from supermarkets with such facilities. This web application makes ABC customers' everyday lives easier by providing retail purchasing, delivering to doorsteps, prompting special offers/promotions and many more significant functions. Main functions in the website provide innovative solutions and services faster and continuously. ABC website consists of four major components. They are retail purchasing, delivery, promotions and other facilities. Retail purchasing produces thousands of product catalogues. Delivery component works in three different ways; home delivery, office delivery and pick up orders. Promotions grant different types of offers to their customers throughout the year. Other facilities cover many more benefits such as social logins, customized shopping lists, gift ideas, quick and easy meals, gift vouchers, k-choice products etc. Few more important developments were done to increase the efficiency of the website. They are the social login feature, quick and easy family meals feature and lazy loading feature. Through this ABC e-commerce solution, customers can place any purchase with Visa, Master and Amex credit and debit cards. ASP.NET framework used with c#. SQL, JQuery and Json was also used to develop the above three features. Ultimately those features improve the user friendliness, quality, effectiveness and efficiency of the ABC website. FCL is providing support, SEO and maintenance services for more than 15 years to enhance ABC's public recognition through this e-commerce solution.

Keywords: e-commerce, k-choice, SEO

Evaluation of VS330 GNSS Receiver in Bridge Monitoring

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Monitoring engineering structures is a vital task as far as safety aspects are concerned. Nowadays, the Real Time Kinematic (RTK) Global Navigation Satellite Systems (GNSS) are capable of providing fast and accurate measurements of bridge and various other important structures. Also the movement and damage severity can be identified using the dynamic bridge characteristics obtained from this monitoring GNSS. The aim of this work was to compare the use of RTK GNSS, DGNSS and Dual Antenna Moving Base GNSS (Hemisphere VS330) in real time motion monitoring. A wooden platform was developed to mount all types of GNSS antennas to record the movements at the same time. Hypack hydrographic software was used in collecting simultaneous data from these three different sensors and the movements were compared in all 3 dimensions. The performance of the DGNSS, RTK and the VS330 in x and y directions were almost identical. The average difference was at a decimeter scale between DGNSS and VS330 while it was just at a centimeter scale between RTK and VS330. However, the height or vertical dimension comparison was not that successful.

Keywords: VS330, RTK GNSS, DGNSS, structural monitoring

Screening the Efficacy of Plant Extracted Herbicide (Pelargonic acid 71.96 %) Against Weeds in Tea Lands (*Camellia sinensis* L.)

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Weed is a plant, grown in an undesired place while interfereing in agricultural goals. Controlling of weeds via chemical methods is more convenient and cost effective and less disturbive to soil properties than manual weeding. Managing weeds in tea plantations has become a crucial issue due to banning of some post emergent herbicides. Thus, an environmental friendly and cost effective alternative weed management strategy is of paramount importance for the sustainable productivity of tea plantations. Therefore, this study was conducted to investigate the efficacy of 71.96% w/w EC of Pelargonic acid from Rapeseed (*Brassica napus*) oil to control weeds in tea lands. Six different rates of Pelargonic acid 71.96 %, (20.3, 30.4, 40.6, 50.7, 60.9 and 81.2 l/ha in 500 l/ha) were tested with three replicates at Up, Mid and Low elevations of tea lands in comparison of standard herbicide (40% MCPA) which is recommended as a selective post emergent herbicide by the Tea Research Institute of Sri Lanka. Visual observation and Quadrat samples of weeds were taken from each plot and dry weight of quadrat samples were recorded in time intervals including pre assessment. The efficacy rate of plant extracted herbicide differed based on elevation. At High elevation, 50.7 l/ha and 60.9 l/ha were the most effective rates in controlling weeds. Pelargonic acid rate 60.9 l/ha at Mid elevation and 50.7 l/ha, 60.9 l/ha and 81.2 l/ha rates at Low elevation performed well in controlling weeds in comparison to standard treatment up to 4WAA (four weeks after application). Regrowth was observed after 4WAA at High and Mid elevations and after 3WAA at Low elevation. Application of Pelargonic acid at the rate of 60.9 l/ha could be used to control weeds for a period of up to four weeks in tea lands at all elevations as cost effective range. Results of visual scoring showed that *Spermacoce latifolia*, *Erigeron sumatrensis* and *Crassocephalum crepidioides*-like problematic weeds at High elevation, *Ageratum conyzoides* and Grass weed of *Cyrtococcum trigonum* at Mid elevation and *Spermacoce latifolia*, *Ipomoea obscura*, *Commellina diffusa* and *Cyperus rotundus* weeds at Low elevation were most susceptible to Pelargonic acid 71.96% w/w EC. Pelargonic acid had effectively controlled some of the weeds which couldn't control via synthetic herbicide application. The results revealed that Pelargonic acid 71.96% is a possible alternative for sustainable weed management in tea plantations as a spot application.

Keywords: pelargonic acid, plant extracted herbicide, rapeseed oil, tea cultivation, weed control

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

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

Keywords; ground runner, orthotropic branches, plagiotropic branches, pruned, trained

AUTHOR INDEX

Best wishes for the 8th Annual Research Session of Sabaragamuwa University of Sri Lanka.

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