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The Tri-Annual Publication of the Institute of Chemistry Ceylon

Founded in 1971, Incorporated by Act of Parliament No. 15 of 1972

Successor to the Chemical Society of Ceylon, founded on 25th January 1941

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	Pages
Council 2017/2018	02
Outline of our Institute	02
Chemistry in Sri Lanka	02
Guest Editorial - Food analysis: why and current hows	03
Forty Seventh Annual Sessions and Seventy Seventh Anniversary Celebrations 2018	04
Theme Seminar on Chemists' contribution towards National Policy Development	05
Cover Page	05
Technical Sessions	06
Dr. C L de Silva Gold Medal Award	09
Abstract of the Dr. C L de Silva Gold Medal Award	09
Abstracts of Research Papers to be presented at the 47th Annual Sessions 2018	10
Guest Article Natural product driven drug discovery	46
Chemistry Olympiad Sri Lanka 2018	48
Commemoration of the Third Death Anniversary of Emeritus Professor JNO Fernando	48
Fourteenth Convocation of the College of Chemical Sciences	49
Convocation Address	50
Guest of Honour's Address - The many facets of leadership	53
Report of the Honorary Rector	54
Graduateship Examinations in Chemistry, 2017 - LEVEL 3 - OVERALL AWARD LIST	59
Yeoman Service Awards 2018	60
Fourteenth Convocation Award List 2017	63
Publications of the Institute of Chemistry Ceylon	65
RSC (SL section) News	66

Theme for the year -

Chemists' contribution towards National Policy Development

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Outline of our Institute

The Institute of Chemistry Ceylon is a professional body and a learned society founded in 1971 and incorporated by act of Parliament No. 15 of 1972. It is the successor to the Chemical Society of Ceylon which was founded in 1941. Over 50 years of existence in Sri Lanka makes it the oldest scientific body in the country.

The Institute has been established for the general advancement of the science and practice of Chemistry and for the enhancement of the status of the profession of Chemistry in Sri Lanka. The Institute represents all branches of the profession and its membership is accepted by the government of Sri Lanka (by establishment circular 234 of 9-3-77) for purposes of recruitment and promotion of chemists.

Corporate Membership
Full membership is referred to as corporate membership and consists of two grades: **Fellow (F.I.Chem.C.)** and **Member (M.I.Chem.C.)**

Application for non-corporate membership is entertained for four grades: Associate (former Graduate) (A.I.Chem.C.), Licenciate (L.I.Chem.C.), Technician (Tech.I.Chem.C.) and Affiliate Member.

Revision of Membership Regulation
All Special Degree Chemists can now apply directly to obtain Associate (Graduate) Membership. Three year B. Sc. Graduates (with an acceptable standard of Chemistry) can
(i) directly become Licentiate
(ii) obtain corporate membership in a lesser number of years.

Tech.I.Chem.C.
Those who have passed the DLTC examination or LTCC examination or have obtained equivalent qualification and are engaged in the practice of Chemistry (or chemical sciences) acceptable to the Council are entitled to the designation Tech.I.Chem.C.
Members/Fellows are entitled to the designation of **Chartered Chemist (C.Chem.)** on establishment of a high level of competence and professionalism in the practice of chemistry and showing their commitment to maintain their expertise.

All corporate members (Members / Fellows) are entitled to vote and become Council/ Committee members whether Chartered Chemists or not.

Membership Applications
Any application for admission to the appropriate class of membership or for transfer should be made on the prescribed form available from the Institute Office.

Current Subscription Rates
Fees should be payed on 1st of July every year and will be in respect of the year commencing from 1st July to 30th June

Fellow	Rs. 1500
Member	Rs. 1500
Associate	Rs. 1200
Licenciate	Rs. 1000
Technician	Rs. 500
Affiliate	Rs. 1000
Membership for Life	Rs. 15000

Entrance Fee

All the grades	Rs. 1000
Processing Fees*	Rs. 500
Processing Fee for Chartered Chemist designation	Rs. 1000
Institutional Members	Rs. 2500

*per application for admission/transfer to any grade

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Council 2017/2018

Editorial and Publicity Committee

CHEMISTRY IN SRI LANKA

Chemistry in Sri Lanka is a tri-annual publication of the Institute of Chemistry Ceylon and is published in January, May and September of each year. It is circulated among the members of the Institute of Chemistry and students of the Graduateship/DLTC course and libraries. The publication has a wide circulation and more than 750 copies are published. Award winning lectures, abstracts of communications to be presented at the annual sessions, review papers, activities of the institute, membership news are some of the items included in the magazine.

The editor invites from the membership the following items for publication in the next issue of the Chemistry in Sri Lanka which is due to be released in September2018.

- *Personal news of the members*
- *Brief articles of topical interests*
- *Forthcoming conferences, seminars and workshops*
- *Latest text books and monographs of interest to chemists*

All publications will be subjected to approval of the 'Editorial and Publicity Committee' and the Council of the Institute of Chemistry Ceylon.

Further, prospective career opportunities for chemists, could be advertised in Chemistry in Sri Lanka at a nominal payment. The editor welcomes suggestions from the members for improvement of the publication.

Guest Editorial

Food analysis: why and current hows

Professor Sagarika Ekanayake

Department of Biochemistry, University of Sri Jayewardenepura, Nugegoda

Food analysis is a discipline that deals with the development, application and study of analytical procedures for characterizing the properties of foods and their constituents. These procedures provide information regarding characteristics of foods which include nutrient composition, structure, physicochemical properties, sensory attributes as well as toxicants, allergens, contaminants, bioactive molecules & health benefits. In addition, analysis is also required to prove authenticity of food components, characterize raw ingredients, monitor food properties during processing, assess standards of final food product so as to maintain quality. This information is critical to understand the factors that determine the properties of foods, health benefits and to economically produce foods that are safe, nutritious and desirable. Food chemists thus have an important role to play in providing a secure food supply to the consumers.

In food analysis, sample preparation techniques are crucial due to the complex nature of foods. Some such techniques used in food analysis include application of molecularly imprinted polymers, use of microextraction techniques (veterinary residues), use of QuEChERS (quick, easy, cheap, effective, rugged, and safe) for determining pesticide residues in food and agricultural samples, immuneaffinity column clean-up techniques, solid-phase microextraction (SPME) techniques for quality characterization, application of ultrasound-assisted extraction to determine contaminants and liquid phase microextraction and most recently supercritical fluid extraction (SFE) and subcritical water extraction (SWE) all of which require a knowledge base in chemistry.

Spectroscopic techniques are the most extensively used in food analysis. For example Near infrared (NIR) spectra are used to identify transgenic foods or for measuring bioactive compounds in foods. The mid-infrared region has been used to study the structure of food proteins or to study intact food systems and their molecular structure-quality relationships. FTIR is used for rapid authentication and detection of adulteration of food. NMR has found use for the quick analysis of oil and fat content in agrifood products. In addition, separations based on liquid chromatography (LC) are being used in food analyses include hydrophilic interaction liquid chromatography (HILIC), nano-LC, or high-speed counter-current chromatography. Gas chromatography (GC) still is important for the analysis of volatile fractions or fatty acids in foods. Electrodriven separation techniques such as capillary electrophoresis (CE) or microchip capillary electrophoresis have applications in detection of genetically modified organisms, nucleosides and nucleotides in foods, in analysis of contaminants and food-borne pathogens. LC-MS or tandem MS (LC-MS/MS) are extensively applied to analyze antimicrobial residues in food of animal origin, antibiotics in food samples, food allergens etc. GC-MS or capillary electrophoresis-mass spectrometry (CE-MS) have applications in analyzing essential oils or food contaminants. Tandem MS has become a tool for the identification and quantification of analytes (mainly contaminants) in food analysis. Use of triple quadrupole, ion trap, and time of flight MS analyzers coupled to uni- or bidimensional separation techniques are widely being used in food analysis. Other MS applications include analysis of pesticides and their metabolites in food and water matrices, analysis of food proteins and peptides, characterize genetically modified crops, MALDI-TOF MS analysis of plant proanthocyanidins, or multistage mass spectrometry in quality, safety, and origin of foods. These clearly indicate the importance of chemistry in food analysis.

Foodomics is defined as the discipline that studies the food and nutrition domains through the application of advanced omics technologies to improve consumer's well-being, health, and knowledge through the use of epigenomics, transcriptomics, proteomics, lipidomics and metabolomics tools. Foodomics strategy, provide an opportunity to study the effect of food ingredients at genomic, transcriptomic, proteomic and/or metabolomic level, making possible new investigations on food bioactivity and its effect on human health at molecular level thus making possible interaction of food science and nutrition with disciplines such as pharmacology, medicine, or biotechnology. Analytical methods in Foodomics include MS- and NMR-based systems highlighting the importance of Chemistry and the role of food chemists in Food Analysis.

INSTITUTE OF CHEMISTRY CEYLON
Forty Seventh Annual Sessions and Seventy Seventh Anniversary Celebrations 2018

Inauguration of the 47th Annual Sessions, Institute of Chemistry Ceylon

Tuesday, June 12th 2018
At Sri Lanka Foundation Institute (SLFI), Colombo 07

Programme

8.30-9.00 am Arrival of Guests (*Refreshments will be served*)

9.00 am Ceremonial Procession of the Council Members and Past Presidents

9.10 am Inauguration by lighting of the Oil Lamp and Playing the National Anthem

9.15 am Welcome Address
Dr. Poshitha Premarathene
President, Institute of Chemistry Ceylon

9.20 am Presidential Address

9.40 am Address by the Chief Guest
Mr. Kulathunga Rajapaksa
Managing Director, DSI Samson Groups (PVT) Ltd.

10.00 am Address by the Guest of Honor
Mr. Madura Vithanage
Attorney at Law, Mayor Sri Jayawardenepura Kotte Municipal Council

10.20 am Presentation of Awards, Prizes and Certificates
Institute of Chemistry Ceylon Awards
- Dr CL de Silva Gold Medal - Dr. P A N Punyasiri
- Professor M U S Sultanbawa Award for Research in Chemistry 2017 - Ms. K Anoosheya
- All Island Interschool Chemistry Quiz and Chemistry Olympiad prizes

Graduateship Examination in Chemistry
- Scholarships, Prizes and Awards
- J N Oleap Fernando Memorial Scholarships

11.10 am Dr CL de Silva Gold Medal Award Lecture
Metabolite profiling of the Sri Lankan tea (*Camellia sinensis* L.) germplasm
Dr. P A N Punyasiri

11.40 am Vote of Thanks
Professor Sudantha Liyanage
President Elect, Institute of Chemistry Ceylon

11.50 am Close of Ceremony

12.00 noon Annual General Meeting – 2018 (*for Corporate Members only*)

Theme Seminar on

Chemists' contribution towards National Policy Development

Date : 14th June 2018 Venue : Sri Lanka Foundation Institute, Colombo 07

Programme

9.00 a.m.	Registration and Refreshments
9.30 a.m.	Welcome Address **Dr. Poshitha Premaratne** *President, Institute of Chemistry Ceylon*
9.40 a.m.	Keynote Address Chemists' contribution towards National Policy Development **Professor Ajith de Alwis** *Project Director, Coordinating Secretariat for Science, Technology and Innovation (COSTI)* *Professor at the Department of Chemical and Process Engineering at the University of Moratuwa*
10.30 a.m.	Chemists' contribution towards National Policy Development: Role of ITI in product development **Dr. G A S Premakumara** *Former Director, Senior Scientist, Industrial Technology Institute (ITI)*
11.10 a.m.	Chemists' contribution towards National Policy Development: Role of the Sri Lanka Accreditation Board in public protection **Ms. Chandrika Thilakaratne** *Director/CEO, The Sri Lanka Accreditation Board for Conformity Assessment (SLAB)*
11.50 a.m.	Chemists' contribution towards National Policy Development: Role of Ministry of Science Technology and Planing **Ms. Nazeema Ahamaed** *Director Planning, Ministry of Science Technology and Planing*
12.30	Lunch
1.40 p.m.	Chemists' contribution towards National Policy Development: Role of SLSI in product certification **Ms. W M V Tennakoon** *Senior Deputy Director, Product Certification, Sri Lanka Standard Institution (SLSI)*
2.20 p.m.	Chemists' contribution towards National Policy Development: Role of consumer affairs authority and public safety **Ms. M M S K Karunaratne** *Deputy Director, Consumer Affairs & Information*
3.00 p.m.	Panel discussion
3.55 p.m.	Vote of Thanks
4.00 p.m.	Tea

Cover Page

The cover page photograph (source: vevra) shows the Graduate Chemists at the 14th Convocation of the College of Chemical Sciences, Institute of Chemistry Ceylon, held at BMICH on 26th February 2018. This was the 35th batch and 129 students were formally awarded Graduate Chemist status and thereby increasing the overall production to a total of 1403. More formal photographs of the Convocation are on page 49 .

Technical Sessions

Venue: P P G L Siriwardene Auditorium, Adamantane House, Rajagiriya

Time: 2.00 p.m. – 5.15 p.m. Date: 12th June 2018

Time	Title	Authors
M U S Sultanbawa Award Applicants		
2.00 - 2.15 p.m.	Comparative study on antidiabetic activity of jaggery made from *Borassus flabellifer* and *Caryota urens*	G Y Gunasekara, D Udukala
2.15 - 2.30 p.m.	The temperature dependence on the acid hydrolysis processes of palmyrah fruit fibers to glucose	S Sivagnanasundaram, G Sashikesh
2.30 - 2.45 p.m.	Preparation of biodiesel from castor seed oil	N Madawala, U S K Weliwegamage
2.45 - 3.00 p.m.	The dehavior of emissive phenanthroline-iron(ii) charge transfer complex on ionic strength	P M Opallage, M D P De Costa, R Senthilnithy
3.00 - 3.15 p.m.	Correlation of variation in the percentage of compounds responsible for mosquito repellent activity in citronella oil over time with mosquito repellent efficacy of commercial citronella oil samples and sprays	N S Adhihetty, C Padumadasa
3.15 - 3.30 p.m.	Sorptive removal of P-nitroaniline from aqueous solution by using magnetized tea waste bio-char	K M K Wickramaratne, M Vithanage, S R Gunatilake
3.30 - 4.00 p.m.	REFRESHMENTS	
4.00 - 4.15 p.m.	Encapsulation of lemon grass oil in chitosan formulation and characterization	Y Paragodaarachchi, S Wickramarachchi
4.15 - 4.30 p.m.	Potential of *Barringtonia asiatica* seed kernel extracts as antifungal agents	P Ragutharan, M M Weerasekera, S Ekanayake
4.30 - 4.45 p.m.	Investigation of quality parameters of coconut oil for chronic kidney disease patients	N M S Hettigedera, P A Paranagama, U Weragama
ABSTRACTS		
4.45 - 5.00 p.m.	Some functional properties of *Ipomea batata* (sweet potatoes) cultivars for potential use in food industry	G R N N Waidyarathna, S Ekanayake, G A P Chandrasekara
5.00 -5.15 p.m.	Characteristics influenced by acid modification of tea waste biochars pyrolyzed at different temperatures	C Peiris, O Nayanathara, P A Paranagama, M Vithanage, M N Kaumal, Todd Mlsna, S R Gunatilake

Technical Sessions

Venue: P P G L Siriwardene Auditorium, Adamantane House, Rajagiriya

Time: 8.30 a.m. – 5.00 p.m. Date: 13th June 2018

Time	Title	Authors
	ABSTRACTS	
8.30-8.45 a.m.	Stability of fatty acids in gamma irradiated yellowfin tuna fish muscles during storage	I H W Surendra, E M R K B Edirisinghe, R M N P Rathnayake
8.45-9.00 a.m.	Adsorptive removal of cadmium in aqueous solutions using coconut dregs residue as the adsorbent	C Madawala, A Perera
9.00-9.15 a.m.	Digestive enzyme inhibitory activities and anti-glycation properties of *Myristica fragrans* seed extracts	H M D C Herath, W I T Fernando, H K I Perera, L Jayasinghe
9.15-9.30 a.m.	Antioxidant activity and extraction kinetics of polyphenols in BOPF grade black tea (*Camellia sinensis*) from different geographical elevations in Sri Lanka	P Soysa, K M Wijesinghe
9.30-9.45 a.m.	Glycaemic index of vitagen:a commercial proforma formulated meal replacement	M P P P Weerarathne, S Ekanayake
9.45-10.00 a.m.	Phenolic compounds and antioxidant activity of *Ampelocissus indica*(L) planch, a wild grape species native to asia	W L Fernando, H P D T Hewa Pathirana, L L W C Yalegama, C D Jayaweera
10.00-10.30 a.m.	REFRESHMENTS	
10.30-10.45 a.m.	Wood based Cologne from Neem	P S Ukwattage, C S Udawatte
10.45-11.00 a.m.	Variation of antioxidant activity and the extraction kinetics of polyphenols of fannins grade green tea (*Camelia sinensis*) with geographical elevation	K M K G Perera, Preethi Soysa
11.00-11.15 a.m.	Determination of antidiabetic activity of commonly consumed medicinal plants in Sri Lanka	D Wickramarachchi, R Visvanathan, A Nizar, R Liyanage
11.15-11.30 a.m.	Identification of chemical constituents of *Panicum maximum* plant that shows attraction to paddy bug	W C S Munindradasa, P A Paranagama
11.30-11.45 a.m.	Determination of the content of cadmium Lead, zinc and arsenic in chicken and beef liver available in the local market	M T Fernando, E G Somapala
11.45 a.m. -12.00 p.m.	Physiochemical properties of rice based herbal biscuit Incorporated with the decoction of *Syzygium cumini* bark	A C Wijeratne, S Ekanayake, K K D S Ranaweera, P R D Perera, Suraji Senanayaka
12.00 -1.00 p.m.	LUNCH	

1.00 -1.15 p.m.	Synthesis, characterization and biological studies of a novel naphthalene-derivatized tridentate ligand and its fac-$[Re(CO)_3L]$ complex as potential therapeutic agents for lung cancer	Taniya Darshani, T Perera V V Priyadarshani, S Samarakoon, I C Perera,
1.15 -1.30 p.m.	Development of natural rubber based materials having enhanced mechanical properties	H C Wijesinghe, T K Mudiyanselage
1.30 - 1.45 p.m.	Development of a pH sensitive indicator from *Terminalia catappa* leaves	H Perera, C S Udawatte
1.45 - 2.00 p.m.	The inhibition of acetylcholinesterase *via* synthetically viable coumarin derivatives	A Azeem, C N Ratnaweera, C S Udawatte
2.00 - 2.15 p.m.	Investigation of antibacterial activity of pinda thailaya	N Anandakumar, D Fernando, P K Perera, C S Udawatte
2.15 - 2.30 p.m.	Study the quality of metformin hydrochloride sustained release tablets available in Sri Lanka	V Ajeethan, Shanika, D N Karunaratne
2.30 - 2.45 p.m.	Lipase inhibition effects of four pure compounds isolated from an endolichenic fungus *Xylaria psidii*	S Sinthujah, H A K Maduranga, R N Attanayake, G Weerakoon, P A Paranagama
2.45 - 3.00 p.m.	Evaluation of anti-obesity, anti-inflammatory and antioxidant activities of oleoresins and essential oil of cinnamon bark and leaf of *Cinnamomum zeylinicum*	J A H Erangika, S W Jayaweera, R D Gunaratna, P A Paranagama, K R D de Silva
3.00 - 3.15 p.m.	Molecular identification and screening anti-obesity activity and anti-diabetes property of selected endolichenic fungi(ELF) in mangrove ecosystem of puttalam lagoon	H A K Maduranga, R N Attanayake, G Weerakoon, P A Paranagama
3.15 - 3.30 p.m.	Heavy metal content and fungal resistance of paints available in the local market	K M K Wickramaratne, G W C S Perera, C S Udawatte
3.30 - 4.00 p.m.	REFRESHMENTS	
4.00 - 4.15 p.m.	Validation of a multi residue QuEChERS method for analysis of 29 pesticide residues in fruits and vegetables using LC-MS/MS technique	J J Jeevanantham, G V V Liyanaarachchi, E G K Kumarapeli, M N A Mubarak
4.15-4.30 p.m.	Synthesis, characterization of copper based metal organic frameworks and their application in heterogeneous catalysis	D Kulasekara, S Rajendran, C Jayasundara, H M M Infas
4.30- 4.45 p.m.	Reef fish waste for production of good quality fish oil	G L A Dulochana, H M K K Pathirana
4.45-5.00 p.m.	Synthesis of homo and heteroleptic Ag(I) complexes based on N and P donor ligands	S D Perera

Dr. C L de Silva Gold Medal Award

Awarded for an outstanding research contribution in any branch of Chemical Sciences and/ or the use of such research for National Development during the last five (5) years in Sri Lanka. Credit will be given for the utilization of local raw materials, and where the contribution has already resulted in (i) a publication in a Citation Indexed Journal or (ii) Registering a Patent or (iii) where the contribution has already resulted in a positive impact in the development and innovation in the industry.

Abstract of Dr. C L de Silva Gold Medal Award - 2018

Metabolite profiling of the Sri Lankan tea (*Camellia sinensis* L.) germplasm

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Tea (*Camellia sinensis*, L.) is renowned for its biochemical constituents, playing an indispensible role in defining the product quality and in conferring pest and disease resistance. Present investigation is the first attempt in profiling seven major metabolites of 87 beverage type and 6 non-beverage type tea accessions from Sri Lankan tea germplasm using HPLC and LC-MS/MS. All seven major metabolites *viz*., epicatechin, epicatechingallate, epigallocatechin, epigallocatechingallate, caffeine, theobromine and gallic acid, widely varied in the beverage type accessions. Non-beverage types did not contain the above, except gallic acid and epicatechin. Results prove the presence of high EC and ECg content in green leaves, to be a reliable marker for identifying high quality black tea producing accessions. Significant variations detected in theobromine, caffeine and total polyphenol contents were helpful in defining the affinity of germplasm to main three tea taxa, and conclude that Sri Lankan germplasm collection is predominantly represented by *C. sinensis* ssp. *Lasiocalyx*.

