Annual Research Session – 2016

Editor - in – Chief
Dr. M.S.M. Aslam

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Message from the Vice Chancellor

Sabaragamuwa University of Sri Lanka

It is with great pleasure that I extend my warmest wishes to mark the occasion of the 6th Annual Research Session (ARS-2016), to be held on 15th December, 2016. The annual research session of Sabaragamuwa University of Sri Lanka has been providing an ideal platform for university academics, postgraduate and undergraduate students to share their research finding and I am confident that the young academia of Sabaragamuwa University of Sri Lanka will immensely be benefited from the ARS-2016.

I take this opportunity to congratulate the organizing committee for taking the challenge and organizing the 6th Annual Research Session in a very professional manner. I have no doubt that ARS-2016 will offer our university academia to share their international and national experience, latest research findings and insight with their colleagues in the different fields of interest.

I also take this opportunity to appreciate and thank CRKD and the ARS committee for their untiring effort to make the 6th ARS a success.

Prof. Chandana P. Udawatte

Vice-Chancellor

Message from the Director
Centre for Research and Knowledge Dissemination

In marking the significance of the Annual Research Session (ARS), as the Director of Centre for Research and Knowledge Dissemination (CRKD) it is a great pleasure for me to forward this message on the 6th ARS of Sabaragamuwa University of Sri Lanka (SUSL). Universities are committed to encourage research and knowledge dissemination to determine the sustainability. Providing a platform annually for academic and students to disseminate their new research findings on predominantly specializing areas of interest. Here, the university shows consistent encouragement and leadership through the ARS towards its vision. Since the CRKD is the body purposefully established for the research and knowledge dissemination of SUSL holding the 6th ARS marks the milestones in the successful journey. Besides, the ARS is becoming a well-recognized institutional stimuli to build the confidence and research culture. Hence a number of enthusiastic and energetic young researchers from diverse disciplines in the university proliferate the magnitude of the 6th ARS remarkably. Enabling the intra and interdisciplinary networking and dialogue among the growing researchers to widen the knowledge on research and sharpen critical thinking of research. Eventually this enables the university to expand the horizon research and publication reaching national and global standards. This also will be an opportunity for the CRKD to expand its resource base to serve for the stakeholders and wider community. The presence and keynote speech of the well-known scientist and eminent scholar in Sri Lanka help the upcoming scholars and researchers to mould them to suite the future world. As the Director of the CRKD I really appreciate and acknowledge the leadership and guidance of the Vice-Chancellor, Prof. Chandana P. Udawatte, and the support of Registrar and Acting Bursar in holding the 5th ARS. I am also obliged to acknowledge the 5th ARS organizing committee specially the Chairman, Dr. Milinda Piyasena and Coordinator, Dr. Ruvini Muthukumaran, for their untiring efforts to hold it through many challenges.

I extend my best wishes for the success of the 5th ARS while extending my gratitude for contributors and presenters.

M.S.M. Aslam

Director – CRKD

Message from ARS 2016 Organization Committee
Sabaragamuwa University of Sri Lanka

Since its inception in 2010 the Annual Research Session (ARS), organized by the Centre for Research and Knowledge Dissemination, Sabaragamuwa University of Sri Lanka, has its prime focus on harnessing the potential of young academics of the university. Accordingly, it provides a supreme platform for young university academics to present their novel findings and to have a deep insight into the diverse fields that their colleagues engaged with and bring some motivations to their fields of interests as well.

Against the backdrop of above, ARS 2016 can be seen as a benchmark event which consist of novel finding of diverse streams of Science and Management. As such, it embraces with vast spectrum of knowledge associated with vital aspects of climatic changes, Languages, Statistical base analysis as well as cutting edge studies associated with other science streams. Apart from this, platform given to the undergraduates who performed exceptionally well in their undergraduate studies can be seen as right motivation for them to step further into their academic carrier and become accredited among the scientific community.

Therefore, on behalf of the ARS organizing committee we are much delighted to organize ARS 2016 and obliged to convey our sincere vote of thanks to the Vice Chancellor, Sabaragamuwa university of Sri Lanka for providing us with right guiding throughout this event. We are in debt to Dr. Iraj Ratnayake,Dean-Faculty of Graduate Studies, Dr. H.S.R Rosairo, Dean-Faculty of Agricultural Sciences, Prof. Udaya Rathnayaka, Dean-Faculty of Applied Sciences, Dr. H.M. Indika Prasanna, Dean-Faculty of Geomatics, Dr. R.M. Wasantha Rathnayake, Dean-Faculty of Management Studies, as well as Dr. W. Manoj Ariyaratne, Dean, Faculty of Social Sciences for their immense support given through human and physical resources of the respective faculties. We also in debt for the Director CRKD, Dr. M. S. M Aslam for the invaluable support that he extended to success this event. Last but not least, the support given by Mr. M.F. Hibathul Careem, Registrar, Mr K. A. Rohitha S. Jayakody, Bursar, Mrs. T.N. Neighsoorei, Librarian as well as their staff is remarkable and would also like to extend our sincere gratitude towards them as well.

We hope this event will be fruitful for all the young academics who have contributed to this event and serve as successful example for the future academics who are eager to follow their path.

Dr. N.M.P. Milinda Piyasena – Chairman, Dr. R. K. Mutucumarana – Coordinator.
On behalf of ARS 2016 Organization Committee

Keynote Speech

Professor Atula Senaratna ,
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Disaster Management and Social Resilience

A disaster is a sudden, fearsome event that seriously disrupts the functioning of a community causing human, material, and economic or environmental losses that exceed the community's capacity to remediate using own resources. Though the disasters often caused by nature, disasters can also have human origins.

Disasters can be classified into Global, Regional and local occurrences. Few major disasters occurred to mankind through the recorded history are the Pompei ash flow, the fire in Rome, World Wars I and ll, Indian Ocean Tsunami – 2004, Hurricane Katrina- 2005, Pakistan Earthquake-2005, Cyclone Nargis -2008, Haiti and Earthquake -2010 and Japan Tsunami - 2011.

Among those, some are Global in nature while the others are either regional or local events. A majority are natural events while the global disasters such as WWI and ll are commonly man-made. The man-made disasters can be prevented but the natural disasters can only be managed and mitigated through understanding the disaster and making the community resilient.