Chemical analysis of the Sri Lankan tea (*Camellia sinensis*, L.) germplasm would immensely contribute to the success of the tea breeding programme. However, the polyphenols, particularly catechins (flavan-3-ols), are readily prone to oxidation in the conventional method of sample preparation. Therefore, optimization of the present sample preparation methodology for the profiling of metabolites is much important. Two sample preparation methodologies were compared, fresh leaves (as in the conventional procedures) and freeze-dried leaves (a new procedure), for quantification of major metabolites by employing two cultivars, one is known to high quality black tea and the other low quality black tea. The amounts of major metabolites such as catechins, caffeine, gallic acid, and theobromine, recorded in the new sampling procedure *via* freeze-dried leaves were significantly higher than those recorded in the conventional sample preparation procedure. Additionally new method required less amount of leaf sample for analysis of major metabolites and facilitate storage of samples until analysis. The freeze dried method would be useful for high throughput analysis of large number of samples in shorter period without chemical deterioration starting from the point of harvest until usage. Hence this method is more suitable for metabolite profiling of tea as well as other phenol rich plants.

Flavonol glycosides in tea leaves have been also quantified as aglycones, quercetin, myricetin, and kaempferol. Occurrence of the said compounds was reported in fruits and vegetable for a long time in association with the antioxidant potential. However, data on flavonols in tea were scanty and, hence, this study aims to envisage the flavonol content in a representative pool of accessions present in the Sri Lankan tea germplasm. Significant amounts of myricetin, quercetin, and kaempferol have been detected in the beverage type tea accessions of the Sri Lankan tea germplasm. This study also revealed that tea is a good source of flavonol glycosides. The *Camellia sinensis* var. sinensis showed higher content of myricetin, quercetin, and total flavonols than var. assamica and ssp. lasiocalyx. Therefore flavonols and their glycosides can potentially be used in chemotaxonomic studies of tea

germplasm. The nonbeverage type cultivars, especially Camellia rosaflora and Camellia japonica Red along with the exotic accessions resembling China type, could be useful in future germplasm studies because they are rich sources of flavonols, namely, quercetin and kaempferol, which are potent antioxidants. The flavonol profiles can be effectively used in choosing parents in tea breeding programmes to generate progenies with a wide range of flavonol glycosides.

These metabolic profiles can be effectively used in choosing accessions of desired tea quality for propagation and in tea breeding programmes to generate progenies with wide variations.

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Abstracts of Research Papers to be presented at the 47th Annual Sessions 2018

Technical Sessions : A - 01

Comparative study on antidiabetic activity of jaggery made from *Borassus flabellifer* and *Caryota urens*

G Y Gunasekara, D Udukala*

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Jaggery is a popular sweetening agent with number of health benefits. Therefore even the people having diabetes tend to use jaggery as a sweetener. It would be great if sugar can be substituted with jaggery. Alpha-amylase and alpha glucosidase have been identified as two dietary enzymes which break down starch into small carbohydrate molecules. Diabetic patients have the tendency to get critical diabetic conditions such as nephropathy and retinopathy. So that reduction of the sudden increment of blood glucose level in postprandial stage will decrease the risk of diabetic complications. The objective of this study is to find out the ability of jaggery to reduce postprandial hyperglycemia by inhibiting alpha amylase and alpha glucosidase enzymes.

Alpha-amylase from *Aspergillus oryzae* (30 U/mg) and alpha-glucosidase from *Saccharomyces cerevisiae* (Type I, 28 U/mg) were used to determine the inhibition activity of selected jaggery samples. Methanol extracts of the two jaggery samples prepared by *Borassus flabellifer* (palmyrah) and *Caryota urens* (kithul) were used as they have shown the highest weight percentage. Percentage inhibition of the two enzymes and glucose content of each sample were determined. Alpha-amylase inhibitory assay was carried out both in the presence and absence of the extract. Acarbose has used as the positive control of this study. Data for positive control of the alpha-glucosidase inhibitory assay was compared with the data which have been already published.

Percentage inhibition of the kithul jaggery sample was increased as the concentration of the extract increased where the percentage inhibition of palmyrah jaggery sample was decreased as the concentration of the extract increased. The highest percentage inhibition activity of the positive control was 86.86 ± 6.26. The highest alpha-amylase inhibition percentage of kithul jaggery sample was 69.91 ±7.15 and the palmyrah jaggery sample was 38.05 ± 1.45. In alpha-glucosidase assay, the highest percentage inhibition of the palmyrah jiggery sample was 54.98 ± 4.77 where that of the kithul jaggery sample was 92.14 ± 0.22.

When comparing the two jaggery samples, kithul jaggery sample showed mild hyperglycemic activity than palmyrah jaggery sample.
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Technical Sessions : A - 02

The temperature dependence on the acid hydrolysis processes of palmyrah fruit fibers to glucose

S Sivagnanasundaram, G Sashikesh*
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Palmyrah (*Borassus flabellifer*) fruits are greatly consumed by human and also it directly used as cattle feed not only in the North and East province of Sri Lanka but also in some other South Asian countries. Palmyrah fruits are thrown into the environment as waste without fully utilized. Palmyrah fruit contains 45.67 % of fibers and these fibers are mainly consist of cellulose, hemicellulose and lignin. The unused cellulose Palmyrah fruit fibers are converted as a glucose monomer *via* the acid hydrolysis processes. The produced glucose monomer can be used either as food/beverage or substrates for fermentative production of useful products. This research study mainly focused on the temperature dependence of cellulose fibers on the acid hydrolysis process of Palmyrah fruit fibers to glucose.

Cellulose was extracted from the Palmyrah fruit husk in the presence of NaOH and Na_2S and it was confirmed *via* the Schultz reagent test. The acid hydrolysis of extracted cellulose was carried out with 7.0 M concentration of H_2SO_4 at the specific temperature (303 K) and the whole experimental procedure was repeated again with the temperature of 313 K, 323 K, 333 K and 343 K. Constant volume of resultant mixture was withdrawn separately from each sets in a particular time interval for a period of 4 hours from the initiation of the hydrolysis reaction and immediately, 3,5-dinitrosalicycilicacid (DNS) reagent was added to the withdrawn sample. The absorbance of the orange red colour 3-amino-5-nitrosalicycilc acid complex was measured at 484 nm using the JascoV-570 UV-VIS-NIR spectrophotometer.

The extracted cellulose polysaccharide and hydrolysed glucose monosaccharide were confirmed via the Schultz reagent test, which gave the purple colour as same as the laboratory grade cellulose, and the DNS reagent, which gave the orange red colour complex as similar to the pure glucose, respectively. The order of the reaction for the acid hydrolysis process was determined *via* the comparative kinetic studies with the common integration rate law and it proposed that the acid hydrolysis processes of Palmyrah fruit fibers to glucose is a pseudo first order reaction processes with respect to cellulose. Figure 1 shows that the yield percentage of glucose from acid hydrolysis of Palmyrah fruit fiber cellulose increases with increasing reaction temperature and it clearly shows that the pseudo order rate constant of acid hydrolysis processes of Palmyrah fruit fibers to glucose depends on the temperature. Furthermore, the activation energy of the acid hydrolysis processes of Palmyrah fruit fibers to glucose was determined by using Arrhenius equation and it was obtained as 24.986 kJ/mol.

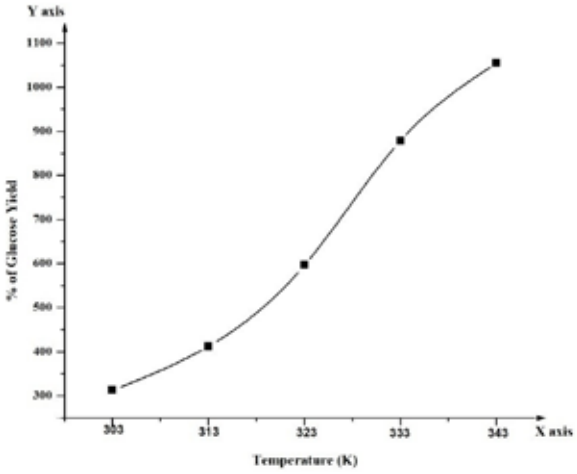

Figure 1: The effect of temperature on yield percentage of glucose at different temperature

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Technical Sessions : A - 03

Preparation of biodiesel from castor seed oil

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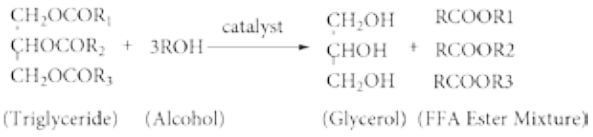
Fossil fuels are major nonrenewable energy sources that take many years to form and the use of fossil fuels cause high environment pollution thereby scientists found alternative energy resources. With the growing demand for fuel, biodiesel has gained a high popularity as alternative to fossil fuels. Biodiesel is a biofuel, which is defined as a fuel comprised of mono-alkyl esters of long chain fatty acids derived from non-edible oil. In this study, it was attempted to produce biodiesel based on caster oil.

Triglyceride is an ester derived from glycerol and three fatty acid molecules. An ester can react with an alcohol to produce a mixture of fatty acids and glycerol as the byproduct. This process is namely Transesterification. The basic and its simplified chemical reaction is mentioned below.



Castor seeds (*Ricinus communis*) were grinded until it comes to small tiny particles. The ground seeds were introduced to the Soxhlet Apparatus and the extraction of the oil was carried out. The solvent was removed by rotary evaporating the oil mixture. The oil mixture obtained was purged with nitrogen to remove excess solvent remaining and transesterification was followed by mixing the catalyst and the alcohol (methanol) in 6:1 ratio first, and then by changing some parameters like temperature and the ratios. Phase separation was carried out to separate the biodiesel and the glycerol followed by purification process to obtain pure biodiesel.

The best alcohol to oil ratio (6:1), temperature, 60 °C and stir speed 600 rpm with a reaction time of two hours (120 minutes), yielded 80.3 % of biodiesel. The density (D1298- ASTM standards) of the biodiesel was 0.929 9 g/ml. The Acid value (D664-ASTM standards) was 0.960 mg KOH/g, and the turbidity was found to be 9.97 FNU.

As the turbidity is higher than ASTM standards, soap formation was found in small scale while acid value showed an uprising by 0.4, which indicates the presence of average cleansing by soap when compared to the ASTM standards.

In conclusion, these results suggest that castor seeds is a promising species for biodiesel feedstock and can gain high yields of biodiesel from castor oil.

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Technical Sessions : A - 04

The behavior of emissive phenanthroline-iron(ii) charge transfer complex on ionic strength

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1,10-Phenanthrolin is a versatile bidentate ligand for transition metals. Their conjugated backbones make them attractive chromophores and molecular "antennae".[1] In this study, fluorescence emission of 1,10-phenanthroline probe and 1,10-phenanthroline-Fe(II) complex were examined in the presence of NaCl and $Pb(NO_3)_2$, in order to study relationship of the fluorescence of 1,10-phenanthroline-Iron(II) complex with the ionic strength. The fluorescence intensity of the probe at λ_{max} of 366 nm was decreased upon addition of Fe(II) which was mainly due to static quenching of unbound probe. A new red shifted emission band was appeared at 411 nm due to formation of probe-Fe(II) complex, which enhanced upon addition of Fe(II). The addition of NaCl and $Pb(NO_3)_2$ (1000 ppm) in acetonitrile medium to a solution of 1,10-phenanthroline-Fe(II) complex enhanced the emission at 411 nm, whereas no significant change was observed at 366 nm up to a concentration of 10^{-7} M of the salt. The emission of 1,10-phenanthroline-Fe(II) complex is highly dependent on the ionic strength of the solution regardless of the added cation and whether it has the ability to complex with phenanthroline or not up to a concentration of 10^{-7} M. These observations suggest that the emissive excited complex may be a charge transfer species and becomes more stable at higher ionic strength by minimizing the ratio of back electron transfer process in the ionic environment, leading to lowering of the quenching.

Acknowledgement; Faculty Research Grant (2017) of Faculty of Natural Sciences/ Open University of Sri Lanka is gratefully acknowledged for funds provided for this study.

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Technical Sessions : A - 05

Correlation of variation in the percentage of compounds responsible for mosquito repellent activity in citronella oil over time with mosquito repellent efficacy of commercial citronella oil samples and spray

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In tropical countries including Sri Lanka, mosquitoes are considered as the greatest menace out of all disease-transmitting insects because of their ability to spread mosquito-borne diseases, which are responsible for millions of deaths every year. Species of mosquitoes belonging to genera *Aedes*, *Anopheles*, *Culex* are the vectors of pathogens causing deadly mosquito-borne diseases such as Dengue fever, Filariasis, Japanese Encephalitis, and Malaria. The Epidemiology Unit of Ministry of Health Sri Lanka reported 185,969 suspected dengue cases during the year 2017. The control of mosquitoes, which transmit deadly diseases, has become a significant public health concern globally. Protection against mosquito bites is an important part of preventing mosquito-borne diseases. Using mosquito repellent products to keep mosquitoes away is currently the most trending method to prevent mosquito bites.

Cymbopogan winterianus Jowitt (Java type) and *Cymbopogan nardus* (L.) Rendle (Ceylon type) are the two types of closely related citronella grass cultivated to extract citronella oil. It is reported that compounds, geraniol, limonene, citronellol, citronellal, α-pinene, linalool, camphor, myrcene and α-terpeneol show
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mosquito repellent activity. The GC-MS spectrum of citronella oil isolated from Ceylon type shows the presence of all these compounds, whereas that of Java type shows the presence of these compounds excluding α-pinene, camphor, myrcene, and α-terpeneol. Repellent action of citronella oil extracted from both types has been reported against mosquitoes. In the Sri Lankan market, there are a number of mosquito repellent products such as sprays, candles, lotions and incense sticks, which are produced using citronella oil. Citronella oil is also found in the market to be directly used as a mosquito repellent product.

In the present study, commercial citronella oil samples of brands A, B, C, D and authentic citronella oil sample were subjected to GC-MS analyses weekly for a period of sixteen weeks to investigate the variation in the percentage of compounds responsible for mosquito repellent activity with time. The mosquito repellent activity of citronella oil samples (brand C and authentic) and mosquito repellent sprays (X and Y) was determined using previously published Arm-In-Cage Method. Out of the citronella oil samples (brands A, B, C and D), only brand C was used for the mosquito repellent study as it showed geraniol and linalool in highest and lowest percentages, respectively (of the compounds under study) similar to that of Ceylon type citronella oil. For each sample the experiment was repeated weekly for a period of sixteen weeks. A gradual reduction in the percentage of compounds responsible for mosquito repellent activity was observed in all samples (brands A, B, C, D and authentic) over the period of sixteen weeks. The highest mosquito repellent activity (100%) was shown by citronella oil of brand C during the first twelve weeks and sprays X and Y during the first eight weeks of the study. The mosquito repellent activity of these samples declined over the rest of the study period. Authentic citronella oil sample showed the highest mosquito repellent activity (100%) throughout the period of sixteen weeks.

The time duration that the maximum mosquito repellent activity would persist in the tested samples of mosquito repelling agents (citronella oil of brand C and sprays X, Y) may be considerably lower than the shelf life stipulated. This effect may be due to the fact that the compounds responsible for mosquito repellent activity in the tested samples have shown a decline in their percentages with time. Therefore, one must take this in to consideration when relying on these mosquito repelling agents in order to prevent being bitten by mosquitoes carrying deadly diseases, which have plagued many countries.

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Technical Sessions : A - 06

Sorptive removal of 4-nitroaniline from aqueous solution by using magnetized tea-waste biochar

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4-Nitroaniline (4NA) is a synthetic precursor of pharmaceuticals, fuel additives, corrosion inhibitors, pesticides, antiseptics agents and azo dyes. Residue 4NA has shown adverse effects in aquatic ecosystems. Biochar (BC) is a low cost adsorbent produced by anaerobic thermal degradation of waste biomass known as pyrolysis. Tea-waste is an excellent raw material for BC production in Sri Lanka due to high availability and low cost. Pyrolysis of biomass was done at three different temperatures (300, 500 and 700 ^{0}C) and magnetically modified. Magnetic BC (MBC) were successfully used for the removal of 4NA from water. The FTIR measurements confirmed that the BC produced at low temperatures (LTBC) have high amount of surface functional groups in comparison with BC produced at higher temperatures (HTBC). Maximum adsorptions for both MBA and NBA occurred at mild acidic conditions (pH = 2-4) and HTBC showed higher adsorption capacities than LTBC. Sorption of 4NA onto tea-waste BC were well fitted into both Langmuir and Freundlich isotherm models (R2>0.99). The π^+ - π electron donor acceptor interactions between electron donating arene rings of BC surface and positively charged nitrogen atoms in 4NA can be considered most dominating sorption mechanism at acidic conditions. Increased sorption capacities were observed at higher temperatures indicating endothermic sorption. There were no significant loss in adsorption capacity due to magnetic modification. The magnetic modification allowed easy recovery of sorbent which can be cost effective in industrial applications. Sorption capacities have not been depleted upon magnetic modification.

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Technical Sessions : A - 07

Enapsulation of lemongrass oil in chitosan: formulation and characterization

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Essential oils are gaining increasing interest in food, pharmaceutical and agricultural industries due to their natural and safe status, wide acceptance by consumers, and multidimensional functional properties. This study was carried out to encapsulate lemongrass oil in chitosan to increase its bioavailability. Microencapsulation of lemongrass oil was carried out using ionotropic gelation of chitosan crosslinking with sodium tripolyphosphate (STPP). The effect of varying amount of polymer, crosslinker and oil on encapsulation efficiency (EE), oil content, and release rate were determined. Gas chromatogram of lemongrass oil indicated the presence of Citral-B (34.12%) and Citral-A (44.31%) as the major constituents. According to optical microscopic images, MCs are spherical in shape and their size varies from 38.66 ± 0.46 to 96.33 ± 0.05 μm. Scanning electron microscopic image of the oil loaded capsules further evidence the spherical shape of MC with a smooth surface while empty capsules had a layered structure. The particle size and EE increased with increasing oil load, polymer and crosslinker concentration. High oil load and polymer concentration lowers the efficiency of the dispersion force (1000 rpm) resulting higher particle size. Increasing crosslinker concentration increases the oil retention. When the polymer concentration is high, solution contains excess polymer to encapsulate oil vesicles. All of these contribute to higher EE. However, EE decreases when the viscosity of the solution is too high which result in lower dispersion of oi/water emulsion. EE increases with increasing cross-linker concentration as a compact solid matrix is formed which lead to increased number of formed MCs. After a critical concentration
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value of crosslinker concentration, aggregation of MCs occur. This decreases the EE. It was found that the number density of the capsules increases and the thickness of the wall of capsules decreases with increasing oil load due to the low efficiency of the dispersion force. This increases the release rate. The thickness of the wall of capsules increases with increasing polymer concentration as excess of polymer is present to cover the oil vesicles thus decreasing release rate of the oil from MCs. The release rate also decreased with increasing crosslinker concentration as the microcapsule wall become more compact.

FTIR spectra of oil encapsulated MC and empty MC were more or less the same hence proving successful encapsulation of lemongrass oil in chitosan. The highest EE and release rate was observed at polymer (1 g), oil (3 g) and cross linker (0.5 g) thus concluding the optimum formulation for lemongrass oil loaded MCs.

Acknowledgement: Financial assistance by University of Kelaniya, Research Grant RP/03/02/06/01/2016

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Technical Sessions : A - 08

Potential of *Barringtonia asiatica* seed kernel extracts as antifungal agents

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Candida species are leading opportunistic fungal pathogens causing infections in humans. Development of resistance to existent anti mycotic drugs cause the need for development of new agents against *candida*. Antimicrobial activity has been reported in methanolic extracts of bark and leaves of *Barringtonia asiatica*. Our previous work indicated the presence of phenolic compounds and cytotoxic potential in the methanolic extract of *B. asiatica* seeds. This study aims to assess the potential of antifungal activity of the crude methanolic extract (CME, 15 g powder / 40 ml MeOH; 24 hrs; dried at 45 ^{0}C) and a fraction obtained from CME run through the Medium pressure liquid chromatography (MPLC) using different solvent gradients. CME and a fraction obtained from MPLC were tested for antifungal activity against standard type strains of *Candida albicans* (10231), *Candida tropicalis* (32113), *Candida parapsilosis* (7330), *Candida glabrata* (90030) and their clinical isolates. The antifungal assays were done with CME (1500 ppm) or MPLC fraction (1000 ppm), flucanozol [positive control, 50000 ppm (50 mg / mL)] and dimethyl sulfoxide DMSO (negative control, 5%)) using Mueller Hinton Agar (MHA) medium and the zone of inhibition was measured after incubation at 37 oC for 24 hours. Table 1 shows antifungal activity against selected *Candida* (ATCC) and their clinical isolates. Both CME and MPLC fraction inhibited the growth of ATCC strains except for *C. tropicalis* showed inhibition of growth at lower concentration than flucanozol. All clinical isolates of *C. albicans* and *C. glabrata* were inhibited by CME and MPLC fraction. Expect for one clinical isolate, CME inhibited the growth of C. tropicalis even though CME did not inhibit the ATCC strain. Both CME and MPLC were not active against most of the clinical isolates of *C. parapsilosis* at the given concentration. The isolates MPLC fraction (1000 ppm) indicated significantly high inhibition zones compared with CME in most of the strains and clinical isolates ($p \leq 0.05$) at these concentrations. Seed of *B. asiatica* CME and the MPLC fraction inhibited the growth of tested Candida ATCC strains except for *C. parapsilosis* and clinical isolates of all four Candida strains at a lower concentration when compared with the positive control flucanozol. Therefore, CME and MPLC fraction of *B. asiatica* have a high potential to be developed as an anti fungal agent.
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Table 1: Results of antifungal activity against selected *Candida* (ATCC) and their clinical isolates.

Candida	Crude methanolic extract		Fraction from MPLC	
	Crude (mm, 1500 ppm)	**Flucanozol (mm, 50000ppm)**	**MPLC fraction (mm, 1000 ppm)**	**Flucanozol (mm, 50000 ppm)**
Candida albicans	13 ± 0.58a	28 ± 2.89	15 ± 0.00b	20 ± 0.00
Clinical isolated *C. albicans*				
37HA	13 ± 0.58a	48 ± 5.86	14 ± 1.15b	48 ± 2.52
41HA	10 ± 0.58a	43 ± 1.53	14 ± 0.58b	42 ± 3.50
36H	10 ±0.58a	40 ± 0.0	9 ± 0.58a	42± 1.53
17H	11 ± 1.15a	40 ± 0.58	14± 0.58b	45 ± 0.00
13H	12 ± 0.00a	42 ± 2.89	14 ± 0.58b	45 ± 1.00
Candida tropicalis	0 ±0.00c	48 ± 0.58	10 ± 0.00d	46 ± 1.00
Clinical isolated *C. tropicalis*				
162A	0 ± 0.00c	11 ± 1.53	12 ± 1.53d	22 ± 2.31
166	12 ± 1.00c	16 ± 0.58	13 ± 0.58c	15 ± 0.58
161A	12 ± 2.08c	41 ± 2.65	14 ± 1.00c	44 ± 0.58
167	11 ± 0.58c	18 ± 1.53	13 ± 1.16c	19 ± 1.15
165B	12 ± 0.58c	19 ± 1.00	13 ± 1.53c	21 ± 0.58
Candida glabrata	15 ± 0.00e	23 ± 2.89	19 ± 0.00f	16 ± 0.58
Clinical isolated *C. glabrata*				
23B	10 ± 0.00e	50 ± 0.00	12 ± 0.58f	50 ± 2.00
32	15 ± 0.58e	41 ± 1.15	16 ± 0.00f	40 ± 0.00
193A	15 ± 0.58e	39 ± 1.15	18 ± 0.00f	41 ± 1.00
145B	14 ± 1.00e	41 ±1.15	17 ± 1.15f	37 ± 4.16
100B	16 ± 0.58e	39 ± 3.61	17 ± 0.58e	40 ± 0.00
Candida parapsilosis	10 ± 0.00g	42 ± 0.58	11 ± 0.58h	43 ±1.73
Clinical isolated *C.parapsilosis*				
14B	0 ± 0.00g	50 ± 0.58	14 ± 1.00h	48 ± 1.00
20	10 ± 0.00g	57 ± 2.89	11 ± 1.00g	62 ± 2.89
26A	0 ± 0.00	47 ± 3.46	0 ± 0.00	47 ± 0.58
109A	0 ± 0.00	51 ± 4.04	0 ± 0.00	47 ± 2.89
16C	0 ± 0.00	54 ± 3.21	0 ± 0.00	58 ± 1.53

Values are expressed as inhibition zone (mm) and an average ±SD. Same superscript along a row indicate no significant difference ($p \leq 0.05$)

Acknowledgement: Financial assistance by ASP/06/RE/MED/2014/07

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Technical Sessions : A - 09

Investigation of quality parameters of coconut oil for chronic kidney disease patients

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Coconut oil is the major fat source in Sri Lankan traditional diet and 92% of coconut fat is saturated. Medical fraternity were in uncertainty whether coconut oil is safe to consume. Based on high Saturated Fatty Acids (SFA) percentage American Heart Association discouraged the consumption of coconut oil. However, SFA in coconut oil differ from saturated fats in animal fats according to the Ceylon Medical Journal published in 2006.

Chronic Kidney Disease (CKD) is a public health issue and cardiovascular diseases (CVDs) cause for morbidity and mortality among CKD patients. Regular observations and Medical Nutrition Therapy by registered dietitian is vital to addresses nutrition issues of CKD patients.

Epidemiological studies have failed to clearly establish a relationship between coconut fats, and CVDs. Quality of coconut oil available in Sri Lankan market is not consistent. Purity maintenance of proper standards during various steps in oil production has resulted high quality coconut oil in one producer. (Hettigedara et al., 2013). CKD patients had beneficial effect on management of the disease through diet with 30-35% fat (physically refined coconut oil) (Hettigedara et al., 2016; 2017). The present study was conducted to evaluate the quality of coconut oil in the market and to check the suitability of physically refined coconut oil to continue dietetic therapy for CKD patients.

The objective of this research was to determine the chemical parameters of coconut oil to be used in CKD patients and to assess the lipid profile of CKD patients after prescription of physically refined coconut oil as a source of dietary fat.

Coconut oil samples available in the market (both branded and non-branded) of Colombo area were collected randomly. Samples were chemically analyzed for SLSI specified chemical parameters and additional parameters essential for quality of coconut oil. The CKD patients in stage IV and V were selected and they were given dietary and life -style modifications and patients were reviewed and monitored at regular intervals by the registered Dietitian- Nutritionist. Physically refined coconut oil was included as a source of fat around 30 %- 35% of total energy. E GFR, serum creatinine and lipid profile of CKD patients were analyzed after 1 year of interval retrospectively. Sample size was 46.

Sample F had the lowest free fatty acid (FFA) percentage while sample I had the highest FFA. Sample F and J had the lowest Peroxide value (PV) while sample C represented the highest. FFA and PV values indicate the degree and hydrolytic degradation of oil and the extent to which rancidity reactions have occurred during the storage, respectively. Sample A had the lowest saponification and highest iodine value while sample B had the lowest iodine value. There is a significant variation in quality among tested samples. Only the sample F had the expected quality as previously reported. There was a significant decrease in serum creatinine levels in 80% and significant increase in eGFR levels in 80% of the subjects. 90% of the subjects had total cholesterol and triglyceride (TG) within normal range. HDL level of 51.51% of subjects was within normal range ($p<0.05$) (n=46).

There is a wide variation of quality and purity of coconut oil, brands available in Sri Lanka. Consumption of physically refined coconut oil as the fat source is beneficial in improving clinical outcome of CKD patients.

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Technical Sessions : A - 10

Some functional properties of *Ipomea batata* (sweet potatoes) cultivars for potential use in food industry

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Sweet potatoes are considered as a typical food security crop for Sri Lankans which can be considered as a low cost energy source. Water solubility index (WSI) and water absorption index (WAI) are used in food industry to find out if particular flour would be useful in the food systems and predict how the materials may behave if further processed. This study aims to make available the data on water solubility and water absorption index of six sweet potato varieties (in boiled and raw forms) consumed by Sri Lankans. Determination of water solubility and water absorption index of Ama, Wariyapola Red, Wariyaopla White, Shanthi, CARI 9 and CARI 426 was carriedout with flour of raw and freshly boiled (home cooked) sweet potatoes of the selected varieties. Determination of water solubility and water absorption index was done by standard methods.

Table 1: Water solubility and water absorption indices of boiled and raw *Ipomea batata* (sweet potatoes) cultivars (n=6), (mean± SD)

Variety	Water solubility index (%)		Water absorption index (%)	
	Raw	Boiled	Raw	Boiled
Ama	19.3 (±0.2)	36.0* (±1.6)	212 (±8.0)	377 (±9.8)
Wariyapola Red (WR)	30.5 (±0.2)	23.6 (±1.7)	221 (±4.8)	417 (±6.0)
Wariyapola White (WW)	21.5 (±0.2)	17.9 (±1.9)	211 (±2.0)	334 (±2.0)
Shanthi	31.6 (±0.6)	27.4 (±1.1)	215 (±5.9)	440* (±2.2)
CARI 9	29.2 (±1.5)	22.1 (±2.7)	237 (±5.6)	383 (±4.7)
CARI 426	31.5 (±1.1)	23.6 (±2.3)	236 (±5.8)	351 (±4.5)

In each column, *for indicate significant differences at $P < 0.05$

WSI of tested sweet potato varieties varied between 19-32% in raw forms and 17-36% in boiled forms. A significant increase in water solubility was observed in Ama due to boiling whereas in the other varieties WSI has decreased. WAI varied between 210-237% in raw forms and 330- 440% in boiled forms of sweet potato varieties. There was significant increase in WAI of all the varieties due to boiling. Among the tested varieties, Shanthi boiled flour had the highest WAI. When comparad to sweet potato varieties, wheat flour (140.00%) and soy flour (193.33%) had low WAI. All the six tested sweet potato varieties (both boiled and raw forms) had high water absorption indices above 200% and low water solubility indices less than 40%. Boiling has increased the water absorption capacity and decreased water solubility except in Ama. Low WSI with high WAI of flours suggests that the flours can be used in formulation of some foods such as excruded snacks, dough, processed cheese and bakery products.

Key phrases: CARI 426, Ranabima, Dhawala, Hordi
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Malee, CARI 273

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Technical Sessions : A - 11

Characteristics influenced by acid modifications of tea waste biochars pyrolyzed at different temperatures

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Biochar (BC) is a low cost adsorbent produced by the pyrolysis of biomass which can be used for water remediation purposes. Tea waste is an excellent biomass for BC production since it is an abundant solid waste in Sri Lanka. A systematic comparison was carried out to evaluate the characteristics influenced by post modification of tea waste BC pyrolyzed at 300, 500 and 700 ^{0}C. According to FTIR spectra, intense peaks observed in BC produced at low temperatures (LTBC) at 3500-3200, 2980-2820, 1720-1690 cm-1 corresponding to OH-stretching, aliphatic CH_2, carbonyl stretching vibrations, respectively provided a qualitative indication of a relatively high content of oxygen containing surface functional groups (SFGs) in comparison with BC produced at high temperatures (HTBC). In order to enhance adsorption characteristics, three post modification methods were carried out using hydrochloric, sulphuric and nitric acids. Surface acidities of BC were determined by Bohem titration method. The amounts of phenolic functional groups in all three BC were 73 – 82% higher than that of lactonic and carboxylic SFGs. Nitric acid modification considerably increased the carboxylic acid content while the total acidic FG content was increased by acid modifications. Surface morphology of BC was evaluated by SEM imaging. Observed cation exchange capacity (CEC) values at pH = 10 were up to 7.2 times and 2.7 times higher than that of pH = 3, and 7, respectively and the highest CEC was obtained in the nitric acid modified BC when compared with hydrochloric and sulphur acid treatments. The pH at the point of zero charge of non-modified BC was ranged from 6.3 – 7.5 which were decreased upon acid treatment up to 2.6. The produced BC contained 6.75 – 11.40% ash content whereas the moisture content varied from 6.33– 9.70%.
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Technical Sessions : A - 12

Stability of fatty acids in gamma irradiated yellowfin tuna fish muscles during storage

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Fish oils have been identified as a good source of polyunsaturated fatty acids (PUFAs). Therefore present study was conducted to evaluate the effect of low dose gamma irradiation (0, 1 and 3 kGy) followed by storage in ice over 35 days on the fatty acid composition of Yellowfin tuna (*Thunnus albacares*) fish fillets. Irradiation has performed by gamma rays from a cobalt-60 source and the fatty acid composition of fish oils was analyzed by Gas Chromatography – Mass Spectrometry (GC-MS). The most abundance fatty acid group was polyunsaturated fatty acids (51.56c ± 0.06%) consisting mainly docosahexaenoic acid (C 22:6 n-3, DHA). The initial DHA content (24.43%) was significantly declined to 23.74 and 19.18% at 1 and 3 kGy in day 0 and it was prolonged with the storage in ice (23.55 in 0 kGy, 18.60 in 1 kGy and 20.18% in 3 kGy at 35 days of storage, respectively). The initial eicosopentaenoic acid (C 20:5 n-3, EPA) content (4.92%) was significantly declined to 4.489 % and 3.86% with 1 and 3 kGy irradiation, respectively. The rate of declining the EPA content in 1 kGy irradiated tuna was higher than control sample. The results showed that saturated fatty acids increased significantly ($p < 0.05$) with irradiation dose and storage except in 3 kGy irradiated muscles. The palmitic acid (C 16:0) showed significant increment ($p < 0.05$) with the irradiation dose (initial value of 13.50% was increased up to 16.72% and 18.64% in 1 kGy and 3 kGy, respectively). Monounsaturated fatty acids were mainly consisted of oleic acid (C 18:1), and it was significantly increased with the irradiation and the storage. Gamma irradiation significantly affected the fatty acid profile of tuna fish muscles stored for 35 days at 0 ^{0}C. The results suggest that species with 1 kGy irradiation can exhibit minimal quality deterioration of fatty acids subjected to irradiation and prolonged storage in ice.

Acknowledgment

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Technical Sessions : A - 13

Adsorptive removal of cadmium in aqueous solutions using coconut dregs residue as the adsorbent

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Rapid industrialization has contributed to the release of toxic heavy metals into natural water bodies giving rise to water pollution which has become a serious concern all over the world due to the non-biodegradable nature of heavy metals. Removal of heavy metals by utilizing the technique of adsorption using biological waste is an effective alternative.

The present study is focused on the potential use of coconut dregs residue, a by-product of coconut milk production, as an effective low cost biosorbent for adsorbing Cd(II) from aqueous solutions. Batch adsorption studies were carried out to investigate the percentage removal and adsorption capacity of coconut dregs residue as a function of contact time, initial pH, initial Cd(II) concentration, adsorbent dose and temperature.[1] The data were analysed using different kinetic and isotherm models. The equilibrium data satisfactorily fitted all three isotherms of Langmuir, Freundlich and Dubinin-Radushkevich (D-R) models with correlation coefficients (R2) greater than 0.98. Boehm titration and Fourier Transform Infrared spectroscopy (FT-IR) were conducted to analyse the surface functional groups on coconut dregs residue while surface structure was analysed by Scanning Electron Microscopy (SEM). Further characterization was done by determining the pH and pHpzc (pH at point zero charge).

A percentage removal of 87.65% and an equilibrium adsorption capacity of 4.408 mg/g were observed at the optimum pH of 7.0 for an initial metal concentration of 25 ppm, 0.5 g/100.00 cm^3 adsorbent dosage with 250-500 µm particle size, within the contact time of 120 minutes at 303 K. The Freundlich isotherm model best explained the adsorption of Cd(II) on to the coconut dregs residue while among the kinetic models studied, pseudo-second order model provided a better explanation for the adsorption process with an adsorption capacity of 4.327 mg/g which is approximately equal to the experimental value at 303 K. The calculated thermodynamic parameters showed a favourable and a spontaneous exothermic process. The Gibbs free energy change in Cd(II) adsorption process was -5.41 kJ mol^{-1} while the enthalpy change was calculated as -50.40 kJ mol^{-1}. The negative entropy change of -150.00 J mol^{-1} indicates the decrease in randomness of metal ions at the solid-liquid interface. FT-IR analysis indicated the presence of hydroxyl carbonyl and amide functional groups on the adsorbent. SEM analysis confirmed the presence of uneven surface structure with tubular voids important for adsorption. The pH of coconut dregs residue was determined as 6.13 while the pH_{pzc} was determined as 5.6. As the pH was greater than pH_{pzc}, it could be confirmed that the adsorption of positively charged Cd(II) species was favoured. Chemical Oxygen Demand (COD) measurement indicated that the use of coconut dregs residue in aqueous medium for the removal of heavy metals is within safe limits. The comparison study conducted with activated carbon prepared from coconut dregs residue showed a higher adsorption capacity of 4.685 mg/g and a percentage removal of 95.64% for Cd(II) when compared with raw coconut dregs residue.

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Technical Sessions : A - 14

Digestive enzyme inhibitory activities and anti-glycation properties of *Myristica fragrans* (nutmeg) seed extracts

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Diabetes mellitus is a metabolic disorder characterized by hyperglycaemia. Management of type 2 diabetes mellitus is by controlling hyperglycaemia and its complications. The objective of this study was to investigate the α-glucosidase inhibitory activity, α- amylase inhibitory activity and anti-glycation properties of *Myristica fragrans* (nutmeg) seed extracts.

Dried and powdered seeds of *Myristica fragrans* were extracted sequentially with hexane, ethyl acetate and methanol using the ultra sonicator. Different concentrations of the extracts were subjected to the non-pre-incubation and pre-incubation amylase inhibition assay using starch as the substrate, 3,5-dinitrosalysilic acid as the chromogen and porcine pancreatic α-amylase as the enzyme[1]. The extracts were also subjected to a non-pre-incubation glucosidase inhibition assay using 4-Nitrophenyl α-D-glucopyranoside as the substrate and α-glucosidase enzyme from *Saccharomyces cerevisiae*[2]. The effect of the extracts on inhibition of protein glycation was observed with native polyacrylamide gel electrophoresis (PAGE) using bovine serum albumin as the protein and fructose as the sugar[3]. Extracts were further assessed for their glycation induced protein cross-linking inhibitory potential using sodium dodecyl sulphate polyacrylamide gel electrophoresis (SDS–PAGE) and lysozyme as the protein and fructose as the sugar[4].

All the three extracts showed amylase and glucosidase inhibition and the methanol extract exhibited the highest inhibition for both amylase and glucosidase assays. The values exhibited by methanol, ethyl acetate and hexane extracts for the amylase inhibition using non-pre-incubation method were 53.96 ± 3.42 %, 7.30 ± 3.92 %, 13.56 ± 3.43 % and using pre-incubation method were 73.27 ± 2.40 %, 8.94 ± 3.20 %, 5.05 ± 2.89 % respectively. The methanol extract showed an IC_{50} value of 1.03 mg/ml for the non-pre-incubation method compared to that of acarbose which was 0.004 mg/ml. The IC_{50} value of methanol extract obtained using the pre-incubation method was 0.153 mg/ml while acarbose exhibited a value of 0.004 mg/ml. The glucosidase inhibitory activities given by the methanol, ethyl acetate and hexane extracts were 90.93 ± 1.68 %, 74.35 ± 3.53 %, 43.35 ± 3.97 % respectively. The methanol extract showed a much lower IC_{50} value of 8.46 µg/ml as compared to that of acarbose which was found to be 178 µg/ml. Among the three extracts a strong glycation inhibitory potential was observed with the methanol extract and a moderate inhibition was shown by the ethyl acetate extract while the hexane extract did not show any significant inhibition on glycation of proteins. In the assessment of glycation induced protein cross-linking inhibitory potential the methanol extract exhibited a clear inhibition which was comparable with the inhibition of the positive control aminoguanidine. Ethyl acetate and the hexane extract did not show any significant inhibition.

Methanol extract of *Myristica fragrans* seeds could be a source of potent amylase and glucosidase inhibitors. As well as it could be a good source for inhibitors of protein glycation and glycation induced cross-linking of proteins. Further, the ethyl acetate extract could be a source of glucosidase and protein glycation inhibitors.

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Technical Sessions : A - 15

Antioxidant activity and extraction kinetics of polyphenols in BOPF grade black tea (*Camellia sinensis*) from different geographical elevations in Sri Lanka

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Tea processed from young leaves and buds of *Camellia sinensis* is one of the most widely consumed beverages in the world due to its beneficial health effects. Tea grown in Sri Lanka are categorized as high grown (HGT), mid grown (MGT) and low grown tea (LGT) based on the geographical elevation of tea cultivation regions.

Optimization of brewing time is vital to get health benefits of tea. The present study was carried out to determine the extraction kinetics of total phenolic content and antioxidant activity in BOPF grade tea brewed in the traditional method as limited studies have been reported on the above parameters for BOPF tea manufactured in Sri Lanka.

Boiling water (250 mL) was added to tea leaves (5.0 g) and the mixture was stirred over the extraction period. Total phenols (TPC), flavonoids (TFC) and antioxidant activity was deduced for samples (2.0 mL) of tea extracts obtained at different time intervals. TPC and TFC were determined using Folin Ciocalteu method and aluminium chloride method respectively. DPPH• radical scavenging and Ferric Reducing Antioxidant Power (FRAP) assay were used to determine the antioxidant activity.

Both TPC and TFC contents were highest in HGT followed by LGT and MGT. The highest values for TPC (%w/w GAE) were 12.39 ±0.48 (at 360 s), 11.93 ± 0.24 (at 480 s) and 9.24 ± 0.42 (at 720 s), and TFC (% w/w QE) were 6.46 ± 0.46 (at 360 s), 6.35 ± 0.28 (at 720 s) and 6.19 ± 0.38 (at 720 s) for HGT, LGT and MGT respectively. Positive correlation was observed for antioxidant activity with the phytochemicals for all samples analyzed. Extraction kinetics of the antioxidants indicated that the extraction of polyphenols and flavonoids obeyed second order kinetics and extraction of polyphenols was rapid in LGT compares to the other two types.