The Organization for Economic Co-operation and Development (OECD) has defined the Disaster Resilience as a part of the broader concept of *resilience* – 'the ability of individuals, communities and states and their institutions to absorb and recover from shocks, whilst positively adapting and transforming their structures and means for living in the face of long-term changes and uncertainty'.

In summary, the following can be identified as the core elements of disaster resilience:

Context: Whose resilience is to be built – a social group, socio-economic or political system, environmental context or as institution.

Disturbance: Causes and receiving end of the shock (sudden events like conflict or disasters) and /or stresses (long-term trends like resource degradation, urbanization, or climate change) the group aims to be resilient to.

Capacity to respond: The ability of a system or process to deal with the impending shock or stress depending on exposure (the magnitude of the shock or stress), sensitivity (the degree to which a system will be affected by, or will respond to, a given shock or stress), and the capacity to adapt (how well it can adjust to a disturbance or moderate damage, take advantage of opportunities and cope with the consequences of a transformation).

Reaction: A range of responses are possible, including: bounce back better, where capacities are enhanced, exposure are reduced and the system is prepared and empowered to deal with future shocks and stresses; when for some reason if capacities are reduced the system may collapse, leading to catastrophic reduction in capacity.

Motivation for Learning English among Science Undergraduates in Sri Lanka: An Investigation into the Second Language Learners' Selves, Goals and Attitudes

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That English language education and university designed English courses need to be changed to address the learner needs, wants and lacks to meet the requirements of globalization is a known issue in Sri Lanka, but there is a very little empirical evidence to show the issue. The identification of learner needs, wants and lacks with relation to English learning motivation at the university level remains very important for the peace building and nation building process of Sri Lanka. The failure of addressing learners' needs and wants (specially among rural youth) caused for the civil unrest of the country for decades. In fact, this thesis investigates the factors affecting on the English learning motivation of the Sri Lankan public university youth. This thesis uses an existing psychological construct of L2 Motivational Self System to investigate the factors affecting on the English learning motivation of the Sri Lankan science undergraduates. By utilizing the construct, the study aims to determine the primary factors that affect for the Sri Lankan science undergraduates' English learning motivation, to analyse the differences in terms of factors affecting for L2 learner motivation based on the urban and rural needs and to evaluate the differences between factors according to war affected and non-war affected learner backgrounds. This study uses a quantitative approach to arrive at the major aims. Data were collected from 918 Sri Lankan university students through a questionnaire study. The two-part questionnaire looked at the motivated learning behaviour, ideal L2 self, ought to L2 self, social goals, mastery goals, performance goals, attitudes toward learning English and attitudes toward L2 community. Structural Equation Modelling (SEM) was used as the major analytical tool for the identification of causative relationships between the factors and to develop the comparative models. The results of the study provided substantial support for the validity and usefulness of L2 Motivational Self System in the Sri Lanka context. The most obvious finding to emerge from this study is the strongest contribution of the ideal L2 self in science undergraduates' English learning motivation. It was also shown that the ideal L2 self is the strongest contributory factor of rural and war affected science undergraduates' motivation compared the urban and non-war affected science undergraduates' motivation. The second major finding was that the significant contribution of social goals to examine the Sri Lankan science undergraduates' English learning motivation. In sum up the findings suggest the personal and contextual factors affecting for the English learning motivation of the Sri Lankan science undergraduates. These findings have important implications for the Sri Lankan universities, education policy and L2 motivation theory.

Keywords: L2 Motivational Self System, Science Students, Urban and Rural Learners, War Affected and Non-war Affected Learners

Constructing an Index to Measure the Aggregate Capacity to Climate Change in Sri Lanka

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Climate change is considered as the major threat to the human beings in the future. Vulnerability to the climate change refers to the potential of a system to be harmed by an external threat and it is a function of exposure, sensitivity to impacts and the ability or lack of ability to cope or adapt. Adaptive capacity represents the ability of a region or community to cope with and thrive in the face of change. Communities vary in their physical exposure to threats, and it is widely recognized that adaptation is place, culture, and issue specific. This means that strategies to facilitate and enhance adaptive capacity also must attend to context and recognize that capacities do not exist or are not developed uniformly across all communities. In this context, an attempt has been made to construct index to measure the adaptive capacity for the district level aggregate data. The data were obtained from Sri Lanka Household and Expenditure Survey results in 2009/2010, covering 25000 households. Constructing index raises several problems in the aggregation including the decision of assigning weights to the selected assets. One purpose of this research is to demonstrate a method of aggregating adaptive capacity indicators that result in a composite index. Weighted Principal Components Analysis (WPCA) is performed on assets and variables for the indicators in district level aggregation data. Constructed index shown in the analysis that the positive relationship between adaptive capacity and social assets are clearly followed by economic assets and physical assets, but human assets have been attributed a negative association. Batticaloa, Jaffna, Ampara, Moneragala, Trincomalee, Vavuniya and Puttlam districts had lower adaptive capacity, along with Colombo and Gampaha had a higher level of adaptive capacity.

Keywords: Adaptive Capacity, Climate Change, Cumulative, Weighted Principal Component

The Sinhalese Perspective of Old Age; a Sociological Analysis

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Sri Lanka is unique as the fastest aging nation in South Asia with its regionally unparalleled indicators of social development. Social gerontological theory proposes ageing as a socially constructed entity varying across cultures. Adopting the new paradigm of anthropology which posits culture as a totality actively constructed by the human actors, the study captured the socially constructed culturally specific experiences of Sinhalese old age. Dimensions of elderly experience analyzed in the study include elderly activity, religiosity, attitudes, coping and successful aging, elderly problems and issues of welfare. The study focused on the elderly experiences both in the spheres of family and work, and was sensitive to diversity of experiences across gender, age and cultural- ecological settings. This research employed a mixed method approach. The qualitative component of the study employed cultural domain analysis utilized the techniques of free listing and pile sorting (N= 100) aimed at capturing the cultural meaning of 'being old'. In addition, sixty in-depth qualitative interviews were carried out in 5 selected communities. The quantitative data were collected in a survey of 400 elders (N=400) in households randomly selected from the five cultural geographical zones of urban, semi-urban, estate, rural/traditional villages and agricultural colonization schemes in the Districts of *Colombo, Kalutara, and Rathnapura*. Cultural domain analysis enabled finding 68 culturally meaningful traits and five elder types namely 'family oriented positive', 'predominantly religious', 'active and integrated' , 'sick and disintegrated' and 'life style elders.' Elderly experience pertaining to said fields of analysis is reflective of variations pertaining to gender, age and cultural-ecological zones. The patterns of engagement and disengagement varied across the living sectors. Majority of elders were active in their old age. Disengagement was a process in which activities were replaced and shadowed meaningfully. Majority of Sinhalese elders show a high level of religiosity with sector wise variations. Female elders were more religious and were more emotionally involved with the religion compared to male counterparts. Religion is one of the most prominent coping mechanism and key means of maintaining solidarity among elders. Elders show a vast attitudinal diversity as some elder attitudes changed on the basis of living sector and gender. This study strongly suggests that all elderly problems are closely bound with their living socio-cultural and physical environment, and whatever the approaches for resolution of elder-related problems should be sensitive to the ecological setting they live in. Clear majority of problems impact more on female elders. Elderly experience suggests that strengthening the family economy and, inter and intra- familial relations and community based welfare should be considered as an integral parts of Sinhalese culture based elderly welfare. The Sinhalese experience of aging stands in contrast to the Western model of 'new ageing' as the two models view embodiment of old age differently. The Sinhalese old age is a phenomenon highly integrated with family and community which is considerably distant to the 'ageing' in Western, modernized world.

Keywords: Aging, Elderly, Old Age, Sinhalese

Community Participation in Tourism Benefits Sharing Schemes of Sri Lanka: A Case Study of Arugam Bay Destination

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This study focused on the local community participation in tourism development through benefits sharing schemes in Sri Lanka using a case study of Arugam-Bay destination. To accomplish this task, the study was directed by the research objective: To evaluate the nature of community participation in tourism benefits sharing schemes. To achieve better understanding of the context of the research, the study utilized a case study approach, which offers: exploration at the community level to analyze the issue from the grass root level, where very few studies on this topic has been done. Participation of diverse stakeholders such as Local government institutes, NGOs, Tourism entrepreneurs, members of community, and tourism professionals helped to cover wider aspect of said matter. The study utilized both quantitative & Qualitative method by using household questionnaire survey & direct interviews to effectively answer the main research question. Based on the results acquired from mixed approach, this study concluded that there are enough spaces for local community to enjoy tourism related benefits in tourism development process. It further proved, local communities are mostly entertaining Economic benefits rather than Socio-cultural & Environmental benefits such as develop infrastructure facilities, create job opportunities for locals, increase household income and create market for local products while entertaining some other benefits such as makes community well-known, uplift the language skills of locals and environmental beautification.

Keywords: Community participation, benefit sharing, Tourism development

Impacts of The Expansion of Transport Sector on The Changes of Exchange Rate in Sri Lanka

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Economic development and transport are solely linked since the transport activity is a key component of economic development and human welfare. The main objectives of this study is to identify, whether or not the expansion of transport sector and the resultant ballooning of imports bill due to this incidence had a significant impact on the exchange rate in Sri Lanka. For this purpose, data were collected from the Ceylon Petroleum Cooperation, annual reports of CBSL, the Department of Motor Traffic and the World Bank database. Augmented Dicky-Fuller, Johansson cointegration test and Vector Error Correction Model were employed as major econometrics procedures to identify the impacts of vehicles and crude oil imports on exchange rate in Sri Lanka.

This study revealed that, vehicle imports and crude oil imports are positively affected to depreciate the Sri Lankan rupee in the long run as well as in the short run. A one per cent increase in vehicle and crude oil imports affect the depreciation of Sri Lankan rupee by 4.6% and, 14.98% respectively, in the long run. Interest rate was found as an insignificant factor affect the changes of exchange rate. Increasing export, promoting public transport system, encouraging fuel efficient vehicles could be suggested to mitigate associated problem with currency depreciation of Sri Lanka.

Keywords: Currency depreciation, Exchange rate, Transport, Vehicle imports, Crude oil Imports

Hybrid sEMG Classifier Methods of Lower Limb during Low-Level Flexion

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Demographic change is becoming an identical serious problem in the world. To improve Quality of Life (QOL) of the lower limb disabled and elderly people, robotic and biomedical researchers have been trying to combine their techniques into the enhancement of rehabilitation system. Robotic devices and sensorimotor functions are important to the physical rehabilitation during the retrieval process. Their requirement is quickly retrieval of lower limb disability state again and improve their living condition very effectively manner. Consequently, human bio-signal, such as surface Electromyogram (sEMG) play a major role to develop assistive devices to improve their recovery process.

The aim of this research was identified four movements, such as heel up, toe up, left side up, and right side up of lower limb during low-level flexion. Gastrocnemius Medialis (GM), Tibialis Anterior (TA), Soleus (SL), Flexor Digitorum Longus (FDL) and surface electrode channel 1-4 were assigned correspondingly into each appointed lower limb muscles. Mean Absolute Value (MAV), Variance (VAR), Standard Deviation (STD), Root Mean Square Value (RMS) and maximum amplitude length (MAX) were expended to process and analyze the feature extraction of time domain. The Support Vector Machine (SVM) was used as a first classification method and Linear kernel function, polynomial kernel function, radial basis function (RBF), and sigmoid kernel functions were used to analyze the first part of experiment. RBF was performed higher classification accuracy and it was selected to the pattern classification. Hidden Markov Model (HMM) was followed to handle the second classification task correspondingly. The final classification task was performed to analyze the signal data using hybrid classifier method of SVM with HMM.

The pattern recognition accuracy of SVM with RBF indicated good percentage accuracy during the first part. Hybrid classifier has also indicated good percentage level as a second part. When comparison of the both classification methods, the accuracy of hybrid classifier method was displayed higher percentage level than method of SVM classifier. Therefore, according to the resulted data it can be concluded that the hybrid classifier method could be used to obtain higher accurate pattern recognition than other single classification methods. The research was beneficial to the EMG signal researchers to study of hybrid EMG classification technique.

Keywords: Electromyography, kernel function, Hybrid classifier, Support Vector Machine, Hidden Markov Model

A Novel proposed ANN_GBM Hybrid Statistical Approach for Time series Forecasting under the Volatility

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The time series analysis and forecasting is an essential methodology which can be widely used for identifying meaningful characteristics to make future ad-judgements, especially making decisions in finance under the numerous type of economic policies and reforms. Miscellaneous type of forecasting methodologies can be seen in the literature. However, most of these models have been shown the poor realistic under the non-stationary frame work.