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Technical Sessions : A - 16

Glycaemic index of vitagen: a commercial proforma formulated meal replacement

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Based on the glycaemic index (GI) food can be categorized according to their blood glucose response. At present, GI values are assigned to more than 750 food items available in the international market. However, though there are GI data of some basic Sri Lankan foods and traditional foods, sufficient data of commercial food products are not much investigated. Thus, the present study was carried out to determine the chemical composition and GI of proforma formulated meal replacement (Vitagen) available in the Sri Lankan market.

Chemical composition of Vitagen was tested using standard AOAC methods. FAO/WHO guidelines were used to test the glycaemic responses where glucose was used as the standard. Healthy normal volunteers (n=10, 5 males and 5 females, 20-30 years) who were not under any medical treatment and with BMI range of 18.5-23 kg/m^2 participated for the study.
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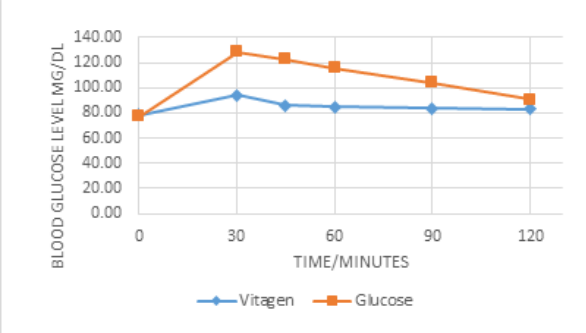

Figure 1: Blood glucose response to Vitagen and glucose

Vitagen contained 61.12±0.67% of carbohydrates, 24.79±0.58% of proteins, 4.39±0.71% of fat, 3.09±0.04% of moisture and 7.59±0.05% of ash. Mean glycaemic index was 22 and categorized as a low GI product (Figure 1). The mean glycaemic load was 11, thus a medium glycaemic load is provided per portion. Peak time was achieved in 30 minutes and the peak reduction was 26%. Therefore, consumption of Vitagen in the recommended quantity as a food supplement can be recommended for individuals seeking to control blood glucose levels or reduce caloric intake.

Acknowledgement

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Technical Sessions : A - 17

Phenolic compounds and antioxidant activity of *Ampelocissus indica* (L.) planch; a wild grape species native to Asia

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Grape is a natural source of phenolic compounds, that contributes to the sensory characteristics and many beneficial bioactivities, mainly antioxidant activity of wines and other processed food products. Antioxidant activity and phenolic distribution of European grape species have been thoroughly investigated due to their popularity as a consumer product and availability all over the world. However, less amount of research has been done for Asian grape species. Hence, in the present study, we analyzed the phenolic content and antioxidant activity of *Ampelocissus indica* (L.) planch, a wild grape species native to Asia. Ripe wild grape berries were collected from Kanneliya rain forest in Sri Lanka. Seed and skin were separated from the berry and skin/seed was extracted using 80% methanol. Phytochemical screening and qualitative HPLC analysis were carried out to identify phenolic groups/compounds present in grape berry. Additionally, two phenolic compound parameters namely total phenolic content and total proanthocyanidin content, and one antioxidant parameter namely DPPH (2,2-diphenyl-1-picrylhydrazyl) radical scavenging activity were measured, for the extracts. Phytochemical tests indicated that flavanoids, proanthocyanidins, tannis and polyphenols are present in grape berry. Further, HPLC analysis confirmed the presence of gallic acid and catechin in wild grape fruit. Total phenolic content of wild grape seed expressed as gallic acid equivalents (GAE) was estimated as 56.69 ± 0.23 mg g^{-1} while that was 23.32 ± 0.13 mg g^{-1} for the wild grape skin for the fresh weight of sample. Total proanthocyanidin content expressed as catechin equivalents (CE) of wild grape seed and skin were estimated as 36.81 ± 0.17 mg g^{-1} and 14.68 ± 0.21 mg g^{-1}, respectively for fresh weight of sample. The DPPH radical scavenging assay expressed as IC_{50} in mg ml^{-1} of wild grape skin and seed were 0.34 ± 0.002 mg ml^{-1} and 0.29 ± 0.001 mg ml^{-1}, respectively. The results revealed that the wild grapes native to Asia contain a higher amount of total phenolic and total proanthocyanidin content compared to that of European grape *Vitis venifera* spp. The antioxidant activity of wild grape is comparable with ascorbic acid as well as European grapes. This study demonstrates that the wild
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grape species *Ampelocissus indica* (L.) planch, is a good source of nutritional phenolics and that can be utilized as a natural source of antioxidant.

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Technical Sessions : A - 18

Wood based cologne from neem

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Perfume is a mixture of fragrant essential oil or aromatic compounds with fixative and solvent. They are used to give the human body, animals, food, objects and living species a pleasant odour. Wood extracts are very important in perfumery because they provide mostly fragrance which gives a smell for a long period of time. In this study, we used several wood extracts, *Azadirachta indica* (Neem/kohomba), *Berrya cordifoli* (Trincomalee wood/ halmilla), *Terminalia arjuna* (Kumbuk), *Bridelia retusa* (katakalla), and *Schleichera oleosa* (kone) to determine the one with the best odour for the preparation of the cologne.

To extract the wood essential oil from neem, several methods were experimented with, such as solvent extraction, using Clevenger apparatus and steam distillation. Out of the wood essential oils, the most appealing one was selected by consulting a panel of 15 people for the best odour. Wood essential oil is usually categorized as the base note. To confirm this, test and control solutions were prepared, and these were left at room temperature for 6 hours. After 2, 4, and 6 hours, the smell of the two cotton fabrics, one soaked with Neem extract and the other with the control, were checked by 15 people. They were asked which fabric had the best retention of the fragrance. Fixative property was checked by two methods, selection by a panel of people and weight loss method. Selection of best fragrance combination was carried out by preparing 7 samples using different essential oils from top, middle and base notes, and these were examined by a panel of 15 people. Quality parameters of the cologne were checked according to specifications for cologne, SLS 534:1981, and pH, alcohol content and turbidity were checked. Alcohol content was determined by GC. Turbidity was measured by Hach2100Q Turbiditymeter.

Neem, rose, jasmin and lime essential oils were extracted. Neem was selected as the preferred wood fragrance essential oil. As the odour of neem retained for six hours, it was categorized as the base note. Neem essential oil had fixative property. The majority of the panel of 15 people preferred the sample which contained neem, jasmine, rose and lime essential oils. Therefore, this combination was developed in to a cologne (Table 1). The pH of the cologne was 6.5, which is within the SLS specifications while the turbidity was 2.52 NTU indicating that neem oil mixes well with the other components.

Table 1 Composition of the cologne

Ingredients	Volume (mL)
*Fragrances	4
Glycerin	5
96% Ethanol	80
Deionized water	Volume needed to make up to 100 mL
Total volume	100

According to GC analysis, there was no methanol and only ethanol was present in the cologne. Ethanol content was calculated as 76%.

The best method for the extraction of neem (*Azadirachta indica*) wood essential oil was steam distillation. Solvent
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extraction can also be used, and Neem essential oils can be extracted with dichloromethane and hexane. The panel of 15 people selected neem oil extracted with dichloromethane as the best for perfumery. It has a pleasant odour and it can be used as a base note fixative. It is also a real fixer as it can absorb other materials and slows down evaporation. In conclusion, Neem essential oil can be developed as a cologne which is natural and has beneficial properties for the skin.

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Technical Sessions : A - 19

Variation of antioxidant activity and the extraction kinetics of polyphenols of fannins grade green tea (*Camelia sinensis*) with geographical elevation

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Camellia sinensis is one of the most commonly consumed drinks in the world. It has many beneficial health effects associated with our day to day life. Tea polyphenols are responsible for antioxidant activity and health benefits. The phytochemicals composition of tea may vary with the geographical area. Hence the present study reports a comparison of polyphenols, flavonoids, antioxidant activity and extraction kinetics of fannings grade green tea from different elevations (upcountry, mid country and low country) in Sri Lanka.

Tea extracts were prepared in the traditional method by adding tea leaves to boiling deionized water and analysis were carried out with the tea extracts collected at different time intervals. The total phenolic and total flavonoid contents were determined using Folin Ciocalteu method and Aluminum Chloride assay respectively. The 1,1-Diphenyl-2-picrylhydrazyl (DPPH.) and Ferric Reducing Antioxidant Power (FRAP) assay were used in the determination of antioxidant activity.

The present study revealed that the antioxidant activity of tea from low and mid country is higher than those from up country. The variation of phenol content (w/w % GAE equivalent) at 720 s in brewed green tea varied with the geographical elevation and follows the order of mid country (20.22 ±0.24) > up country (18.56 ±0.73) > low country (14.83 ±1.45) and the flavonoid content (w/w % quercertine equivalent) at 720 s varied in the order up country (11.11 ±1.27) > low country (12.25±0.83) > mid country (6.92 ±1.0). The EC50 value for DPPH. scavenging and FRAP assay indicated that the antioxidant activity increase in the order low, mid and up country. The results showed a significant variation ($p < 0.05$) in antioxidant activity and total phenolic and flavanoid content among the three elevations. The extraction kinetics of polyphenols and flavanoids showed second order kinetics. To obtain maximum extraction of antioxidants, green tea has to be steeped at least 6 min.

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Technical Sessions : A - 20

Determination of anti-diabetic activity of selected medicinal plants in Sri Lanka

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Diabetes mellitus is one of the main chronic diseases currently affecting mankind. In type two diabetes mellitus, the post-prandial blood glucose level increases uncontrollably causing metabolic imbalances in the body. α-Amylase and α-glucosidase are the two important enzymes, responsible for digestion of starch inside the body. Therefore, inhibition of these two enzymes can stop the increase of blood glucose level after a carbohydrate diet.

Treatment for diabetes without any side effects is still a challenge in medical research. Currently used anti-diabetic drugs can cause some side effects such as liver toxicity and adverse gastrointestinal symptoms. Because of this reason, natural anti-diabetic agents play an important role over synthetic anti-diabetic drugs. Hence, in recent years, medicinal plants have gained more attention on the effective management and treatment of diabetes mellitus. Herbal supplements can be used as an adjuvant or as favourable alternative therapy for diabetic condition.

The present study was designed to assess the *in vitro* anti-diabetic activity and responsible compounds for anti-diabetic activity of selected ten medicinal plants; Belimal (*Aegle marmelos*), Iramusu (*Hamides musindicus*), Ranawara (Cassia auriculata), Walkottamalli (*Scoparia dulcis*), Nelli (*Phyllanthus emblica*), Rasakinda (*Tinospora cordifolia*), Polpala (*Aerva lanata*), Babila (*Sida rhombifolia*), Beligeta (*Aegle marmelos*) and Venivel (*Coscinium fenestratum*), which are extensively used in the Ayurveda medicine in Sri Lanka. Methanol crude extracts were used to evaluate the α-amylase and α-glucosidase enzyme inhibition activity. Among ten plants, nelli, ranawara, iramusu, belimal and walkottamalli exhibited more than 90% of inhibition for α-amylase at 2000 ppm, whereas only nelli, ranawara and iramusu displayed more than 90% inhibition for α-glucosidase at 2000 ppm. Hence, nelli, ranawara and iramusu demonstrated more than 90% of inhibition for both enzyme assays at 2000 ppm. For α-amylase assay, IC_{50} values of nelli, ranawara, iramusu, belimal and walkottamalli lie in the range of 21.57 μg/ml -580.19 μg/mL, where nelli reported the lowest IC_{50} as 21.57±0.14 μg/mL. For alpha glucosidase assay, IC_{50} values of nelli, ranawara and iramusu reported in the range of 16.42 μg/mL -109.60 μg/mL, where nelli exhibited the lowest value as 16.42±0.23 μg/mL. Nelli, ranawara and iramusu were partitioned using hexane, dichloromethane and ethyl acetate. Each fraction was tested for enzyme inhibitory activity. For α-amylase and α-glucosidase enzyme assays ethyl acetate fraction showed the highest inhibition in nelli, iramusu and ranawara at 500 ppm. Hexane fraction of nelli showed significant inhibition for α-amylase and α-glucosidase assays while the hexane fractions of ranawara and iramusu exhibited no inhibition for α-amylase and α-glucosidase assays. Therefore, both nonpolar and polar compounds could be responsible for enzyme inhibition activity of nelli and only polar compounds could be responsible for enzyme inhibition activity of ranawara and iramusu.

Technical Sessions : A - 21

Identification of chemical constituents of *Panicum maximum* plant that shows attraction to paddy bug

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Paddy bug (*Leptocorisa oratorius*) is the major pest damaging the rice plant in Sri Lanka. These bugs attack the plant by sucking the sap of grains. This causes partially filled grains making severe lose in products. The highest population is seen during the flowering stage of rice in paddy field. Paddy bugs are not only attracted to the rice plant. They feed on weed plants growing in the paddy fields. Research have been conducted to identify the weeds that paddy bugs survive on when the rice panicles are not present. *Echinochloa colonum*, *E. glabrescens*, *Panicum repens*, *Cyperus iria* are the major plants that act as weed hosts for paddy bugs. This research is conducted to investigate the chemical compound responsible for attractivity of paddy bugs to *Panicum maximum* weed. Leaves, flowers, stems of *Panicum maximum* plant were collected separately and subjected to steam distillation. From the steam volatiles, series of doses were prepared (2µg/ml, 4µg/ml, 6µg/ml, 8µg/ml). Bioassay to investigate attraction using Y-shaped olfactormeter. Leaves and flowers showed the highest attraction. Gas chromatography results showed that volatiles of all plant parts had 3 major compounds. Preparative thin layer chromatography was carried out to isolate 2 major compounds present in flower volatile. One of the pure compounds showed a greater attraction to paddy bug than the crude flower volatile. LC-MS data showed the molecular weight of the compound is 390. Structure elucidation is currently being conducted.

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Technical Sessions : A - 22

Determination of the content of cadmium, lead, zinc and arsenic in chicken and beef liver available in the local market

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Intake of heavy metal contaminated meat items has been a major risk to human health. The concentrations of cadmium (Cd), Lead (Pb), Arsenic (As) and Zinc (Zn) in two different liver types chicken and beef collected from local market were analyzed using Flame Atomic Absorption Spectroscopy (Hitachi ZA 3000 Polarized Zeeman). Hydride generation method was used to determine Arsenic. Further the moisture contents of each brand of beef and chicken liver were also determined.

The average contents of metal levels detected in chicken liver ranged from (1.603 - 6.552), (0.839 - 3.173), (19.76 - 172.85) mg/kg for As, Cd, Zn, respectively. Lead was not detected in any of the chicken liver samples. For beef liver, the average contents of metal levels ranged from (1.87 – 2.53), (2.835 – 3.642), (50.952 – 100.47) mg/kg for As, Cd, Zn, respectively. Lead was not detected in any of the beef liver samples. In addition, the mean concentrations of metals in chicken liver and beef liver were found in the order of their abundance as Zn > As >Cd and Zn > Cd > As, respectively. Pb was not detected in any of beef or chicken liver brands. Cadmium levels were exceeded more than the maximum permissible limits (defined by World Health Organization) in both chicken and beef liver samples. Zn levels were above the maximum permissible levels in chicken samples CD, CE, CF, in all the other samples the levels were below the permissible limit. In both chicken and beef liver samples As levels were above the maximum permissible limit.

This study concludes that consumption of chicken and beef liver for a long time may cause health effects in human beings.
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Technical Sessions : A - 23

Physiochemical properties of rice based herbal biscuit incorporated with the decoction of *Syzygium cumini* bark

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Diabetes mellitus is a widespread debilitating disease in the modern-day world which leads to many health complications affecting the quality of life. Intake of less refined food, herbal decoctions etc. play a vital role in managing diabetes. Scientific experiments have proven the efficacy of some medicinal plants for their therapeutic potential in the management of diabetes mellitus. *Syzygium cumini* (madan) is one of the widely used medicinal plants in the treatment of diabetes mellitus. Traditional rice variety, pachchaperumal is widely known to have many health benefits.

The present study was designed to develop a nutritionally rich diabetic friendly herbal snack incorporating Syzygium cumini decoction and pachchaperumal rice flour as the major ingredients. The biscuit was developed so that a portion of 6 biscuits (44 g) will contribute the daily intake of decoction dose as prescribed in Ayurveda (20 mL).

Physiochemical properties as diameter, thickness, volume, density, weight, texture and colour of the herbal biscuit was determined according to standard AOAC methods and other standard methods. Presence of anti-diabetic compounds in the biscuit was confirmed by HPLC analysis.

The moisture, fat, protein, fiber, carbohydrate and ash contents of the biscuit were 9.86%, 4.74%, and 12.07%, Crude fiber 1.27%, 70.8% and 1.19%, respectively. Physical parameters were within the standard accepted ranges of a biscuit. DPPH antioxidant potential (IC50) of the herbal biscuit was 1.60 mg/L and showed a high antioxidant potential compared with the control sample as 5.66 mg/mL and the standard BHT (Butylated Hydroxy Toluene) as 18.5 mg/mL. The total starch content was 40.4%. The biscuit showed the presence of several important fatty acids as lauric acid, palmitic acid and myristic acid in the fatty acid profile of GC-MS analysis. Presence of gallic acid and ellagic acid which are known antioxidants and hypoglycemic agents was confirmed by HPLC analysis. It can be concluded that the herbal rice biscuit prepared using pachchaperumal rice and the decoction of Syzygium cumini can be considered as a diabetic friendly snack.

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Technical Sessions : A - 24

Synthesis, characterization and biological studies of a novel naphthalene-derivatized tridentate ligand and its *fac*-[Re(CO)$_3$L] complex as potential therapeutic agents for lung cancer

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Re(I) compounds, among other organometallic compounds, have recently gained attention as potential anticancer agents. In this study, a novel tridentate ligand (N(SO_2)(1-nap)dien) derived from diethylenetriamine (dien) attached to a sulfonamide group, was synthesized in good yield (63% yield) and its net neutral Re(I) complex ([Re($CO)_3$(*N*(SO_2)(1-nap)dien)]) synthesized by treating fac-[Re($CO)_3$($H_2O)_3$]$^+$ with the synthesized ligand. The compounds were characterized by X-ray diffraction studies, ^{1}H NMR, FT-IR, UV-Vis and fluorescence spectroscopies.
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The $[Re(CO)_3(N(SO_2)(1\text{-nap})dien)]$ compound crystalizes in monoclinic system with space group *P21/n* [*a* = 8.0675(4), *b* = 22.9977(12), *c* = 9.9692(5) Å, *V* = 1793.27(16) Å3, *Z* = 4]. The complex has a distorted octahedral structure where the Re(I) metal is coordinated by three nitrogen atoms of the dien backbone and three CO ligands. The two chelate rings of the $[Re(CO)_3(N(SO_2)(1\text{-nap})dien)]$ complex have the same pucker chirality. Crystal structure of the complex and NMR analysis confirm that, upon complexation, the sulfonamide nitrogen deprotonates and binds with metal in a tridentate fashion giving a net neutral coordination sphere. The metal complex exhibits an upfield (*exo*-NH) and a relatively downfield NMR signal (*endo*-NH) in DMSO-d_6, In an FTIR spectrum of the ligand, the peak at 870 cm^{-1} due to S-N stretching vibrations, has shifted to 860 cm^{-1} in the spectrum of the metal complex. The high energy bands between 200-300 nm in the absorption spectrum of the free ligand have shifted to shorter wavelength in the spectrum of the complex. Emission spectra were recorded in methanol and enhanced fluorescence intensity was observed at 440 nm for the $N(SO_2)$(1-nap)dienH ligand while its Re complex showed quenched fluorescence intensity. The i*n vitro* cytotoxic activity of the synthesized compounds was examined using NCI-H292 (non-small cell lung cancer cells) and MRC-5 (human normal lung fibroblast cell line). Both the ligand and the complex show acute cytotoxicity for MRC-5 cells at 24 hours. Highest cytotoxic activity was observed for $[Re(CO)_3(N(SO_2(1\text{-nap})dien)]$ complex for NCI-H292 cells with an IC_{50} value of 9.91μM at 48 hours.

The promising cytotoxic activity of the novel synthesized ligand and its metal complex indicate that these compounds may be good candidates to be utilized as anticancer drug agents.

Acknowledgement

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Technical Sessions : A - 25

Development of natural rubber based materials having enhanced mechanical properties

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Advances in polymer science have led to the development of several novel mechanical strengthen high performance polymers from natural rubber (NR). The properties of natural rubber itself restrict it to be used for many applications. Modifications of NR acquire a vast range of desired properties to use in so called areas. Those shortcomings were overcome by chemical and physical alteration of natural rubber. The mechanical strength of a polymer mainly depends on its physical parameters and cross-links density.

Double network (DN) systems were synthesized using NR (network I) and isodecyl acrylate (IDA) (network II) to acquire a higher mechanically strengthen material following a general synthesis procedure reported elsewhere. The long chains of isodecyl acrylate can favor chain entanglements which could increase the strength of the material.

Different concentrations of natural rubber (NR), different percentages of cross-linker of NR; dicumyl peroxide (DCP), monomer -isodecyl acrylate (IDA), initiator-benzoyl peroxide (BPO) and the cross-linker for the second network-divinyl benzene (DVB) were used to synthesize a series of DN systems. As a reference set, a series of single network (SN) samples were prepared by using the conventional method. Swelling test, hardness test and compression test were carried out for property analysis.