The main purpose of this study is to take an attempt to understand the behavioral patterns and seek to develop a new hybrid forecasting approach for forecasting financial data under the high volatile fluctuations. The results are implemented on Colombo stock exchange (CSE) over the six -year period from June 2009 to November 2015. The methodology of this study is running under the three main phases as follows. In the first phase, stock market validations are identified based on traditional time series approaches such as exponential smoothing and auto regressive moving average. In the second part, Geometric Brownian Motion (GBM) algorithm is applied. In the last stage, newly proposed combined approach of Artificial Neural Network (ANN) with GBM algorithm (ANN_GBM) and Artificial Neural Network with ARIMA (ANN_ARIMA) methodologies are implemented successfully for forecasting long term predictions.

According to the error analysis results, newly proposed ARIMA-GBM is highly accurate with lowest RMSE error values. Furthermore, the RMSE reveal that (RMSE[ARIMA] > RMSE[GBM] > RMSE[ANN_ARIMA] > RMSE[ANN_GBM]), newly proposed ANN_GBM model has been giving high accurate predictions in long term scenario under the high volatility than traditional forecasting approaches.

Keywords: ARIMA, ANN, ARIMA-ANN, CSE and Volatility

Preparation and Surface Modification of Europium Doping Hydroxyapatite Luminescent Nanoparticles for Cell Labeling

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The sensitivity of the detection techniques used in biological analysis primarily depends on the fluorescence labelling agent. A new generation of fluorophores such as Europium doped hydroxyapatite nanoparticle (Eu-HAPnps) has the ability to emit near infrared radiations which are of low absorptivity by tissue chromophores and especially suitable for biological system imaging.

Eu-HAP luminescent nanoparticles were prepared by co-precipitation method with the aim of seeking a compromise proposal for achieving high luminescence and nano-scale particles. Hence, the effect of reaction temperature and Eu^{3+} doping content on luminescence property as well as phase composition, crystal size and crystallinity of Eu-HAPnps were investigated. The 2% Eu doping content and reaction temperature of 121^0C were preferred for preparing Eu-HAPnps with strong luminescence.

We synthesised two sets of well stable Eu-HAPnps in the presence of different concentration of a low molecular weight capping agent, Polyacrylic acid (PAA) and different concentration of sodium heparin to investigate the best stabiliser and its productive concentration. Results of this characterization study showed that 0.3 PAA was an effective stabiliser concentration.

Furthermore, we also investigated on the modifications made by pluronic F 127 and targeting conjugation of folic acid on Eu-HAPnps. Thereafter, a tumour specific targeting ligand, folic acid is conjugated onto PF127-PAA-Eu-HAPnps to produce a multifunctional hydroxyapatite nanoparticle. According to characterization observations of synthesised nanoparticles, PF127 and its derivatives were grafted onto PAA-Eu-HAPnps by the chemical conjugation to yield more stable and smaller HAP clusters which could be stored in lyophilized form and rapidly re-suspended in double distilled water. Moreover, the surface coating polymer on PAA-Eu-HAPnps was also the determining factor for the efficiency of cellular uptake. FA-PF127-PAA-Eu-HAP having the FA moiety showed a better cellular internalisation in the folic receptor overexpressing cells. The biocompatibility of Eu-HAPnps was studied by hemolysis test and cytotoxicity experiment. Results showed that Eu-HAPnps has no hemolysis and cytotoxicity to L02 human normal liver cells. Therefore, the targeting experiment in vitro demonstrates that folic acid targeting Eu-HAPnps shows much higher cell uptake than non-folic acid conjugated Eu-HAPnps.

High performance dye-sensitized solar cells with PEO based gel polymer electrolyte and rice grain-shaped TiO$_2$ nanostructure developed by electrospinning

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Among the methods used to fabricate metal oxide nanostructures, electrospinning appears to be a convenient method due its ability to make continuous nanostructures with large surface area. Rice grain-shaped nanostructure of high surface area was prepared on TiO$_2$ nanoparticle layer by simple, inexpensive electrospinning method. The electrospinning solution was prepared by using Titanium (IV) isopropoxide (TiP), polyvinyl acetate (PVAc) and acetic acid in N-N dimethylformamide (DMF). After the calcination at 500 ^{0}C, nanoparticle layer was coated on the fiber mat. These composite electrodes were used to fabricate quasi-solid state dye-sensitized solar cells (DSSCs) and the performances of these solar cells were checked with Polyethylene oxide (PEO) based gel electrolyte by optimizing the best electrolyte composition. These values were compared with DSSCs fabricated using pristine TiO$_2$ nanoparticle electrode. While the DSSCs fabricated with rice grain-shaped nanostructure composite TiO$_2$ electrodes showed an average efficiency of 6.9 % with short circuit current density (*Jsc)* of 16.93 mA cm^{-2} and open circuit voltage (V_{oc}) of 672.3 mV respectively, the DSSCs fabricated with TiO$_2$ nanopartical electrode alone showed an average efficiency of 5.76% with *Jsc* of 12.12 mA cm^{-2} and V_{oc} of 718.7 mV respectively. A comparison of the photovoltaic performance of the DSSCs with TiO$_2$ nanoparticle alone showed that the rice grain-shaped structures are superior to TiO$_2$ nanoparticle prepared with commercially available TiO$_2$.