Swelling data of the DN samples in toluene have shown higher swelling ratio than the conventionally prepared SN samples confirming that DNs contain higher free volume than the SN. Hardness test was carried out using an IRHD hardness tester and it showed that DNs have better hardness over the SN. The sample NR-2.5M-30-5/IDA-2.5M-1-2.5 which contains 2.5M NR concentration and 5% (w/w) of DCP along with 2.5M of IDA with 1% (w/w) and 2.5% (w/w) has shown the highest IRHD (International rubber hardness degrees) value of 68.33 out of the DNs. This sample contains the highest initiator to cross-linker ratio in network II among the rest of the samples.
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Compression test was carried out to analyze the compressive force or crush resistance of a material. The ability of the material to recover after applying a specified compressive force over a defined period of time is measured and the strain vs stress curves of the samples were compared. According to the graphs, the sample NR-2.5M-5 / IDA 2.5M-1-2.5 has shown the highest stress resistant value of 12,900,000 Nm^{-2}.

Oil absorption properties of these DN polymers were analyzed extensively in diesel, coconut oil and discard oil. The oil absorption properties of DNs were mainly depending on the chemical architecture of the macromolecular matrices. The prepared DNs have shown much higher oil absorption in diesel and coconut oil. The highest oil absorbency (diesel, coconut oil or discard oil) was shown by the DN sample NR-2.5M-30-5/ IDA 2.5M-0.1-2.5. Results conclude that the efficient absorbency for the entrapment of these oils is DN networks over SN networks.

Considering all the results, it could be concluded that the developed DN systems have better mechanical properties as well as the oil absorbtive properties than conventionally SN samples.

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Technical Sessions : A - 26

Development of a pH sensitive indicator from *Terminalia catappa* leaves

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A pH indicator is a chemical compound used to visually determine the acidity or basicity of a solution. Extracts of both red and green leaves from Terminalia catappa were investigated to develop a natural pH sensitive indicator.

A 1 mol dm^{-3} stock solution of HCl was diluted to prepare a series of solutions from pH 0 to 6. To prepare the pH series from pH 8 to 14, a 1 mol dm-3 stock solution of NaOH was diluted accordingly. The pH 7 solution was prepared with deionized water and adjusting its pH with NaOH and/or HCl. Leaves of Terminalia catappa were washed well with water, wiped clean and dried in air. The leaves were then deveined and cut into small pieces. 20 g of these leaves were placed in a mortar along with a small volume of methanol and crushed. The crushed leaves were transferred to a large beaker and more methanol was added so that the total volume of methanol was 80 ml. The beaker was covered with a watch glass and left for 1 hour. The resulting solution was filtered, stored in a glass container and 25 times and 50 times diluted solutions of the extract in methanol were prepared. Portions of 2.00 mL from each pH solution were pipetted into a set of labeled test tubes and 0.20 mL of the leaf extract was added to each tube. The same procedure was adapted to two other sets of labelled test tubes using the 25 times and 50 times diluted extract. The green leaf extract showed a colour change only in the pH range 12-14. Therefore, only the red leaf extract was used for further investigations. A wavelength scan from 200-800 nm was performed on each mixture using Hitachi U-2910 Spectrophotometer.

The methanol extract of red leaves produced the colour changes shown in Figure 1 when added to solutions of different pH.

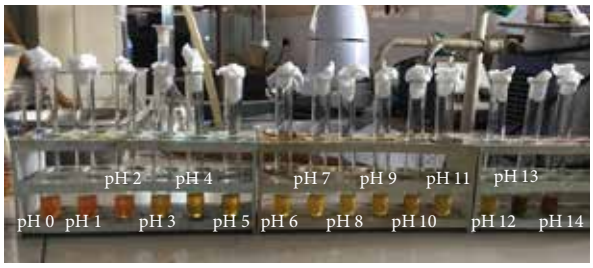

Figure 1: Change in colour of the methanolic extract of red *catappa* leaves with pH

Isosbestic point is a wavelength at which the absorbance of a solution containing two chemical species remains constant as the equilibrium between them changes. The wavelength/s at which the spectra of two or more species cross each other are taken as the isosbestic point/s.1 In the above plots, the observed isosbestic points could be attributed to colour changes in the pH series.
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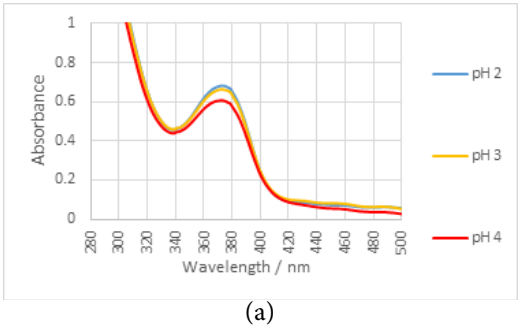
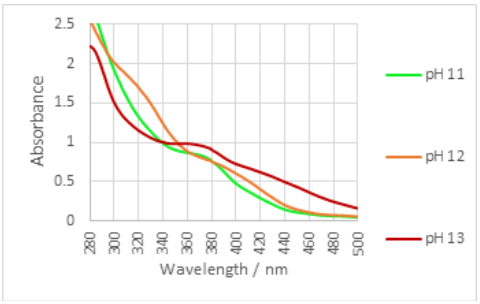


(a)



(b)

Figure 2: UV-Visible spectra of the red catappa leaf extract (a) pH 2 – 4, (b) pH 11 - 13

The methanolic extract of Terminalia catappa red leaves possesses pH sensitivity, and shows colour changes from red orange to yellow when the pH changes from 2 to 3, and from green yellow to purple when the pH changes from 12 to 13. It can be used to develop a natural pH indicator which is environment friendly and less toxic compared to synthetic indicators.

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Technical Sessions : A - 27

The inhibition of acetylcholinesterase *via* synthetically viable coumarin derivatives

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Acetylcholinesterase is a serine hydrolase responsible for the hydrolysis of acetylcholine. The reversible inhibition of acetylcholinesterase can be useful in combating Alzheimer's disease (AD). A computational study of the inhibition of acetylcholinesterase was conducted by performing Molecular Docking using a series of coumarin analogs generated by fragment based drug design methods.

The crystal structure with the PDB ID 1GQR was chosen as the receptor for docking studies. The synthetic coumarin analogs were each subjected to an energy minimization via the Spartan version 14 program, the level of theory being B3LYP /6-31G**. The drugs, rivastigmine and tacrine were used as reference molecules for identifying potential drug candidates by comparing the docking score and the interactions of the ligand with the active site. These two reference molecules were docked using Autodock Vina. The binding affinities are given in Table 1.

Table 1. Binding Affinities

Ligand	Binding Affinity(kJ/mol)
C_15	-11
C_06	-11
C_10	-10.5
C_05	-10
C_01	-9.9
C_13	-9.7
C_11	-9.6
C_14	-9.5
C_09	-9.4
C_07	-9.1
Tacrine	-8.9
C_02	-8.8
C_16	-8.7
C_12	-8.5
C_04	-8.4
C_08	-8.4
C_03	-8.2
Rivastigmine	-7.9
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The parent structure (Figure 1) was subjected to systematic changes by introducing different moieties at 'R', hence generating a series of coumarin analogues that were used in this study as shown in Figure 2. Note that an asterisk (*) is used to show where the moiety connects to the parent.

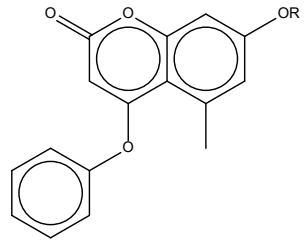

Figure 1: Parent Coumarin Structure

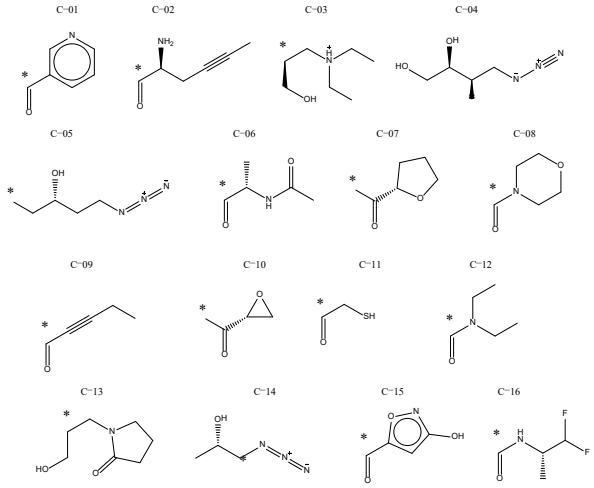

Figure 2: Structure of R side chains in the different coumarin analogues used in the study

This step was achieved by a programme called Autogrow 3.0. The set of ligands generated are synthetically viable to a significant extent. These ligands were screened through the following filters; Lipinski's Rule of Five, Criteria specified by Ghose et al. - calculated log P being between -0.4 and 5.6 with an average value of 2.52. For molecular weight, the qualifying range is between 160 and 480 with an average value of 357. For molar refractivity, the qualifying range is between 40 and 130 with an average value of 97. For the total number of atoms, the qualifying range is between 20 and 70 with an average value of 48.

The selected molecules were then docked into the prepared 1GQR structure using Autodock Vina and the binding affinities are reported in Table 1.

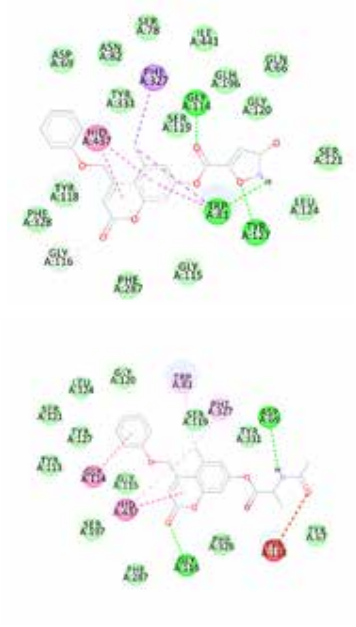

Figure 3: Interactions of C_15 and C_06

The 5 ligands showing the most favorable scores (highlighted) have electron withdrawing functional groups as the R side chain. The most favourable binding affinities are for ligands C_06 and C_15. Although both ligands have the same binding affinity, C_06 has an unfavourable interaction with Tyrosine 118. Ligands bearing side chains that formed pi-pi and pi-sigma interactions and hydrogen bonding with the residue Tryptophan 81 had a higher binding affinity. Due to this reason, ligands C_15, C_06, C_10, C_05 and C_01 appear to be accommodated in the binding pocket well.

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Technical Sessions : A - 28

Investigation of antibacterial activity of pinda thailaya

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Pinda Thailaya (PT) is an herbal ayurvedic preparation which is used mainly to treat gout, where inflammation of joints occurs due to deposition of uric acid crystals in joint fluid and capsule. This substance is applied topically, and is also used for the treatment of wounds. The objective of this study was to determine the anti-bacterial activity of PT, and to compare the antibacterial activity of different brands of PT available in the Sri Lankan market.

The antibacterial activity was determined by measuring the diameter of the zone of inhibition, and was tested against the bacterial strains, *Escherichia coli* (ATCC 25922, Gram-negative), *Staphylococcus aureus* (ATCC 25923, Gram-positive) and *Bacillus subtilis* (MTCC 121) by the disc-diffusion method. Three PT samples available in the local market, 'DC', 'L' and 'K' were examined. The minimum inhibitory concentration (MIC) was determined for the sample produced by Ayurvedic Drug Corporation (DC). The positive control was Azithromycin (1.5 mg/mL), and the negative control was DMSO: CH_2Cl_2 1: 2.

Zone of inhibition from different percentages of PT of the Ayurvedic Drug Corporation were compared with that of the controls (Table 1). The results showed that all PT samples investigated in this study showed antibacterial activity against *E. coli*, *S. aureus* and *B. subtilis*. The pinda thailaya from the Ayurvedic Drug Corporation had the highest antibacterial activity.

Table 1: Diameter of inhibition zones shown by v/v 70% PT samples

Bacterial strain	Diameter of zone of inhibition/mm				
	(-) control	(+) control	Sample 'DC'	Sam-ple 'L'	Sample 'K'
E. coli	0.0	19 (18-20)	11 (10-13)	6 (6-7)	6 (6-7)
S. aureus	0.0	10 (9-12)	7 (5-9)	7 (6-8)	0
B. subtilis	0.0	25 (20-31)	9.5 (6-12)	6	6

(The range observed is given in parenthesis below the value.)

The Minimum Inhibitory Concentration (MIC) of pinda thailaya from Ayurveda Drug Corporation for the different bacterial strains are as follows: *E. coli* – 25% PT, *S. aureus* – 10% PT, *B. subtilis* - 19% PT (Table 2).

Table 2: Diameter of inhibition zones of PT of different concentrations from DC samples

Bacterial strain	Diameter of zone of inhibition/ mm				
	(-) control	(+) control	PT10%	PT19%	PT25%
E. coli	0.0	15	0.0	0.00	7.66
S. aureus	0.0	25	09	15	
B. subtilis	0.0	23	0.0	7	

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Technical Sessions : A - 29

Study the quality of metformin hydrochloride sustained release tablets available in Sri Lanka

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Type 2 diabetes mellitus (T2DM) is a non-insulin dependent diabetes mellitus, where high blood glucose level is due to comparatively less amount of insulin secretion or insulin resistance or decreased insulin action on target tissues. Highly water soluble Metformin Hydrochloride (MH) is used in the treatment of T2DM as first line drug choice. The sustained release dosage form is needed for better therapeutic effect due to low bio availability and short half-life of MH. The quality of drug is a very important parameter in success of treatment.

Top seven MH sustained release tablet brands in Sri Lanka were selected for this study. Samples were collected from local market and quality was evaluated. Assay of tablets from each brand was studied in High Performance Liquid Chromatography (HPLC) system according to United State Pharmacopeia (USP). Drug releasing pattern of tablets from each brands were studied in the medium of potassium dihydrogen phosphate (pH- 6.8) at 37 ^{0}C in dissolution tester according to United States Pharmacopoeia (USP), using Apparatus 2 (paddle). The aliquot was withdrawn from the vessel at the end of first, third and tenth hour and amount of MH released from the tablet was calculated through measurement of absorbance at 232 nm in a uv-visible spectrophotometer. Twenty tablets were randomly selected from each brand and tested for weight variation according to the British Pharmacopeia. The thickness, diameter and hardness were tested for ten tablets from each brand. Ten tablets from each brand tested for friability according to USP.

Tablet assay of all brands was between ± 6.0 % of label claim. It satisfied the USP standard. In terms of drug release, at the end of the first hour (USP limit – 20 to 40%) and the tenth hour (USP limit – greater than 85%) the USP standard limits were obeyed, but drug release at the end of the third hour (USP limit – 45 to 65%) was a little above the upper limit for three brands out of seven. The tablet weight of all seven brands was within 5% of average weight. It fulfills the BP standard limits. The friability of six brands out of seven was less than 1% for 100 rotations as USP standard. The tablet diameter, hardness and thickness of all brands were in acceptable limits.

Even though, tablet assay of all brands were within USP limits, three brands failed in sustained drug releasing properties due to unsuccessful combination of drug releasing polymers in the formulation. The friability of one brand out of seven failed due to low hardness. It can be concluded that friability of tablets do not affect drug releasing property.

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Technical Sessions : A - 30

Lipase inhibition effects of four pure compounds isolated from an endolichenic fungus *Xylaria psidii*

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Obesity caused by long-term energy imbalance is an epidemic disease in developed and developing countries. The prevalence of obesity is increasing at an alarming rate, but, unfortunately, only a few medications are currently on the market. Obesity is primarily regarded as a disorder of lipid metabolism and the enzymes involved in this process could be selectively targeted to develop anti-obesity drugs. Therefore, researchers try to introduce novel pharmaceutical drugs. Scientists have trended natural products based on drug development because it has become attractive area in the modern word. There are different kinds of natural sources such as folk medicinal plants, marine organisms, sea weeds, *etc* used to treat for diseases. Endolichenic fungi are also attractive natural source belonging bioactive compounds according to available literature review. The endolichenic fungi existing in the mangrove environments are expected to synthesize specialized secondary metabolites. Secondary metabolites ensure their survival in the ecosystem against all the challenges by the harsh conditions of the surrounding. They may carry unique properties that would be of potential advantage in biomedical applications. In this study, endolichenic fungi inhabiting in Puttalam lagoon were selected to screen their bioactivities.

Endolichenic fungus was isolated and molecular identification was carried out using standard procedure described by Ceni, 1999 with slight modification. Fungal strain had 99% similarity to the *Xylaria psidii* in the GenBank sequences and based on morphology and sequence data it was identified as *X. psidii*. Sequence was deposited in the GenBank (MF773655). Secondary metabolites of isolated endolichenic fungi were extracted with ethyl acetate. As the preliminary screening, crude extract was evaluated for the anti-obesity. The lipase assay was carried out in a flat bottom 96-well microtiter plate, according to the method described by Abubakar et al., 2013 with slight modifications. According to the results of anti-lipase assay crude extract of *X. psidii* showed activity with IC_{50} value of 20.06. Orlistat was used as the positive control the IC_{50} value of orlistat was 68.54. Compare to the standard ethylacetate crude of *X. psidii* showed the highest activity. Therefore compounds of ethylacetate extracts were isolated using silica gel column chromatography and preparative thin layer chromatography (PTLC). Anti-lipase assay was carried out for isolated pure compounds. Out of isolated compounds four compounds showed significant anti-obesity activity. The IC_{50} values of isolates were PP/SS/02/27/12 (30.99µg/mL), PP/SS/02/30/04 (25.23 µg/mL), PP/SS/02/30/05 (30.40 µg/mL) and PP/SS/02/30/07 (72.11 µg/mL). Three isolates (PP/SS/02/30/04, PP/SS/02/30/05 and PP/SS/02/27/12) exhibited high anti-obesity activity compared to the positive control. PP/SS/02/30/04 showed the highest activity out of four isolates tested, giving promising results to find new pharmaceutical drug and further studies on structure elucidation is ongoing.

Acknowledgement

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Technical Sessions : A - 31

Evaluation of anti-obesity, anti-inflammatory and anti-oxidant activities of oleoresins and essential oil of cinnamon bark and leaf of *Cinnamomum zeylanicum*

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It is known that various chronic metabolic disorders such as coronary heart diseases, diabetes type 2, atherosclerosis, metabolic syndrome, stroke and cancers are arising due to the obesity and inflammation. Anti-oxidant property of phenolic and flavonoid compounds is responsible for anti-obesity and anti-inflammatory activities of a plant extract. There is much interest in search of plant-based remedies with the potential of curing of these diseases. *Cinnamomum zeylanicum* (Ceylon cinnamon) is an endemic plant to Sri Lanka and previous research has revealed that the bark and leaf of cinnamon contains medicinal properties. The present study focused on anti-inflammatory, anti-obesity and anti-oxidant activities of cinnamon bark oleoresins, and essential oil of cinnamon bark and leaf of Cinnamomum zeylanicum.

The extracts used in the present study were cinnamon bark oleoresins obtained from supercritical extraction method (A), cinnamon bark oleoresins from Soxhlet extraction method (B), powdered cinnamon bark (C), water extract of cinnamon bark (D), essential oil of cinnamon bark, essential oil of cinnamon leaf and cinnamon powder. Cinnamaldehyde and eugenol was used as the authentic samples. Human red blood cell membrane stabilization method was used to conduct anti-inflammatory assay and aspirin was used as the positive control. Pancreatic lipase enzyme inhibition method was used to proceed anti-obesity assay and orlistat was used as the standard drug. The DPPH (2,2-diphenyl-1-picrylhydrazyl) was used for anti-oxidant assay and BHT (Butyl hydroxy Toluene) was used as the standard.

Super critical extraction of cinnamon bark oleoresins and eugenol showed highest percentage inhibition of 85.57% and 85.69%, respectively at a concentration of 0.18 mg/mL while the standard showed an inhibition of 80.72% at the same concentration. All the extracts showed higher activity than the standard drug Orlistat. The Soxhlet extract of cinnamon bark oleoresins showed the highest inhibition of lipase enzyme with 68.60% percentage inhibition at a concentration of 200 µg/mL while the standard drug showed 50.30%. The highest percentage radical scavenging activity was obtained in essential oil of leaf (90.54%) at a concentration of 0.8 mg/mL while the standard BHT showed 90.82% at the same concentration.

These results reveal that cinnamon bark oleoresins and essential oil of cinnamon bark and leaf of *Cinnamomum zeylanicum* have the potential to combat the diseases arise due to obesity and inflammations.

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Technical Sessions : A - 32

Molecular identification and screening of anti-obesity activity and anti-diabetes property of selected endolichenic fungi in mangrove ecosystem of Puttalam lagoon

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Natural products based drug development has become an attractive area of research since there are limited options available to treat certain non-infectious diseases such as diabetes and obesity. Among these natural products, it has been reported that secondary metabolites of fungi, especially of endolichenic fungi (ELF) have the ability to produce promising bioactive compounds. The objectives of this research were to isolate and identify ELF inhabiting mangroves in Puttalam lagoon, Sri Lanka using classical and DNA barcoding approach, and to determine anti-diabetes and anti-obesity activities of their secondary metabolites.

The ELF were isolated following a standard procedure: a small piece of the thallus was surface sterilized, cut into pieces and dried on sterilized filter papers then it was placed on malt extract agar in petri dishes and incubated at room temperature (28 ^{0}C – 30 ^{0}C) once pure cultures were obtained, seven isolates were randomly selected for DNA extraction following standard procedure. Quality of DNA was checked by agarose gel electrophoresis. Fungal internal transcribed spacer (ITS) region was amplified using polymerase chain reaction (PCR) with universal ITS 1 and ITS 4 primers and PCR products were sequenced using Sanger dideoxy chain-termination technology. DNA sequences were edited using BioEdit software and compared with the available sequences in the GenBank using Basic Local Sequence Alignment Search Tool (BLAST). Further morphological characterization of each fungal isolate was also carried out. Secondary metabolites from each isolate were extracted with ethyl acetate separately and the solvent was evaporated under reduced pressure to get the crude extract. Anti-obesity and anti-diabetes activity of the extracts were evaluated using Lipase inhibitory assay and α-amylase inhibitory assay, respectively.