Keywords: Electrospinning, Dye sensitized solar cells, Rice grain-shaped TiO$_2$nanostructure

Carbon and Carbide Derived from Lotus Stem as Electrocatalyst Supports for Methanol Electro-Oxidation

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Methanol shows potential as a promising alternative fuel to hydrogen in fuel cells. Platinum has been identified as a capable catalyst due to its high activity and stability for methanol electro oxidation. The support materials play important roles on the activities and stabilities of the catalysts. Herein, lotus-stem derived carbon (denoted as LC) with porous structure was synthesized by using lotus stem as carbon source. Pt supporting on LC (Pt/LC) as catalyst for the methanol oxidation reaction (MOR) was explored. Then tungsten carbide (WC) and molybdenum carbide (Mo_2C) were synthesized using lotus carbon as the carbon source. This was followed by investigating the lotus derived tungsten carbide and molybdenum carbide with nano- Pt/LC catalyst to further improve the activity and lower the over potential for methanol oxidation. Studies into lotus stem derived tungsten carbide (WC-LC) addition showed that the catalysts have been formed with smaller, more uniform platinum particles, and catalysts with WC contents had higher mass activities and lower onset- and peak- potentials than Pt/LC, which effectively demonstrated the synergistic effect of WC on Pt. Results indicate that the LC favors both mass transfer and dispersions of WC and Pt, leading to excellent MOR activity and stability of the Pt/LC and Pt/WC-LC, by comparing with the commercial Pt/C and Pt/C-WC(commercial carbon powder supported WC and Pt). Investigations into the lotus derived molybdenum carbide (Mo_2C-LC) effect showed similar mass- and specific-activities for catalysts as the WC-LC. Significantly, the insights garnered from this study on the fundamental properties required for early activation, activity and stability of the platinum catalysts could lead to a more intellectual design of lotus derived carbon as a potential catalyst support and Pt/WC-LC and Pt/Mo_2C-LC as electro catalysts in future.

Keywords: Lotus stem, methanol oxidation, molybdenum carbide, tungsten carbide

Preliminary Study on the Avifauna of Hapugastenne Estate, Ratnapura District, Sri Lanka

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A preliminary avifaunal survey was conducted at Hapugastenne Tea Estate, Ratnapura, Sri Lanka from October to December 2015 with objectives of assessing the bird diversity within different habitats and documenting threats to biodiversity. Bird populations were sampled in 39 line transects and 17 point counts (respectively for terrestrial and aquatic habitats) representing eight habitat strata (tea fields, home gardens, scrublands, secondary forests, natural forests, stream-side vegetation, riverine forests, and water-logged areas) within the estate, replicated in its nine divisions. Transects were conducted during the morning between 07:00 and 09:00 hrs. A total of 91 species, including nine Sri Lankan endemics and nine winter visitors were recorded, which included three nationally threatened (two endangered and one vulnerable) and six near threatened species. Estimates of relative abundance indicated a high degree of rarity, with only few abundant species, the red-vented bulbul being the most abundant. Among the habitats, highest species richness (39) was recorded in stream-side vegetation where Simpson's diversity index (0.947) was also the highest, while the Shannon-Wiener diversity index (H'=3.247) is marginally second to tea fields (H'=3.382), where the evenness was highest (J=0.994). Interestingly, the Shannon-Wiener diversity and the evenness of the secondary forest fragments were comparable to those of home gardens (H'=2.591; J=0.795 and H'=2.515; J=0.791 respectively). The results of the feeding guild analysis indicated a greater abundance of the insectivore guild in tea fields than in other habitats. In contrast, the relative abundance of frugivore guild was higher in the natural and secondary forests. Cluster analysis indicated a highly dissimilar species composition in scrublands compared to other habitats, while tea fields and home gardens were very similar in their avifauna. The study revealed that this managed landscape provides a diversity of niches maintaining the natural biodiversity to a certain extent. Nevertheless, 14 alien invasive species (nine plants and five animals) were identified from the area among several other threats to the biodiversity. Increasing plant diversity, introduction of native shade trees and connecting remnant natural habitat patches via stream reservations are recommended to conserve and enhance the avifaunal diversity in the study area.

Keywords: Birds, Conservation, Diversity, Feeding Guilds, Habitat Association

Urban Land Use Changes in Flood Prone Areas During Last Two Decades: A Study of Batticaloa Municipal Council Area

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Flood prone areas are rapidly growing urban areas in Sri Lanka. Land use activities are converting natural landscapes for human use, as urban land use change, both geographically and demographically, the flood hazard risk and exposure is very high. This study aims to understand the urban land use changes in the flood prone area with special reference to Batticaloa Municipal Council area (BMC) during the period of last two decades. Specific objective of the study is to develop a Geographic Information System (GIS) and Remote Sensing (RS) based tools to identify land use changes. Both primary and secondary data used to fulfill the objectives. Structured questionnaire survey has been used to collect primary data through random sampling method. Landsat multi spectral images of 1980, 1995, 2005 and 2015 were used as secondary data and analyzed through supervised classification process by Erdas imagine 9.1. In addition overlay, proximity and image analysis were used to identify the land use changes according to flood risk area by Arc GIS 10.1. Past considerable events were drawn by indigenous people with the use of Participatory Rural Appraisal (PRA) tool timeline technique. Sector wise land use changes were identified using Chi square analysis and existing situation was noticed with SWOT analysis.

Land use activities were classified into buildup area, vegetation, cultivated land and water bodies. The results show that the buildup areas are highly increasing from 830.8ha in 1980 to 2450.86ha in 2015. Vegetation in 1980 was 49% it has reduced up to 12% in 2015. Cultivated land during 1995 to 2005 has reduced from 32% to 20% and further reduced to 17% in 2015. Severe flood damages were identified in 1999, 2009 and 2011 through the participatory historical mapping and there are relationships between settlements, administrative, agricultural land use changes in flood prone areas showed by the Chi square results. Finally, considering the land use change has occurred in the flood risk zones cause many impacts like improper land use, land filling and land encroachment. Study provided with the suggestion that proper land use planning and management is needed to reduce the flood risk in urban areas.

Keywords: Flood prone area, GIS, Image analysis, urban land use change, PRA, Supervised classification.

The Effect of Marination Method and Holding Time on Physicochemical and Sensory Properties of Broiler Meat

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Marination is a simple technology to enhance the meat quality characteristics. The present study investigated the effect of the marination method and holding time on physicochemical and sensory properties of broiler meat. Deboned thigh meat obtained from 32-days old broiler chickens were marinated with a commercially available marinade mixture using three different methods; Injection, Immersion, and Tumbling. Un-marinated meat was kept as the control. Each treatment was further held at three different holding times of 4, 8, and 12 hours (n=7). The meat samples from each treatment (n=21) were analyzed for pH, water holding capacity (WHC), cooking loss, cooking yield, uptake of marinade, marinade loss, meat colour, and shearing force value (SFV). Cooked meat samples from each treatment were evaluated for sensory properties. The experiment was conducted in a completely randomized design and two-way analysis of variance was conducted to determine the effects of marination method and their interaction with the holding time. Irrespective to the holding time marination method significantly (P<0.05) influenced on all the physicochemical parameters assessed. Among the criteria assessed, darkness (-l*) and yellowness (b*) of meat was not significantly (P>0.05) influenced by the holding time. Tumbling resulted (P<0.05) higher marinade uptake, cooking yield, and higher pH value and the values were the highest (P<0.05) at 8 hours. Tumbling resulted (P<0.05) the lowest drip loss, SFV, cooking loss compared to other methods. Marination effectively reduced (P<0.05) SFV than untreated control. Of the meat colour parameters assessed, tumbling and immersion yielded (P<0.05) the highest darkness (-l*) and redness (a*) meat at both 8 and 12 hours. As compared to other methods, immersion method significantly improved (P<0.05) the darkness (-l*) of meat. Sensory data suggested that the injection method improved (P<0.05) the sensory attributes for texture, marinade penetration, colour penetration, flavour and overall acceptability. Immersion method significantly improved (P<0.05) the sensory attribute for meat color. The present study concluded that the marination of broiler meat by tumbling method held for 8 hours improved physicochemical parameters of broiler meat. Injection method is the best when sensory attributes are concerned.

Keywords: Holding time, Immersion, Injection, Marination, Tumbling

Relationship Marketing Practices and Customer Loyalty – Special Reference to Arpico Interiors (Pvt.) Ltd - Colombo District

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Relationship marketing is identified as the most important concept under the marketing paradigm. It is also recognized as the strategic concept to the business to business practices to enhance customer loyalty in the hyper competitive environment. In this context, the study examines the influence of relationship marketing on customer loyalty with six underpinning dimensions of relationship marketing practices as trust, competence, communication, conflict handling, commitment and bonding. The study employs exploratory factor analysis and multiple regression analysis to come to the general conclusion based on sample respondents. Study covers the Colombo district and applies the facts on business customers and questionnaires completed by 108 customers of Arpico Interiors, who represent the executive level positions in the organizations using simple random sampling. Results of the study stress the underpinning relationship between relationship marketing and customer loyalty. The findings revealed that the relationship marketing practices significantly influence on customer loyalty (R^2 = .772) in Interiors Company. Among the dimensions competence, commitment and bonding enhance the customer loyalty. Implications are derived from the results and recommendations are discussed.

Keywords: business to business, customer loyalty, customer loyalty

Develop Sex and Age Specific Normative Values for Health & Skill Related Physical Fitness of 19 – 21 Years Old Sri Lankan Youth

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Numerous test batteries are available to assess physical fitness, "Eurofit" is the major test battery which is used in Sri Lanka commonly. Many studies have been done to assess fitness in different settings, for both sexes at different ages in various countries except Sri Lanka. Harmonized measures were used as literature due to scarcity of reference values related to physical status of Sri Lankans. Sabaragamuwa University of Sri Lanka has been using "EURO FITNESS" and "AAHPERD" test batteries to test physical fitness level among 19 - 21 years old teenagers when conducting aptitude test. The follow up of the requirement of reconstructing norms for aptitude test were guided to develop age and sex specific normative values for the health and skill related physical fitness among 19-21 years old Sri Lankan youth. 225 males (age 19-21) and 225 females (age 19-21) were selected as covering whole country. Four tests in EUROFIT (sit & reach, 5x10 shuttle run, 30s'pushups, standing broad jump), one test in AAHPERD (50-yard sprint) and 1000 m run were considered to develop suitable norms. 5th, 15th, 25th, 35th, 45th, 55th, 65th, 75th, 85th and 95th percentiles were computed for each test. The range of existing norms for 50-yard sprint, 5x10m shuttle run, sit and reach, push-ups and standing board jump tests were [5.9 - 7.9], [17.4 - 19.9], [(-1) - 29], [4 - 42], [1.79 - 2.78] and the range of newly constructed norms are [5.99 - 7.45], [15.81 - 18.99], [(-1) - 20], [17 - 38] and [1.95 - 2.65], respectively for males. The range of existing norms for female were [6.8 – 9.5], [19.2 - 21.9], [(-1) – 35], [1 – 23], [4.0 - 10.8], [1.52 – 2.18] and the range of newly constructed norms are [6.66 - 8.50], [16.75 - 20.60], [2 – 23], [8 – 25], [3.25 - 7.29] and [1.56 - 2.14], respectively. The range of newly constructed norms for 1000 m run are [2.70 - 5.87] and [3.25 - 7.29] for men and women correspondingly. Further studies are essential to enhance the reliability and validity of the newly constructed norms.

Keywords: AAHPERD, Eurofit, Norms, Percentiles, Physical fitness, Test batteries

Impact of Interior and Exterior Designs on Demand for Hotels

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This study mainly focused on investigating the impact of interior and exterior designs on demand for hotels in Sri Lanka. According to previous literature there is a close correlation between the designing of a hotel and the tourist's arrivals. Although the developed countries are highly considering about this psychological concept, Sri Lankan hotels do not cover the full range of designing as designing is a wide range of concept. Therefore it is significant to improve the tourism industry with the interior and exterior designing as it may support to the guests mental satisfaction, customer loyalty and perception. The main objective of this study was to investigate the impact of interior and exterior designs on demand for hotels, to identify the relationship between interior and exterior designs, customer perception, and to examine the importance in designing to increase the demand for hotels.

The study site was taken as the Hikkaduwa. The sample size was taken as 30 hotels and the 60 tourists and sample selection was done based on stratified random sampling method. The data was collected through interviews, questionnaires and field observations. The analysis was conducted by the factor analysis with creating interior and exterior indexes, simple linear regression and one-way ANOVA. The results were found out that the interior and exterior designs were impact on the arrivals and also there is a positive relationship between the designing and customer perception. Furthermore, this study concluded that the hotel lobby designing, wall colours, room decors, star type and the room type were extremely important to increase the demand for hotels. Finally, it was recommended to develop the green hotel designing in Sri Lanka. The policy implications can be established as the better management in the hospitality business and by promoting eco-tourism in Sri Lanka.