Based on the highest sequence similarity to the GenBank sequences, isolates were identified as *Hypoxylon anthochroum* (100%), *Xylaria feejeensis* (100%), *Daldinia eschscholtzii* (100%), *Endomelanconiopsis endophytica* (100%), *Neosartorya hiratsukae* (99%), *Neurospora crassa* (100%) and *Xylariaceae* sp (100%). According to the results of the amylase inhibition assay, maximum percentage inhibition for the highest dose of *H. anthochroum*, *X. feejeensis*, *D. eschscholtzii*, *E. endophytica*, *N. hiratsukae*, *N. crassa* and *Xylariaceae* sp were 10.50±2.53, 7.61±0.41, 1.29±0.27, 8.21± 0.67, 6.76± 1.39, 1.57± 0.08 and 0.69± 0.02, respectively. Acarbose was used as positive control and its maximum percentage inhibition was 55.27±4.13. According to the results of the lipase inhibition assay maximum percentage inhibition for the highest dose of *H. anthochroum*, *X. feejeensis*, *D. eschscholtzii*, *E. endophytica*, *N. hiratsukae*, *N. crassa* and *Xylariaceae* sp were 10.00 ±0.83, 19.71±0.97, 39.72±1.86, 30.76±4.04, 5.62±0.65, 37.71±2.31 and 24.67±2.16, respectively. Orlistat was used as positive control and its maximum percentage inhibition was 45.60±4.18 at 100µg/mL. In lipase assay, percentage inhibition of all tested ELF were less than that of the positive control. Considering the α-amylase assay results all tested ELF didn't show significant activity comparing with standard acarbose.

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Technical Sessions : A - 33

Heavy metal content and fungal resistance of paints available in the local market

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Heavy metals and their compounds can have adverse effects on human health. Humans are exposed to these metals by inhalation, ingestion or dermally. Heavy metals have been used in many different applications, including paint industry, building materials, pigments for glazing ceramics, and pipes for transporting water. Paints are used to protect substrates and to provide an attractive appearance by acting as a barrier against environmental conditions. Water-based paints contain heavy metals which are used as binding agents. Discoloration of the surface paint film, or bio deterioration, can be caused by microbial colonization such as fungi and algae, deposition of dust, and weathering processes such as acid rain.

Analysis of heavy metals for different categories of paint was conducted by using flame atomic absorption spectrometry (FAAS), and resistance to fungal growth according to an established protocol.

Four different brands from different categories of paint samples were obtained from the local market to check the heavy metal content and fungal growth resistivity. The paints were of different categories, enamel paints, emulsion exterior paints, and emulsion interior paints. The paint samples had to be processed before being analyzed. For the measurement of heavy metal content, the samples had to undergo acid digestion. For the determination of water soluble heavy metals, an acid extraction process was used. The digested samples were analyzed using Flame Atomic Absorption Spectroscopy.

Four different brands of emulsion interior paints, A, B, C, and D were analyzed. Lead content in all four brands were < 1.0 ppm, which is less than the detection limit. No fungus or algae growth were observed after 5 months of exposure.

Emulsion exterior paints from the same four brands, A, B, C, and D were analyzed. The lead content in all four brands were < 1.0 ppm, which is less than the detection limit. No fungus or algae growth were observed after 5 months of exposure.

Enamel paints from three brands, B, C, and D were analyzed. The heavy metal analysis showed that in brand B; Pb, Cr, Cd, Hg, and Co contents were all less than 1.0 ppm, and therefore below the detection limit. In brand C; Pb, Cr, Cd, Hg and Sb were all less than 1.0 ppm, and therefore below the detection limit. However, Co content was 56.56 ppm, and Ba content was 112.55 ppm. In brand D; Pb, Cr, Cd, Hg, and Sb were less than 1.0 ppm, and therefore below the detection limit. However, the Co content was 60 ppm, and Ba content was 98 ppm.

In conclusion, the lead content was less than 1.0 ppm, and therefore below the detection limit in all enamel, emulsion interior and emulsion exterior paints that were analyzed. No fungus or algae growth were observed after 5 months of exposure. In the enamel paints that were analyzed, the lead, chromium, cadmium, mercury and antimony content were less than 1.0 ppm and therefore below the detection limit. However the content of cobalt and barium were found to be more than 5 g/cm^3, which can be considered as toxic.

Technical Sessions : A - 34

Validation of a multi residue QuEChERS method for analysis of 29 pesticide residues in fruits and vegetables using LC-MS/MS technique

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Fruits and vegetables are an important component of human food which supplies the day to day essential and vital nutrition needed for survival. In agricultural industry, agro chemicals like pesticides are applied to protect the harvest from harmful pests and get maximum yield during a single season of harvest which could be highly toxic to human if consumed above the permissible levels as these chemicals are designed to destroy the pests or the living organisms. Therefore, it is important to know the level of contamination arising from pesticide residues in fruits and vegetables. A multi residue analytical method was validated for analysis of 29 pesticide residues; Metribuzin, Hexaconazole, Tebuconazole, BPMC (Fenobucarb), Diazinon, Thiamethoxam, Carbofuran, Fipronil, Imidacloprid, Quinalfos, Dimethoate, Captan, Methomyl, Tricyclazole, Isoprothiolane, Fenamiphos, Flutolanil, Triazophos, Fenitrothion, Chlorpyrifos, Phenthoate, Profenophos, Fenoxapro p-ethyl, Pirimiphos methyl, Fenthion, Norvaluron and Deltamethrin in selected fruits and vegetables.

Modified QuEChERS method was used for the preparation of samples for detection, and the prepared samples were analysed using Liquid Chromatography tandem mass spectroscopy (LC-MS/MS) in electron spray ionisation (ESI) mode with positive polarity. The accuracy of the method was assessed by participating in a FAPAS proficiency test (PT) and satisfactory "Z scores" falling within ± 2 values were obtained for all the tested pesticides. The method had acceptable linearity with regression coefficients over 0.99 obtained with six calibration levels. Furthermore, the samples were spiked at three concentration levels covering 20%, 50% and 80% of the working range and the recoveries obtained were between 70% and 130% for the 29 pesticides. The method had limit of detection (LODs) and limit of quantitation (LOQs) of 0.003 mg/kg and 0.005 mg/kg, respectively. The Precision of the method expressed as relative standard deviation (RSD) was less than 10 % for all the pesticides. The selectivity of the method was assured by considering the qualifier to quantifier ratio of the mass fragments of each pesticide used in mass detection in the third quadrupole. The types of fruits and vegetables taken for this study were categorised as following: apple representing the high water content, pineapple representing the high acid content with high water content, raisins for high sugar content with low water content and beans for high starch/ protein content with low lipid/water content and found to be robust over different complex matrices. Therefore, the developed LC-MS/MS method is accurate as well as reproducible over a wide range of fruits and vegetables for the analysis of residual pesticide content.

Technical Sessions : A - 35

Synthesis, characterization of copper based metal organic frameworks and their application in heterogeneous catalysis

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Metal organic frameworks (MOFs) are crystalline porous materials that consist of metal ions/clusters (which act as connectors), coordinated to organic ligands (linkers) to form 2-D or 3-D framework like structures. Basically the choice of metal and the linker dictates the structure of the MOF and hence the properties. The properties exhibited by MOFs are; high surface area, high porosity, size selectivity, fine-tunability and stability. Due to these physiognomies, MOFs can be applied in many industrial applications. Heterogeneous catalysis is one of the important applications of MOF materials. Not only MOFs exhibit higher catalytic activity but also when they are used as catalysts they allow for easier separation and recyclability. In this project the catalytic behavior of two known Metal Organic Frameworks; STAM-1 (St. Andrew's MOF-1) and Cu[TPA] (Copper Teriphthalate) is studied with compared to HKUST-1 (Hong Kong University of Science and Technology) and MIL-100 (Materials of Institute Lavoisier–100).

STAM-1, Cu[TPA], HKUST-1 and MIL-100 were prepared using solvothermal method and they were analyzed using FTIR and PXRD. Then the synthesized MOFs were used as catalysts for previously studied MOF catalyzed organic reactions. The studied organic reactions are Claisen-Schmidt condensation between benzaldehyde and acetophenone and reduction of para- nitrophenol (PNP). The yielded products from the reactions were analyzed using FTIR, GC-FID, GC-MS and UV-Visible Spectrometer.

In literature, it has observed that 2% of Chalcone was given without a MOF, 6% with HKUST-1 and 98% with MIL-100 when the Claisen-Schmidt Condensation was carried out in Toluene. In this project, the percentage yields of the product chalcone with respect to benzaldehyde were; 4% without MOF, 57% with MIL-100, 10% with HKUST-1, 8% with STAM-1 and 13% with Cu[tpa].DMF.

When the reduction of PNP was carried out with HKUST-1 in literature, the complete reduction of PNP was observed in 3 minutes. In this project, PNP was completely converted in 3 minutes with HKUST-1, in 1.5 minutes with STAM-1 and in 6 minutes with Cu[TPA]. However, without getting a clear solution, a black color solution was obtained after the reaction. When analyzing this incident it was found that Cu based MOFs in the presence of $NaBH_4$, either get reduced or decomposed and the reaction proceeds with the reduced form of MOF or with CuO, respectively.

Acknowledgment

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Technical Sessions : A - 36

Reef fish waste for production of good auality fish oil

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Fish oil is a good source for ω-3 fatty acids such as docosahexaenoic acid (DHA) and eicosapentaneoic acid (EPA). Fish oil is commercially produced using tissues or waste of cod, salmon etc. Autoxidation of unsaturated fatty acids forms hydroperoxids, aldehydes etc. giving unpleasant order and flavor to fish oil. Fish oil is not produced in Sri Lanka and it is imported. Fish waste from fish processing industries has caused environmental problems. Reef fish is more oily than other marine fish. Objective of this research was to produce good quality fish oil from waste of different reef fish species and identify a good source. *Lutjanus rivulatus* (LR), *Plectorhinchus ceylonensis* (PC) and *Lethrinus olivaceus* (LO) were bought from fish market in Madampe.

Unrefined fish oils were obtained from viscera and head region of LR, fish waste of PC and LO by solventless microwave extraction and centrifugation (2800 rpm for 10 min.). Density, saponification value, iodine value, free fatty acid level (FFA) and peroxide value (PV) were determined by AOAC and AOCS methods. Oils were refined by bentonite treatment (method-i) and acid activated bentonite treatment (method-ii). To select the best refining conditions unrefined oils were treated with adsorbents (w/w 10 %) for different time periods (45 min., 75 min., 105 min.) and PV and FAA levels were measured. Fatty acid profiles were determined by GC. Unrefined oils were used as the control. All the experiments were carried out in triplicate.

Microwave heating was limited to one minute because the colour of fish oil changed when waste was heated for more than one minute. Centrifugation lowered the turbid appearance. Yield of unrefined oil from viscera of LR (41.8 %) was higher than that of the head region (10.7 %). Yield from PC and LO were 10.7 % and 3.1 % respectively. Refining changed the orange colour of the oil of LR to yellow due to removal of pigments by the adsorbents. Yellow colour of other two oils remained unchanged. Density, saponification value, iodine value and FFA level of the unrefined oils agreed with values given by International fish oil standards (IFOS), but PV of the oils from viscera of LR (5.5 meq kg^{-1}) and wastes of PC (5.3 meq kg^{-1}) were higher than the allowed maximum level (4.9 meq kg^{-1}). Comparison of effect of refining methods (i) and (ii) are shown in Table 1.

Table 1: Comparison of effect of refining methods (i) and (ii) on PV

	PV (meq kg^{-1})	
	LR viscera oil	PC waste oil
Allowed level	4.9	4.0
unrefined	5.5	5.3
Refining method (i), 75 min.	4.3	3.8
Refining method (ii), 75 min.	3.8	1.4

According to Table 1, both refining methods are good to lwer the PV.

Table 2: Comparison of effect of refining methods (i) and (ii) on FFA

	FFA (meq kg^{-1})	
	LR viscera oil	LR head region
unrefined	0.9	0.9
Refining method (i), 75 min.	0.6	0.6
Refining method (ii), 75 min.	0.9	1.0

As shown in Table 2, Effect of method- ii on lowering the FFA level is poor. Therefore the refining metod (ii) was rejected.

Table 3: Comparison of DHA and arachidonic acid levels of the oils obtained by the methd (i), 75 min

	DHA level (%)	Arachidonic acid level (%)
Oil from LR viscera	4.1	6.1
Oil from waste of PC	5.1	9.3
Reported values for shark liver oil	4.1	6.1

According to Table 3, oil obtained by the method (i) from waste of PC is better than the oil from viscera of LR and the reported values for shark liver oil.

Technical Sessions : A - 37

Synthesis of homo and heteroleptic Ag(I) complexes based on N and P donor ligands

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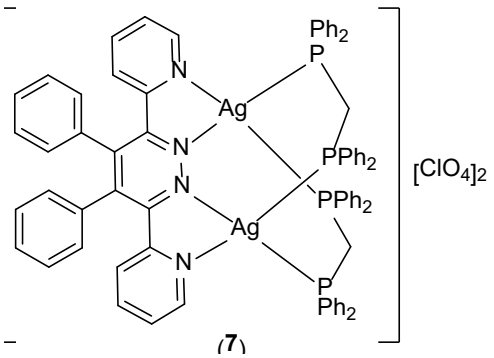
Silver has been known to possess antimicrobial properties for more than two thousand years and is considered as an antimicrobial agent. Pharmaceutical application of silver was first recognized with the use of silver nitrate in early 1800s for the treatment of ulcers. Water-soluble homoleptic Ag(I) complexes of the type $[Ag(N\hat{}N)_2](CF_3SO_3)$ based on adamantylamines have shown antibacterial properties. Recently, fluorescence emission in mononuclear heteroleptic trigonal Ag(I) complexes with the molecular formula $[Ag(N\hat{}N)(PR_3)](NO_3)$; PR_3 = PPh_3, PMe_2Ph, $PMePh_2$, $P(p\text{-}tolyl)_3$, $P(nBu)_3$, $P(OPh)_3$, and $P(OEt)_3$) has been studied. Therefore, it is of interest to investigate the chemistry of Ag(I) centres with chelating (N^N), (P^P), and mixed (N^N) and (P^P) donors. In this communication we report the preliminary studies carried out to devise synthetic routes to such complexes.

First, the coordination chemistry of the Ag(I) centre with the bulky bidentate nitrogen-donor ligand 3,4,5,6-tetraphenyl-2,2′-bipyridine (tpbpy) was studied. The two-coordinate Ag(I) complex of the type $[Ag(tpbpy)]^+$ (1) was prepared by treating $AgClO_4$ or $AgBF_4$ with one equivalent of the ligand. This complex and other Ag(I) complexes were characterized by IR, Mass and NMR spectroscopy. The four-coordinate Ag(I) complex $[Ag(tpbpy)_2]ClO_4$ (2) was isolated in 88% yield by reacting $AgClO_4$ with two equivalents of tpbpy in acetonitrile. Formation of (2) was supported by microanalytical data and the presence of the mass profile for $[M\text{-}ClO]^+$ ion.

Treatment of one equivalent of 4,5-bis(diphenylphosphino)-9,9′-dimethyl xanthene (Xantphos) with $AgClO_4$ in acetonitrile gave the complex $[Ag(Xantphos)(MeCN)]ClO_4$ (3) as a white solid in 83% yield. The $^{31}P\text{-}\{^1H\}$ spectrum of (3) showed a doublet of doublets at -5.3 ppm with $1J(^{109,107}AgP)$ = 461 Hz and 532 Hz.

The four-coordinate heteroleptic complex [Ag(Xantphos)(tpbpy)]ClO_4 (4) was prepared in 80% yield by treating (3) with one equivalent of tpbpy in dichloromethane. The complex (4) can also be prepared by treating $AgClO_4$ with a mixture of tpbpy and Xantphos in (1:1) ratio in acetonitrile. The phosphorus resonance of (4) appeared as a doublet of doublets at -5.4 ppm with $1J(^{109,107}AgP)$ = 384 Hz and 444 Hz. Similarly, the complex $[Ag(Xantphos)(dmbpy)]ClO_4$ (5) (dmbpy = 6,6′-dimethyl-2,2′-bipyridine) was isolated as a white solid with over 80% yield. It showed a doublet of doublets at -6.2 ppm with $1J(^{109,107}AgP)$ = 357 Hz and 412 Hz in its $^{31}P\text{-}\{^1H\}$ spectrum.

The chemistry of $AgClO_4$ with the diphosphine, bis(diphenylphosphino) methane (dppm) which is known to bridge two metal centres, was also studied. Treatment of $AgClO_4$ with one equivalent of dppm in acetonitrile gave a white solid in good yield. The $^{31}P\text{-}\{^1H\}$ NMR spectrum showed a broad spin system centred at 6.9 ppm with 1J(AgP) = 512 Hz suggesting that it is a fluxional molecule. It can be tentatively suggested that it has the molecular formula $[Ag_2(\mu\text{-}dppm)_2][ClO_4]_2$ (6) with two bridging dppm ligands. Complex (6) was reacted with 3,6-di(2-pyridyl)-4,5-diphenyl-pyridazine (dppz) which has the capability to bind two metal centres. Treatment of (6) with one equivalent of dppz gave a white solid $[Ag_2(\mu\text{-}dppm)_2\{\mu\text{-}dppz\}][ClO_4]_2$ (7) in 87% yield.



(7)

In conclusion, synthetic routes to homoleptic Ag(I) complexes of the type $[Ag(N\hat{}N)]^+$ and $[Ag(N\hat{}N)_2]^+$ were developed. Heteroleptic complexes such as $[Ag(N\hat{}N)(P\hat{}P)]^+$ can be prepared by adding both P^P and N^N ligands to $AgClO_4$ in acetonitrile or by adding one equivalent of N^N ligand to a solution of $[Ag(P\hat{}P)]^+$. A binuclear heteroleptic Ag(I) complex containing bridging

ligands 3,6-di(2-pyridyl)-4,5-diphenyl-pyridazine and dppm was also prepared.

Acknowledgement: Author wishes to thank the Trinity College Dublin for a Research Fellowship and Professor S. M. Draper for laboratory facilities and other support.

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Guest Article

Natural product driven drug discovery

Dr. Pamoda B Ratnaweera

Department of Science and Technology, Uva Wellassa University, Badulla

The success stories reveal that the world's biodiversity offer human society with various pharmaceuticals, agrochemicals and research biochemicals. Various methods such as isolation of compounds from plants, microorganisms and other sources; synthetic chemistry, combinatorial chemistry and molecular modeling are being used for obtaining compounds for drug discovery. According to the most recent review of Newman and Cragg natural product driven drug discovery is still alive and going well. For an example, in the area of cancer, out of the 175 small molecules approved as drugs during 1940-2014, 75 % are non-synthetics, of which 49% is either natural products or directly derived from natural products.

Although there are numerous success stories of natural product driven drug discovery, the process of drug development from natural products are faced with frequent challenges. The path to the success of drug discovery using natural products is through a lot of obstacles. While most of the drugs such as antibiotics become obsolete with time due to the resistivity developed by the pathogenic bacteria, the natural products scientists and pharmaceutical industries continuously need to look into lead substances with novel structures and novel mechanisms of action or improve the quality of the existing ones through modifications to suit the needs.

Drug discovery process consists of several steps (Figure 1) which expands for an average period of 10 years and the estimated cost per drug development in average will reach up to $800 million or more. The first step in the process, which is identifying a drug lead, is also a tedious course. From the step of identifying an active extract to activity guided isolation of bioactive compounds take a substantial time limit. In addition to lead identification, lead optimization which involves medicinal and combinatorial chemistry, lead development using pharmacology, toxicology, pharmacokinetics and drug delivery and finally clinical trials prolong the drug discovery process.

Active compound isolation procedures coupled with the bioassays take weeks or months. This is simply too sluggish to complete with the screening of pure compounds. Nevertheless, with only microgram quantities of the active compound being isolated is not sufficient to drive the meaningful biological evaluation or clinical trials. In such situations re-isolation of the active compounds, i.e. if it is from a microbial source re-culturing, extraction, and isolation need to be carried out which makes this time-consuming process. Unfortunately, during some of these occasions some microorganisms under long term storage and growing on artificial media may have stopped producing the bioactive compounds. This has become one of the major challenges in microbial natural product drug discovery route.

On the other hand, to collect the active compound sufficient for the structure elucidation process large biological samples (plant, animal or microorganism) need to be utilized. Obtaining large biological samples such as a plant or an animal draw various issues related to conservation and ethics. In contrast, obtaining large

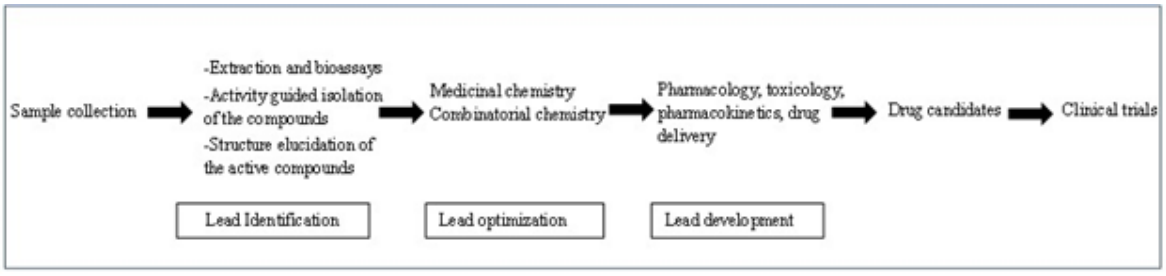

Figure 1: Drug discovery process
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microorganism cultures are less problematic although it utilizes a lot of man power, time and a high cost for artificial growth media.