Keywords: Interior and Exterior Designs, Customer Perception, Green Hotel Designing, Eco-Tourism, Lobby Designing

Study on Relationship between Self- Determined Motivation Level and Athletics Performance of Sri Lankan South Asian Games Squad

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The aim of this investigation was to identify the relationship between self-determined motivation (SDM) towards the sports in relation with performance. The minor objectives were to find the relationship between SDM and variables of different performance levels, event categories and gender. Hundred (n=100) Sri Lankan national athletes (males n = 70 and females n = 30) who were competed in the South Asian Games' national trial 2015 was taken as the sample. Athletes' SDM was measured by using Sport Motivation Scale (SMS; Pelletier et al., 1995). Performance was collected by competition results sheets and each performance assign respective points on the International Association of Athletic Federation point table. Spearman's Rank Correlation was used to examine the relationship between variables and all the differences were considered significant in 95% confidence interval. Findings indicated SDM and performance were positively associated but relationship is not significant (r = 0.156, p = 0.122). Results in different event categories shown that SDM produced a significant negative correlation with low level (r = -0.500, p = 0.667) and middle level performance (r = -0.012, p = 0.921). The correlation between best performance level and SDM produced a positive (r = 0.288, p = 0.218) and non-significant. In Sprints, Hurdles and Relays (r = 0.246, p = 0.092) and Long distances categories (r = 0.224, p = 0.533) results indicated a positive correlation and non- significant relationship. In middle distances (r = -0.064, p = 0.853) and jumping and throwing (r = -0.091, p = 0.628) events categories' SDI made negative and non-significant correlation in relation with performance. Results indicated that SDM produced a positive and moderate significant correlation with performance in females (r = 0.529, p = 0.003). Females' SDI has produced a significant relationship with their performance. In males' SDI made positive and non-significant correlation in relation with their performance (r = 0.021, p = 0.861). In conclusion, self-determined motivation was produced a positive relationship with performance, beside with respect to gender, there was a strong difference relationship between SDI and performance of male and female.

Keywords: Competition, Motivation, Performance, Self-determination theory, Sport psychology.

Evaluating the Occupational Health and Safety Performance in Compliance to OHSAS 18001:2007: A Study in Food Industry of Sri Lanka

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Occupational Health and Safety (OHS) is a precondition to protect the workers' health whilst fulfilling the social responsibilities. The role of research in improving working conditions is gaining a new impetus. Thus OHS management systems like OHSAS 18001:2007 is one result of this concern. Even though many organizations in Sri Lanka have gained this certification but still safe and sound OHS practices are questionable. Thus it is crucial to evaluate the OHS of an OHSAS certified organization. Nevertheless studies in concern to OHS in the food industry are limited. This study was conducted to access the OHS practices in the food industry in compliance to OHSAS 18001:2007 and to measure the perception of workers on OHS practices. One hundred and thirty two (132) industrial workers and 46 supervisors and executives of a fruit and vegetable processing factory were selected. The study revealed poor accomplishments in certain requirements of OHSAS 18001:2007 like Communication, Participation and Consultation, Documentation, Emergency Response, Incident Investigation, Non-conformity and Corrective action and Preventive action and Continual Improvement. Practices like proposing innovative methods in risk reduction and reporting near misses were poorly performed by the workers. Majority of the industrial workers have encountered minor injuries (68%). Weak relationships were found between safety performance and educational level of the workers, working experience, and attendance of the OHS trainings, safety communication among co-workers, safety communication between supervisors and workers. However, long working hours, Hazard Identification, Training and Competence showed a moderate relationship with safety performance. The most dominant factor that affects safety performance was the Top Management Commitment which was strongly correlated with safety performance. The major constraints identified in promoting the OHS were Organizational constraints (Lack of trainings) and dispositional characteristics of the workers (Staffs' habitual practices). Thus the study revealed that the food industry in Sri Lanka should focus more and strengthen their policies regarding safety concerns.

Keywords: Occupational Health and Safety, Safety performance, OHSAS 18001:2007

Schemes in Enhancing Efficiency of Land Adjudication Process in Sri Lanka under the Process of Title Registration

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In case of a disaster, so as to recover the damaged land to its initial status, a proper land registration system which includes a legally enforced adjudication process must exist with a resourceful database as it will contribute to reduce a considerable amount of time in terms of reconstruction. Adjudication is the official determination of rights in land. It is the first stage in the registration of title to land in an area where the ownership of land is not officially known. Adjudication does not alter the existing rights or create new ones. It merely establishes what rights exist, by whom they are practiced and to what limitations they are subject to. A proper land registration system is a must for a proper adjudication procedure to exist. Land registration is primarily a process that records the rights to land and real estate and thereby provides the security of title that is needed if reforms and developments are to take place on a visible scale. Appropriate legislations, institutions, financial and human resources are compulsory for its implementation and maintenance. In 1998, the government of Sri Lanka introduced a title registration system in response to numerous problems faced by deed registration systems. But the land titling program has not yet achieved the expected progress even if titles are issued free of charge. This study relates schemes in enhancing efficiency of Land Adjudication process in Sri Lanka under the process of title registration so as to overcome the current latency and draw backs. Four government departments are involved in the process and the land settlement department is responsible for the adjudication process in substance. Thus, the process of land settlement department is broadly examined. The inadequateness of the Act to achieve its purposes is broadly discussed in this study hence it's directly related to the adjudication process. The act does not prescribe a basic framework for the adjudication process, to ensure that it is fair transparent and consistent. Findings show that the landowner has to submit claim forms claiming that a particular land parcel belongs to him or her as an initial step of adjudication. Without the submission of that claim form, the registration process cannot proceed further. One of the main operational problems is that all landowners do not submit the claim forms. Adjudication officers' role is inquired extensively while making suggestions for its drawbacks. This study furthermore amplifies best practices of land adjudication in comparison with other countries focused on legislations, acts and jurisdictions of relevant officers. Ultimately, it is found that the present adjudication procedure needs severe alterations so as to make the Bim Saviya program efficient and empower relevant officers' role legally. However, the existing system cannot make a significant difference unless the legislations and regulations are changed.

Keywords: Bim Saviya, Claim form, Land Adjudication, Land settlement Department, Title registration

Fundamental Determinants of Dividend Decision in Manufacturing Firms: Evidence from Colombo Stock Exchange (CSE).

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This study mainly analyses the determinants of dividend decisions of firms listed in Colombo Stock Exchange (CSE) Sri Lanka. The research involved sixteen companies listed in Colombo Stock Exchange (CSE) and selected data for the period of ten years from 2006 to 2015 for the purpose. The Panel Data regression model is used to test the theoretical relationship between the dividend pay-out and selected fundamental factors. The research found that the profitability, liquidity, leverage, growth and size are some key determinants of the dividend decisions in manufacturing companies in Sri Lanka. The results suggested that more profitable and high liquid manufacturing companies pay more dividends while manufacturing companies with high growth opportunities tend to pay lower dividends. Also, the study clearly showed that profitability, liquidity and size were the three most important factors affecting dividend policy of manufacturing companies in Sri Lanka.