Though there are highly sensitive Nuclear Magnetic Resonance (NMR) spectrometers available nowadays, structure elucidation of new and unprecedented carbon skeletons often requires several milligram quantities of the compounds and a considerable time period because the stereochemistry of the new structure also needs to confirmed. The issue of isolating low quantities of the active compounds can be overcome by exploring synthetic and medicinal approaches for semi or total synthesis of the active compounds. However due to the complexities of the structures of the natural products, synthesis or modification processes become frequently challenging. Similarly, preparation of natural product analogues is also difficult compared to the synthetic chemicals within the same time period.

Despite of all above, biological material collection process from nature also causes certain issues that need to be dealt according to the legislative requirements of the country. This would require researchers to seek permission from appropriate regulatory authorities prior to collecting biological materials. However, research may involve continuous collection of biological materials from time to time or from various locations thus making it impractical to seek permission each time, and this also extends the lead identification process. Most often after identifying an active plant extract, researcher needs to collect the plant again in bulk which may in turn exert a problem due to plants' threaten status and scattered distribution. At the same time improper authentication of biological material cause various issues when trying to re isolate the lead compound. Hence, preparation of voucher specimens including the location/ time/season/ geographical conditions of collection, and depositing them in a herbarium becomes important in case of repeated studies.

It is probable that unusual ecological niches in developing countries will yield novel microorganisms and novel natural products for drug discovery. Most of these niches have not yet been investigated by the natives due to lack of knowledge, skills or technical advances. However, developing countries are reluctant to allow the export of the biological materials for fear of losing control of their value. This limits scientists in the developed world to access and make immediate use of them in drug development. In such a situation for effective utilization of biological resources for the benefit of the world, countries should implement proper processes to sign agreements or memorandum of understanding for covering issues regard to genetic resources and intellectual property rights related to the discovery, or fare method of sharing of benefits in an event of a commercialization. However, legal requirements involved will be time-consuming while these will limit the academic researchers' activities in non-commercial studies such as ecology, taxonomy etc. Nevertheless, these provisions are essential to conduct the natural product research in an ethical manner.

High throughput screening (HTS) is a novel approach practiced these days in screening thousands of compounds/extracts for biological activities within like a week to speed up the drug discovery process. However, this approach is not successful other than for screening pure compound libraries. One reason is the complexities of natural product extracts which give rise to false positive readings. Secondly if an extract was identified as 'active' from HTS, then from the classical approach the active compound needs to be isolated basically through chromatographic techniques which will take weeks or months. As the HTS assays will be online only for a few weeks, the initially used assays may not be able to use to screen the purified fractions or isolated pure compounds with the extended times they take for the purification process. Thus, the design determination and implementation of appropriate, clinically relevant, high-throughput bioassays are difficult procedures for all drug discovery programmes.

Due to lack of efficient dereplication methodologies, rediscovery of the known compounds becomes a major issue in the field. Also, when the active compound becomes a known compound with a known activity it is not protectable from patents.

Currently there are financial pressures for pharmaceutical research and development in general and particularly in the USA. Therefore, the developing countries cannot rely on 'big pharma' to discover and develop their medicinal natural products. Thus, in developing nations this should be supported and carried out by smaller pharmaceutical companies and academic researchers. However, in Sri Lanka the pharmaceutical companies are not yet in a confident state to invest and initiate the drug development process using drug leads from nature other than using plant or herb extracts to formulate tablets, capsules or oral liquid preparations.

Sri Lanka, along with the Western Ghats of India is listed as one of the 35 biodiversity hotspots of the world. We are rich in our own flora with 4203 flowering plants in which 889 are endemics. Other than those there are around 35 Gymnosperms, 336 Pteridophytes, 560 mosses, 222 liverworts and 661 lichens. Despite having an exceptional level of biodiversity to drive the drug discovery process, Sri Lanka still spends a lot of revenue to import pharmaceuticals from elsewhere. As a nation, our researchers and pharmaceutical companies should unite to use our invaluable biological resources in drug discovery for the benefit of our country and for the human race as a whole, overcoming all the obstacles.

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Graduate Chemists Welfare Fund

This fund has been established with effect from 1-1-2012. The principal benefits towards CCS Graduate Chemists would be,

I. To provide partial assistance towards international travel of those proceeding abroad for PG degrees (once a life time). Assistance for
Active Graduate Chemists : Rs. 60,000 Passive Graduate Chemists: Rs. 30,000

ii. To provide partial assistance towards registration fees in respect of IChemC /CCS events such as international Conferences.

iii. To provide assistance towards registration fees for IChemC /CCS training seminars etc.

iv. To provide partial assistance towards activities of the Alumni Association.

Note:
Depending on the demand, Graduate Chemists who maintain positive contact and participate in IChemC/ Alumni activities will get preference for the above mentioned assistance scheme.

AUSTRALIAN NATIONAL CHEMISTRY QUIZ AWARD CEREMONY

The award ceremony of the Australian National Chemistry Quiz – 2017 was held on 4th April 2018 at the Institute premises. The Chief Guest of the occasion was **Dr. Janaka Dias**, a former Merit winner of ANCQ. Fifty three students received plaques and certificates for their performances at the competition. Eighteen coordinating teachers who served as Assistant Supervisors for more than 5 years were also awarded with plaques and certificates of appreciation.

Chemistry Olympiad Sri Lanka 2018

The second Chemistry Olympiad Sri Lanka (COSL) competition and training sessions were successfully conducted on 17th and 18th May 2018 at the Adamantane House, Institute of Chemistry Ceylon, Rajagiriya. Twenty six finalists were selected for the COSL-2018 from the results of the preliminary examination conducted by the Institute in March 2018 at ten centers island wide. Competition consisted of both theory and practical examinations, and prior to the examinations lectures and practical sessions were conducted by the lecturers of the College of Chemical Sciences of the Institute of Chemistry Ceylon together with their fellow university academics. A social evening was organized to foster networking of students. Winners of the COSL-2018 will receive medals and prices at the 47th Annual Sessions of the Institute of Chemistry Ceylon scheduled to be held on 12th June at the Sri Lanka Foundation Institute. The all island preliminary examination, training sessions and the final competition were sponsored by the Institute of Chemistry Ceylon, and conducted free of charge for students. (photographs on inner front cover page)

Benevolent Fund Benefits for Members

i. Long life benefits:
Amount provided will be as follows:
a. Over 70 yrs : Rs. 12,000 b. Over 75 yrs : Rs.18,000 c. Over 80 yrs : Rs. 25,000.

ii. Critical illness benefits: up to Rs. 60,000

iii. International travel for conferences (with presentation of a paper):
a. Passive members : Rs. 30,000 (international travel only)
b. Active members : Rs. 60,000 (international travel and/or accommodation).

Any member who has paid membership fees for life (after 3 years of such payment) is entitled for these benefits. All members are advised to pay the membership fee for life and become beneficiaries.

Commemoration of the Third Death Anniversary of Emeritus Professor JNO Fernando

The third death anniversary of the late Professor J N O Fernando was commemorated on 2nd March 2018 at the Adamantane House, Rajagiriya. The almsgiving was held in the morning at Sri Ganawansa Thripitaka Vidyayathanaya, Rajagiriya. The Professor J N O Fernando Memorial Oration on "Quality Assurance in Higher Education" was delivered by Professor Uma Kumaraswamy, Director, UGC Center for Gender Equity/Equality and Former Vice Chancellor, the Open University of Sri Lanka. Mrs. Mandrupa Fernando, family members, former colleagues of Professor Fernando, staff members and students participated at these programmes to pay tribute to the late Professor. (photographs on inner back cover page)

Fourteenth Convocation of the College of Chemical Sciences
26.02.2018 BMICH

Welcome address by the President, IChemC

Hony. Rector delivering her report

Convocation address by the Chief Guest

Address by the Guest of Honour

Prof. P A Paranagama recives the yeoman services award

Part of Graduate Chemists

Ms. K Chandrakanthan receives the Shireen Jayasuriya Gold Medal

Mr. K I S Piries, DLTC batch top receive his award

Fourteenth Convocation of the College of Chemical Sciences

Convocation Address – 2018

Professor Ananda Jayawardane
BSc Eng Hons (Moratuwa), MSc (UK), PhD (UK), C Eng, IntPE (SL), FIE (SL), FIPM (SL), FNAS (SL), GSLID
Director General, National Science Foundation
Senior Professor in Civil Engineering, University of Moratuwa
Former Vice Chancellor, University of Moratuwa

I am pleased, honoured and indeed privileged to have been invited as the Chief Guest at the Convocation Ceremony 2018 of the College of Chemical Sciences, Institute of Chemistry Ceylon (IChemC). I would like to extend my appreciation to the Council of the Institute of Chemistry Ceylon for this kind invitation.

I have noted that over the years, the College has earned great reputation as one of the best degree awarding higher education institutes in Sri Lanka. Its Convocation is undoubtedly a significant milestone and indeed a truly memorable occasion both for the participants and for the College of Chemical Sciences as it marks the culmination of hard work and sacrifices with a great reward.

I wish to take this opportunity to extend my warmest congratulations to all the Chemistry Graduands and Laboratory Technology in Chemistry Diplomates today for their well-deserved achievement in their path to become a highly value added professional. I also wish to congratulate the College of Chemical Sciences, Institute of Chemistry Ceylon for its untiring efforts in producing world recognized graduates and diplomates.

Graduation marks another beginning either to continue higher education to become a more advanced professional or to move to world of work as a practicing professional.

Today, when you turn a new chapter in your life with the newly acquired qualification, you will be identified as a Professional in Chemistry. I therefore thought that it is appropriate to choose the topic "How to become an outstanding professional" in my convocation address.

I will address this under 5 topics

1. Be proactive
2. Integrity and ethical practice
3. Bridging the gaps
4. Smart trust
5. Your professional body

1. Be Proactive

I hope at least some of you would have read the world famous personality and leadership development book "Seven Habits of Highly Effective People" by Stephen R. Covey. I was really fascinated to read this book and learn from it. It quotes Aristotle "We are what we repeatedly do. Excellence, then, is not an act, but a habit". It says, a habit is intersection of or effective use of three elements – Knowledge, Skills and Desire. Absence of any one of these will not make a habit. In Stephen's book the first habit he promotes for personal victory is "Be Proactive" He quotes Beth Mende Conny "Life is a book and you are its author. You determine its plot and pace and you –only you- turn its pages".

One of the most important concepts it highlights is the gap between the Stimulus and Response. We all respond to various stimuli in our lives in different ways by different people. Why? Because between every stimulus and response, there is a very important space called "freedom to choose". This space is available only to humans and it is almost zero for animals who respond to a stimuli without any space to choose. Those who take a very appropriate decision for your success are those who will maximize this space – freedom to choose using their Self-awareness, Imagination, Consciousness and Independent Will.

Stephen also highlights that Proactive people have a "larger circle of influence". Every one of us has a circle of influence for which we have authority to act and take decisions. We also have a circle of concern for which we would like to contribute or address, but we do not have authority to do so. This circle of concern is clearly larger than the circle of influence. Proactive people will leverage their inter-personal skills, knowledge applied in a positive manner to enhance their circle of influence. Can you think of strategies for doing this with positive attitude? If you are clever your superiors will start consulting you getting your views before taking a decision – a privilege position you can be and you are sure to get a higher recognition and increase authority.

2. Integrity and Ethical Practice

With the qualification you receive today, you can become an appropriate member of your professional body –

IChemC. When you become a professional and belong to a professional body, automatically you are bound to be governed by its Code of Ethics and professional conduct. Therefore, when you practice your profession and to become an outstanding, recognised, reputed professional, you must practice, ethically, professionally and with highest integrity.

This integrity, professional and ethical conduct need to be practiced all the times - during your studies by avoiding copying or plagiarism and in practice. This is another area where your professional body - IChemC can be behind you with well developed Code of Ethics (CoE) to be practiced by all the members. Your Institute has made the CoE as mandatory for all the members of the Institute to observe in the performance of professional services in SL. Otherwise you bring disrepute to your profession and your Institute will initiate disciplinary action.

Some of you have already acquired academic qualifications to become a Full Member of IChemC, some of you are at different stages of acquiring your academic qualification. In any case your professional body will be behind you to ensure that you practice your profession ethically, professionally and with highest integrity.

Perhaps you would have heard that the most important attribute a true leader should have is the integrity of the operations. You must treasure them to become an outstanding professional.

3. Bridging the Gaps

If you are proactive, you would have already identified your life goals and targets. What are your life goals in different aspects, different directions – education, spouse, family, car, position, health, skills and competencies? This is essential to be an outstanding professional. You need to identify your goal or your benchmark in all these aspects and then identify your actual achievement at a given time. You can then identify the gaps to be bridged in each of these aspects. How many of you have identified those gaps and have taken action to bridge them?

In order to be an outstanding professional you need to have skills and competencies in addition to the knowledge we mainly obtain from the courses, because paper qualifications only are a thing of the past. We develop these skills and competencies with practice of the profession, with experience and with organised training although skills and competencies to some level will be developed during your studies. There is tremendous responsibility by the candidates to do this, acquire skills and competencies with dedication and hard work. IChemC will always give you a hand.

Continuing Professional Development (CPD) is also an essential part of bridging the gap to keep abreast with the latest developments in your subject area. In some professional bodies maintaining a minimum CPD requirement is necessary to keep the membership updated.

Taking these bridging the gap courses and participate at other events should be a habit of an individual in his/her march towards an outstanding professional.

4. Smart Trust

I wonder whether you have read the book "Smart Trust" by Stephen M.R. Covey on "The defining skill that transforms managers into leaders". It is another good reading. It clearly introduces the concept called Smart Trust.

Simply Smart Trust explains the essential need to trust others and be trusted by the others in transforming us from managers to leaders. We know that the degree of success in our performance depends on the support that we get from our stakeholders that we deal with – subordinates, superiors, customers, or clients. If we do not get this support, we cannot perform any function effectively except the things only you can do. Stephen says that this support will depend on the trust that we have with the stakeholders we deal with.

The extent of trust we give or we get can be analysed with two factors – our propensity or tendency to trust and the analysis or investigation we do before we trust. This can be divided into four quadrants as follows.

- Blind Trust (gullibility) – when analysis is low and tendency to trust is high.
- Smart Trust (judgement) – when analysis is high and tendency to trust is high
- No Trust (indecision) – when the analysis is low and tendency to trust is low
- Distrust (suspicion) – when the analysis is high and tendency to trust is low

If we want to become a good leader to you and a good leader to the others and an outstanding professional we need to be in the second quadrant – Smart Trust person. What would be the situation if we chose to be in the other quadrants - blind Trust, No Trust, Distrust?

The Smart Trust should be our option? Stephen M R Covey with stories explains five actions in practicing

Smart Trust as follows.

Action 1 – Choose to believe in trust: This is the fundamental paradigm out of which all other trust building behaviours originate.

Action 2 – Start with self: Focusing on developing the character and competence or the credibility that enables to trust themselves and also give others – a person, team or an organization.

Action 3 – Declare their intent and assume positive intent in others: They signal goals and intended actions – both what and why – generally assume that others also have good intent and want to be worthy of trust.

Action 4 – Do what they say, they are going to do: Follow through an act to carry out declared intent – they walk the talk.

Action 5 – Lead out in extending trust to the others: They are the first to extend trust and initiate the upward virtuous cycle.

Practice the concept of Smart Trust and experience the difference.

5. Your Professional Body

In order to develop all these attributes in you to be an outstanding professional, you need to be very actively engaged in the affairs and activities of your highly reputed professional body. It will be behind you to push you, will be in front of you holding your hand and guiding you and holding a ladder for you to rise and climb. It will be a mentor to correct you, provide career guidance and all the support to become an outstanding professional with following benefits.

- Delivers quality education with partnerships with other institutions
- Provides memberships of various categories with various privileges
- Offering advice and career guidance (mentors)
- Link up with universities – mutual recognition of qualifications
- Link up with industry for accredited training organisations
- Provide guidance and Code of Ethics for practice
- Continuing professional development
- Networking
- Represent your profession
- Enhance reputation, locally and internationally

You can even choose more than one professional body to satisfy your needs.

Coming back to your qualifications, it is my fervent wish and hope that the qualification you have achieved has imparted upon you all necessary attributes including 'The lessons of learning' or the ability for life long independent learning. I am confident that the programmes you followed have taught you how to stay relevant and up to date on all matters. You have now reached a milestone. Some of you will practice your profession, and some will go for higher education. It is now your choice to ignite the leader in you to become an outstanding professional.

Finally, I take this opportunity to congratulate all Chemistry Graduates and Laboratory Technology in Chemistry Diplomates, and wish you a very bright future and success in every endeavour. Similarly, I wish the College of Chemical Sciences and the Institute of Chemistry Ceylon a great success and have vision and commitment to reach greater heights.

Thank you.

Guest of Honour's Address

The many facets of leadership

Dr. Sarath Paranavitane
Chairman, Lanka Hospitals PLC/Lanka Hospitals Diagnostics
Chairman/CEO, Central Medical Centre (CEYMED) (Pvt) Ltd

Chief Guest Professor Ananda Jayawardena, Honorary Rector, Academic Board and staff of College of Chemical Sciences, distinguished invitees, ladies and gentleman:

I am honored, firstly to have been asked to be the Guest of Honor at the 14th convocation of the College of Chemical Sciences and secondly for the even greater honour which I received by the conferment of the membership of your prestigious Institute.

In my message to your journal, I spoke about the close link which I perceived that existed between the chemical scientists and medical practitioners. However today I do not want to elaborate on that nexus, but speak to you about a much more topical topic.

All of you are armed with an excellent professional qualification and standing at the threshold of employment and at some stage of your career and life you will be called upon to take up the role of leadership. Therefore, today, I have chosen to share with you some intriguing facets about leadership.

Leadership is the only profession where performance matters more than anything else. Most of us wish to become leaders because they are highly valued and their final decision making impacts the destiny of others.

Leadership is a game – A game that you must learn to win by using all means at your disposal. In this game, winning is everything and results only matter.

You need to be effective because if you fail to achieve visible success you will not be accepted as a leader even though you possess talents and commitment to the cause. Peter Drucker, the management guru endorsed this opinion when he said, I quote "Effective leadership is not about making speeches or being liked; leadership is defined by results not attributes" unquote. Steve Jobs, former CEO and founder of Apple described leaders as "the round pegs in the square holes"

In the real world, leaders are not what they have been portrayed in books. They have their own shortcomings and flaws.

Abraham Lincon once said "it has been my experience that folks who have vices have very few virtues. He was right. Leaders are generally not flawless but rather they rise above their failing to emerge stronger as leaders.

Almost all great leaders had humble beginnings. Mahatma Gandhi struggled to speak confidently in court, he did not have enough cases to sustain his life. Bill Gates and Steve Jobs were school dropouts. Abraham Lincoln was born in a log cabin to humble parents and his struggles in life are legendary. Yet all did something in their lives which helped them to achieve greatness.

The greatest challenge before all leaders is to draw from their vices, but publicly conceal them. Leaders must expose only the virtuous side. You must concentrate on building on your inner goodness and don't waste time trying to correct your shortcomings.

There can be no magic formula for leadership because human beings are not purely rational beings. Most people are selfish and emotional and expect leaders to fulfill their desires by any means. So, a good leader takes care of all the needs of those under them, those needs that are expressed and those that are implied.

A good leader needs to understand human beings for what they truly are. You must remember that good and evil are woven together in the fabric of life.

Miller explains this in his poem:

In men whom men condemn as ill
I find so much of goodness still,
In men whom men pronounce divine
I find so much of sin and blot,
I do not dare to draw a line
Between the two, where God has not

A leader sometime creates a façade, behind which he hides all that appear dirty and immoral.

Let me cite two examples from the book Losing my virginity by Sir Richard Branson. In this book he talks about Lord King. Lord King was the chairman of British Airways, a Conservative Party member, knighted and life peerage awarded as Baron of Wartnaby. Sir Richard Branson says, Lord King when chairman of British Airways which is a public quoted company, resorted to dirty tricks, to eliminate Virgin Airways from the competitive threat posed by them to British Airways when they first started to enter the aviation industry in

UK. Subsequently, Lord King was ordered to pay libel judgments to both Virgin Atlantic and Sir Richard. The second person he mentions in his book is Guy Snowdon. Guy B. Snowden was the Founder, Partner, and Director of Snow Mark Corporation and of GTEC. It is mentioned in this book that Snowden attempted to bribe Sri Richard Branson to gain control over the British Lottery.

There have been instances where leaders conceal their evil thoughts and deeds and hunt for scapegoats to transfer their evil deeds so as to maintain their clean image. There may arise a situation where you need to do this as a leader need to appear clean at whatever cost and fit into the imagination of his followers however unreal it might be.

You must also learn the other well-known attributes that becomes a leader. Therefore, you must strive to develop positive qualities like courage, initiative and teambuilding. You must learn the steps to develop imagination and initiative.