Keywords: Dividend, Fundamental factors, CSE, Manufacturing.

The impact of Media Convergence on Customer Satisfaction (With special reference to Bank of Ceylon in Malabe)

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Today organizations seem to change rapidly due to the changes in the technology and business environment. To remain in the business world, organizations have to use its each and every resource with the full capacity to attract the customers. Services and products of organization could be improved their services through many ways of economically, technologically, social and culturally. With an accurate media convergence can identify as the theory that can apply to the enhance customer satisfaction level. There has been no adequate research conducted to discover the media convergence and customer satisfaction in Sri Lanka. To fill the available gap, this research has explored the impact of media convergence on customer satisfaction.

Primary objective of this research is to examine media convergence impact on customer satisfaction via better customer services and sub objective is to measure the relationship between Media convergence and customer satisfaction. The study used primary data from 80 bank customers through simple random sampling methods using an arranged structured questionnaire. Factor analysis, Multiple Regression models were used to analyze data. Results revealed to the relationships among the dimensions of the media convergence and customer satisfaction. There is a high relationship among the dimension of social convergence and customer satisfaction. Technology convergence is also more important to enhance the customer satisfaction via better customer services. Whoever, any reader who find this research relevant and beneficial to academic working or any other work, should read in depth to fully understanding the core representation of the research. A broad understanding in to the purposes and procedures are described in detail with this research. Based on this research few recommendations and conclusions were implement. However, this study can be possible to administered or extended to the banking industry.

Keywords: Customer Satisfaction, Consumer Behavior, Factor Analysis, Media Convergence, Reliability Test, Utility theory

A Study on the Impact of Psychological Capital on Organizational Commitment of Staff Employees of Lanka Sugar Company (Private) Limited – Sevanagala

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In the twenty first century Business Organizations are operating in a very competitive environment and the Business Practitioners have identified the need for having a sustainable competitive advantage. Therefore, Human Resource has become a sustainable competitive advantage and the organizational commitment is the key to increase organizational performance with the ultimate purpose of achieving its goals and objectives. Gaining and retaining a committed work force is still challenging for any Organization. Therefore, the researcher derived the research problem of the study with related to the Organizational Commitment of the staff employees.

The current study was aimed at investigating the impact of Psychological capital on organizational commitment of staff employees at Lanka Sugar Company (Private) Limited, Sevanagala. Since Staff employees play a vital role in this factory they were treated as the target population of this study. There were around 900 direct employees in the company to the date and staff employees were selected as the population. The sample size of the study was 66 and convenience sampling method was followed. Data were collected through standard questionnaires developed by previous authors. Minitab 16 and SPSS 21 statistical software were used to analyze the data which were collected through the questionnaire survey.

A multiple regression was performed to investigate the impacts of the variables interested. Organizational commitment acted as the dependent variable where self-efficacy, optimism, hope and resilience were the predictors of the study. Pertaining to the previous research findings the current study also brought evidence to a significant positive impact of optimism, hope and resilience on organizational commitment. In contrast to the previous research findings, this study highlighted no any impact of self-efficacy on organizational commitment.

This study creates a novel contribution to the existing literature as well as to the Lanka Sugar Company (Private) Limited, Sevanagala in order to gain and maintain a committed workforce so as to achieve its goals and objectives. Further future researchers are advised to do the studies by considering moderators, mediators as well as to use the longitudinal time horizon with the multiple data collection methods.

Keywords: Hope, Optimism, Organizational Commitment, Self-efficacy, Resilience

Extraction and Characterization of Bacterial Cellulose Nanofibers Isolated from a Nata-De-Coco Producing Culture System

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Nata-de-coco is formed by the fermentation of coconut water, which gels through the fabrication of bacterial cellulose nanofibers, typically by *Acetobacter xylinum*. The present study was based on the extraction and characterization of bacterial cellulose (BC) nanofibers produced from isolated *A. xylinum* from pineapple peels (PC) and vinegar starter culture (VC). The strain from PC was maintained in the Hestrin-Schramm medium containing 2% D-glucose, 0.5% peptone, 0.5% yeast extract, 0.27% Na_2HPO_4 and 0.2% acetic acid. It was subsequently transferred into Tomato Agar slant for isolation of *A. xylinum*. Nata- de-coco was produced from PC (TSS=15^0Brix, 1:5 ratio, pH=4) and VC (TSS=13^0Brix, 1:4 ratio, pH=3.8). Bacterial nano cellulose was extracted by centrifugation after purifying the BC pellicles with 2% NaOH (w/w) until a neutral pH was obtained. The BC was lyophilized. The resulting BC powder and commercially available pure cellulose (Micro crystalline cellulose-MCC) were used for characterization.

Fourier Transform Infrared spectra revealed the presence of the characteristic anomeric carbon regions (950-750 cm^{-1}) which includes the band at 833.17 cm^{-1}, confirming the presence of β, 1-4 glycosidic linkages. X-ray diffraction pattern for PC gave peaks at 5^0, 10^0, 19^0 and VC gave peaks at 6^0, 18^0 and 23^0 of 2θ. MCC gave peaks at 15^0 and 22^0. Fourier Transform Infrared spectra and X-ray diffraction patterns confirmed the purity and the higher chemical stability of BC compared to MCC. The crystallinity of BC in VC was higher to that of MCC. Scanning Electron Microscope revealed the cellulose ultrafine network like structure in BC. Particle size of BC nanofibers gave two distinct diameters for width and length due to its fibrous structure. Nanofibers in PC gave the smallest width 142.2 nm compared to VC and MCC. The widths recorded for BC nanofibers in VC and MCC were 224.1 nm and 166.4 nm respectively. The study also confirmed that nata-de-coco is a rich source of bacterial cellulose. The high degree of purity of BC in nata-de- coco renders it suitable for potential applications in bio-nanotechnology.

Keywords: *Acetobacter xylinum*, Fourier Transform Infrared Spectroscopy, Partial size analysis, Scanning Electron Microscopy, X-ray diffraction