You must also learn the practical steps to manage your bosses, subordinates competitors and customers and the time tested techniques that can improve your performance.

Aspiring leaders must understand that leadership is not an easy game because there is no rule for leadership. There is no competitive examination to select leaders, and there is no minimum qualification to become a leader.

The challenges out there are many. Leaders must cultivate a carefully plotted strategy that's always focused on your ultimate goal. You have to plan each step, consider ways around every obstacle and prepare for every scenario

Dear graduates and diplomates, with this talk, I hope I have given you all some insights into leadership and also unmasked some of the dark realities that lies within because, I believe, that knowing the whole truth will best prepare you to become a leader and succeed in your life goals.

I wish you all the best in the future.

THANK YOU

(Report of the Honorary Rector presented at the Fourteenth Convocation held at BMICH on 26.02.2018)

Senior Professor Sujatha Hewage, *C.Chem., F.I.Chem.C.*
Honorary Rector, College of Chemical Sciences, Institute of Chemistry Ceylon

I am honoured and privileged to present the Honorary Rector's Report for the year 2017, giving a summary of our achievements for the year 2017. Today is the 14th annual convocation of the College of Chemical Sciences (CCS), Institute of Chemistry Ceylon (ICHEMC) to celebrate the graduation of the 35th batch of the Graduateship in Chemistry (GIC) and the 44th batch of Diploma in Laboratory Technology in Chemistry (DLTC) programmes.

Late Emeritus Professor J N O Fernando

The second death anniversary of Professor J N O Fernando, the founder of the College of Chemical Sciences, first Honorary Rector and former Chairman of the Academic Board, was commemorated on 2nd March 2017 with many activities. A bust of the late Prof J N O Fernando was unveiled in the foyer of Adamantane House by Mrs. Mandrupa Fernando, wife of the late Professor Fernando, and Mr K R Dayananda, a Past President of the Institute of Chemistry Ceylon. The "Professor Oleap Fernando Memorial Oration" was delivered by Vidya Jyothi Emeritus Professor Engineer Dayantha Wijesekera. A large gathering was present on this occasion, including family members of the late Professor Fernando. The "Professor Oleap Fernando Memorial Scholarship Fund" exceeds Rs 1.5 million, and criteria for the award of scholarships were announced by Mr M R M Haniffa, President of the Institute of Chemistry Ceylon. Mrs Mandrupa Fernando delivered the vote of thanks. The first, "Professor Oleap Fernando Memorial Scholarships" were awarded to two students of the College at the Annual Sessions held in June 2017 for their performances in Level 2 and Level 3. The Level 2 Scholarship of Rs. 43,750 was awarded to Ms C J Lekamwasam and the Level 3 Scholarship of Rs. 37,500 was awarded to Ms. M A Mushrifa.

The third death anniversary of Professor JNO Fernando will be commemorated on March 2nd 2018 with a memorial oration and religious activities.

Accreditation as a Degree Awarding Body

For the local and international acceptance of the Graduateship in Chemistry programme, it is essential

that the programme is recognized by the relevant accreditation bodies in Sri Lanka and abroad. We realized that local accreditation is a top priority for the Institute and hence we devoted much time during the year 2017, to achieve our objective of receiving local accreditation from the Ministry of Higher Education.

Accreditation from Royal Society of Chemistry (RSC)

The Graduateship in Chemistry programme is already accredited by the Royal Society of Chemistry, United Kingdom, and this provides international recognition to our programme. The Royal Society of Chemistry, UK continues to engage with us regarding the accreditation of the Graduateship Programme in Chemistry, and the accreditation requirements are implemented for all levels of the Graduateship programme. Prof. H D Gunawardhana and Mrs. D Attanayake coordinated matters related to RSC accreditation.

Accreditation: Ministry of Higher Education

College of Chemical Sciences is planning to commence a B.Sc. Honours Degree programme in Chemistry in 2019. The local recognition of the proposed degree programme requires accreditation of the College of Chemical Sciences, Institute of Chemistry Ceylon by the Ministry of Higher Education. The accreditation process is in two stages ie. (Institutional Review and Subject Review). First stage is to carry out the Institutional Review. Professor Sukumal Wimalasena and Professor Sithy Iqbal were recruited to work on this project and it was coordinated by the former Rector, Professor S P Deraniyagala, and former Dean, Professor Priyani Paranagama. Professors Hema Pathirana, Janitha Liyanage and Ranjith Mahanama provided invaluable advice regarding this matter. The documents pertaining to the Institutional Review were submitted on 2nd November 2016 to the Ministry of Higher Education. Institutional Review Report from the Ministry of Higher Education was received on 22nd November 2017. We are happy to announce that the Review Panel is satisfied with the overall quality and the standard of the Institute of Chemistry Ceylon to consider as a degree awarding Institute. The Review Team also has observed that the Institute of Chemistry is equipped with sufficient laboratories and lecture rooms to conduct undergraduate degree programmes in Chemistry. The Team also observed that the permanent academic staff members are qualified and have satisfactory academic records. The Review Team agreed that the programme can be sustained for a long period of time making an impact on human resource development at both local and global levels. The Standing Committee on Accreditation and Quality Assurance approved the initiation of the Subject Review. This work is handled by the internal academic staff and the two senior professors attached to the Institute.

Adamantane House

As the number of students following GIC and DLTC programmes have gradually increased over the years, space at the adamantane house is not sufficient at all. The floor area available in Adamantane House and the Supplementary Campus is about 23,000 sq. ft. This space is utilized fully during week days and weekends to conduct the two programmes. The laboratories have to be used to its maximum capacity, and examinations are conducted at outside venues due to lack of space. The proposed B.Sc. Honours Degree in Chemistry programme cannot commence unless we have adequate space with suitable infrastructure facilities. With much negotiation with the Urban Development Authority, Institute of Chemistry Ceylon is fortunate to obtain a plot of land, 1 acre and 6 perches in extent, at IT Park in Malabe. Dr A A P Keerthi worked tirelessly in this regard.

The architects have been identified and the construction will be carried out in stages. First stage will be the construction of lecture halls, laboratories, library and all other essential requirements to accommodate hundred students. Hopefully, the B.Sc. Honours Degree in Chemistry programme will commence in 2019. However, two professional programmes, GIC and DLTC, conducted by the Institute will continue at the Adamantane House as usual.

Graduateship in Chemistry (GIC) programme

The Ceremonial Inauguration of the GIC programme of the 40th intake was held on 06th January 2018 at the PPGL Siriwardane Auditorium. Mr. Maithri Gunaratne, Lawyer and former Competent Authority of Lanka Mineral Sand Ltd., was the chief guest. 223 students registered for the programme, establishing the popularity of the GIC programme. Registration of new students had to be restricted due to limited space at the Adamantane House. The GIC programme is one of the most successful tertiary level programmes in Sri Lanka, producing Professional Chemists needed both by the government and private sectors. This programme produces highly qualified and skilled graduate chemists, who are in demand particularly in the private sector. Many of our graduates continue their postgraduate studies locally and abroad. Today, at this convocation, 129 students are

receiving their certificates as graduate chemists. The total number of graduates produced so far has reached 1402.

Annual Undergraduate Research Symposium

A large number of GIC Students now opt to carry out research projects in the final year. These students who carry out a research project as partial fulfillment of the requirements for the degree programme present their work at the annual Undergraduate Research Symposium. The Annual Undergraduate Research Symposium for 2017 was held on August 10th and 11th, and Dr Theshini Perera from the University of Sri Jayawardenepura was the Chief Guest. The event was coordinated by Dr. Chinthaka Ratnaweera and Ms. Anoosheya Kuganesan. For the academic year 2017-2018, over 70 students have been provided the opportunity to carry out research projects.

Literature Survey Presentations

Students who do not carry out a research project are required to conduct a Literature Survey project, instructed by their respective supervisors. Their presentations were held on 24th February, 2017. The presentations were followed by an oral examination of their dissertations.

Diploma in Laboratory Technology in chemistry (DLTC) programme

This was the first formal education programme commenced by the Institute of Chemistry Ceylon, in 1973. A large number of school leavers join this programme, as well as those who are already employed in medical and industrial laboratories. This programme is designed especially to produce food chemistry technologists and clinical laboratory technologists. The diplomates produced by this programme find ready employment. 130 students registered as the 45th batch for the year 2018, and the inauguration was held on 12th January 2018, and Dr (Mrs.) Samanthi de Silva, Director, Operations of Asiri Surgical PLC and Asiri Hospital Holdings, was the Chief Guest. Laboratory facilities for this programme have been updated with the addition of two laboratories, the Microbiology and the Biochemistry laboratories. These two laboratories will help the students to gain much needed hands on experience in these two areas. At this convocation 125 Diplomates are receiving their diplomas making the total number to 1325. We thank Mr. E. G. Somapala for coordinating the DLTC programme efficiently.

Post-graduate Research

A research grant from the National Science Foundation was awarded to Dr. Sisira Weliwegamage, in collaboration with Prof. R G S C Rajapaksha from the University of Peradeniya. The research assistant, Ms. Rukshika Hewawasam submitted her thesis on "Production of Bio ethanol towards biofuels and wine production using the fruits of Musa sp". She had ten communications and two conference papers which were presented at the Asian Chemical Congress held in Dhaka, Bangladesh in 2016, and in 2017 in Australia. She defended her Ph.D thesis on 5th January 2018, and she will be awarded the Ph.D degree from the University of Peradeniya. Ms Hewawasam is the first person to be awarded a Ph.D degree for research work carried out at CCS, and it is a land mark in the history of research at CCS.

Research Grant Scheme for Internal Academic Staff

College has a research grant scheme to enable internal academic staff to carry out research projects, leading to a postgraduate degree to assigned research assistant. Each grant is for a period of two years. Two new research grants were awarded to Dr Dinusha Udukala and Dr Chinthaka Ratnaweera for the year 2017 and two selected research students, Ms. M.S.F Nusra and Mr. Senal Dinuka have already commenced their research projects. Several other research projects are being conducted by postgraduate students under the supervision of Dr. S R Gunathilake.

Three research assistants, Mr. N M C M Nawarathne, Ms. Anoosheya Kuganesan and Ms. M A T P Manthrirathna completed their research work and they will be receiving their M.Phils in the near future at the postgraduate convocations of Universities of Kelaniya and Peradeniya

In order to facilitate research, fully equipped Microbiology and Biochemistry laboratories have been established. Research students have access to advanced instruments, AAS, FTIR, UV-visible spectrophotometers, GC and a Spectrofluorimeter available in the H.D. Gunawardhana Analytical Laboratory for their research work.

Collaborations/ Affiliations with Foreign Universities

College of Chemical Sciences has established credit transfer programmes with Cincinnati University and Truman State University in USA, and Northumbria University in UK. Discussions were initiated to have a similar arrangement with Deakin University, Australia. A representative from Youngstown University, USA visited Adamantane House recently to explore opportunities for credit transfer and staff exchange programmes with CCS.

Academic Staff

Currently, there are seven internal academic staff members. Dr.Dinusha Udukala and Dr. Ranmal Gunathilake who were on probation, were confirmed in their positions as Senior Lecturers Grade II.

Senior lecturers, Dr R Parthipan and Dr R Kandiah resigned in 2017 and migrated to New Zealand. We thank them for their contributions to IChemC and wish them success in their new assignments.

Visiting Appointments:

Prof. S P Deraniyagala continues to serve the College of Chemical Sciences as a visiting Senior Professor from January, 2017. He was appointed as the Dean of CCS from 16th October 2017. Prof. Deraniyagala is an experienced scholar, and he is a Senior Professor in Chemistry and holds the Chair in Chemistry at the University of Sri Jayewardenepura. He has been involved in the GIC programme for more than 30 years. His long years of experience as a lecturer and a researcher and his administrative experience will be very valuable to the teaching programmes at CCS.

Professor Hema Pathirana, Senior Professor and Chair in Chemistry at the University of Ruhuna, joined the College of Chemical Sciences as a Visiting Senior Professor from 15th November 2017. In addition to her teaching and research duties, she is responsible for coordinating the subject review of the accreditation process. We thank her for her commitment in attending to the subject review.

Professor P A Paranagama continued as the Dean, College of Chemical Sciences, until 15th October 2017. She guided and supervised the accreditation process by involving the academic and nonacademic staff during the year 2017. Professor Paranagama enthusiastically contributed to the success of the accreditation process, and we record our sincere appreciation for her untiring and dedicated efforts.

Twenty eight other visiting lectures from the state universities, research institutions and industry also contributed in conducting the GIC and DLTC programmes

Resignations

Prof. P A Paranagama returned to the University of Kelaniya in October 2017 after her sabbatical leave, spending over a year with us. Prof. O. A. Illeperuma and Prof. KAS Pathirathna completed their contracts with the College of Chemical Sciences in the year 2017. Prof. KAS Pathirathna continues to assist academic activities as a visiting Senior Professor.

Teaching Assistants

The College of Chemical Sciences continues to offer Teaching Assistant positions to students who excel in the Graduateship in Chemistry programme. In 2017, 6 senior teaching assistants and 20 new teaching assistants were appointed for a period of one year. Of those 6 senior teaching assistants, 3 have received scholarships to pursue graduate studies in USA. Currently, we have 21 teaching assistants serving at the CCS.

Teaching assistants support and assist the CCS activities in various ways. Their main duties are to support laboratory teaching, assist in examinations, and conduct tutorial sessions as required. Additionally, some teaching assistants support senior staff to organize seminars, conduct workshops, and hold special practical sessions for various government and private organizations.

Library

The Library continues to offer its services to the students and the faculty, and it passed another milestone by giving access to its automated library catalogue through the web. The library continued to expand its collection of books, and during the reviewed year, 29 books were purchased. 21 books were received as donations, and the generosity of the donors is greatly acknowledged. As a measure to minimize the demand for photocopying of past exam papers, the library initiated to make booklets of past papers, for purchase. Now the Library website provides the download of past papers in PDF format and also the download of lecture notes delivered by some of the lectures. The library is kept open on all seven days of the week, from 8.00 am to 6.00 pm.

Accounts Divison

Accounts Division of the IChemC is housed in the Supplementary Campus, and there are 3 permanent members, one on contract basis and an internal auditor. Accounts software package is used to handle the accounts and the system will be expanded for student payment information.

Co-Curricular activities

Several popular lectures were conducted at the Adamantane House in 2017. Some of the highlights are,

A lecture on "Product development of stent from bench to bedside" by Dr Bandula Wijey, inventor, engineer,

scientist, and entrepreneur, was held on 28th March. A lecture on "Development of organic and polymeric materials for electronic and energy storage applications" was held on 29th March by Professor Susan Odom of the University of Kentucky, USA. Analytical Chemistry Club of CCS in collaboration with SLAAS organized a guest lecture, "The missing fundamental and the mysteries of time travel: A basic theory and applying science there", by Dr. Shanthadeva Murutenge, an internationally known philosopher, astrophysist and cosmologist on 7th June. The Organic Chemistry Club of CCS in collaboration with SLAAS organized a lecture on, "Who is responsible? Polymeric Environmental Pollution" on 30th August by Dr. Thilini Gunasekara and Dr. Wasanthi Subasinghe.

Student Council:

AGM of the Students Council was held on 16th September 2017 at the PPGL Siriwardena Auditorium. The office bearers were selected, and Mr. Pathum Serasinghe was selected as the President and Ms. Suvenika Perera was appointed as the Secretary for the year 2017/18. Dr. U.S.K Weliwegamage serves as the senior mentor of the Students' Association and Dr. Ranmal Gunathilake serves as the sports mentor.

Extra-Curricular activities

The College encourages the students to conduct and participate in extracurricular activities in order to enhance their soft skills including leadership, communication, social and organization skills and sports in a formal manner. These included religious activities, which are, All night Pirith Ceremony, Vesak celebrations, Christian Thanks giving Mass, Eid, Navarathri, and Christmas celebrations. The talent show AURA-2017 displayed the hidden talents of the students. CCS and Inter-University debating competition was held successfully. Sports include. cricket, rugby, badminton, basketball and martial arts (karate) *etc.* Some of these competitions were won by the College students and received awards and medals. The College annually provides a substantial amount of funds towards these activities.

We have an active Alumni Association and a Career Guidance Unit. Members of the Alumni collected funds to install a water purification plant at the Walisinghe Harishchandra College, Anuradhapura.

There are several clubs; The Gavel, Rotaract, Analytical Chemistry, Organic Chemistry, Photography clubs and there is also an active Sakyadhana Unit. Students participate in the activities of these clubs depending on their interests.

Students participated in several social service activities in 2017 which are conducted by Clubs and societies. These include blood donation campaign, little heart, charity walk, Paduru party to help disabled soldiers and helping devotees at Sri Pada.

There were several chemistry popularization programmes conducted throughout the year in 2017. Among them are, the Chemistry Olympiad, All Island Inter-School Chemistry Competition and Australian National Chemistry Quiz Competition. These competitions are conducted to increase the enthusiasm in Chemistry and to enhance the practical skills of the advanced level students

Acknowledgements

I wish to acknowledge with grateful thanks the receipt of several prizes at various levels during the year. These include,

Level 1:

1. "Abdul Salam Memorial prize for Fundamentals of Physics for Chemists" donated by Prof. Sithy Iqbal.

Level 2:

1. "Nureshan Dias prize for Principals of Quantum Chemistry and Molecular Spectroscopy" donated by Mr. Nureshan Dias
2. "Mrs. Yasawathie Satharasinghe Memorial prize for Organic Chemistry II" donated by Dr. Dinusha Udukala.
3. "Mrs. Deepika Seneviraatne and Family prize for Titrimetric and Gravimetric method in Analysis" donated by Mrs. Deepika Seneviratne.

Level 4:

1. "Dr. Premaratne and Family prize for Nanotechnology" donated by Dr. Jeevantha Premaratna.

I am happy to record that many Prizes/Merit Bursaries have been awarded this year through endowments as well as annual awards. The total value of these awards at all four levels during the current year amounted to nearly Rs. One Million. We thank all our numerous donors for their great generosity and support which has enabled us to award valuable prizes and medals for courses we offer at all levels.

We made satisfactory progress during the last year due to the commitment and cooperation of entire staff of the

CCS and the ICHEMC, the members of the Council, Academic Board and other committees and many members of the ICHEMC. I acknowledge with many thanks, their support and contributions.

I wish to highlight the role of the CCS personnel including academic staff, teaching assistants and staff of the office, library, laboratories and finance division, who have worked tirelessly throughout the year in conducting many activities as well as the work connected with the convocation. Their support and cooperation is very much appreciated and acknowledged with thanks.

Conclusion

Institutional Review process kept our staff members busy throughout the period under review. We are happy that we received positive results for our efforts. We have already commenced the preparation of the self evaluation report for the subject review process and this will keep the CCS academic staff busy in addition to their scheduled commitments. The documents related to the subject review will be submitted to the Ministry of Higher Education before end of April 2018, and we hope to receive a positive response enabling us to commence the B.Sc. Honours Degree programme in Chemistry. The subject review of the proposed B.Sc. Honours Degree in Chemistry will make our degree programme equivalent to degree programmes offered by the other Sri Lankan Universities and thereby creating opportunities for our students to join the government sector.

At present the total number of students following the GIC and DLTC programmes is 920 and 242, respectively. The increase in numbers of students for both these programmes over the years has compelled us to look for a suitable land for the construction of new buildings to accommodate them. The plot of land at Malabe received from UDA, with much effort, ensures that we have adequate space to conduct the above educational programmes successfully with an increase intake of students. The support and commitment of alumni and well-wishers are required to build a modern structure with adequate facilities to conduct fully fledged, locally and internationally accepted degree programmes in Chemistry by the Institute of Chemistry Ceylon. The dedication and commitment of all associated with ICHEMC are gratefully appreciated to successfully complete the building project on time. May I call upon our graduates, diplomates, parents, students, staff, ICHEMC members and well-wishers to extend their fullest support and cooperation in order to achieve our goals.

Thank you for your kind presence here today and for your patient hearing.

GRADUATESHIP EXAMINATIONS IN CHEMISTRY, 2017

LEVEL 3 - OVERALL AWARD LIST

First Prize and Mandrupa & Oleap Fernando Hall Opening Scholarship	Ms. M A F Mushrifa
Second Prize and Susila Jayaweera Memorial Scholarship	Ms. W H K Perera
Third Prize and Graduateship Silver Jubilee Scholarship	Mr. N M H N Thilakarathne

Merit Bursaries

Ms. I L Hettige, Ms. J A S Gayara, Mr. M J M Afnan, Ms. B D Perera, Mr. R D U S Deshappriya, Ms. W S S Perera, Ms. W R P Somarathne, Ms. W G B K K G Gunawardana, Ms. K D N Rathnaweera, Ms. I F Nadiya, Ms. U V De S Jayasekara, Ms. M M F Mubeena

Institute of Chemistry Ceylon President's Scholarship for Level 4 Awarded for the Best overall Performance in the Levels 1, 2 & 3 – Ms. M A F Mushrifa

YEOMAN SERVICE AWARDS 2018

Professor Subramaniam Sotheeswaran, Professor Priyani Paranagama and Dr. Suppiah Sentheshanmuganathan were awarded the Yeoman Service Award at the 14th convocation for their services and activities rendered towards the advancement of the educational programmes of the Institute of Chemistry Ceylon.

Professor Subramaniam Sotheeswaran

Professor Subramaniam Sotheeswaran is an Emeritus Professor of the University of the South Pacific, Fiji. He graduated from the University of Ceylon in 1963 with a B.Sc. Honours degree in Chemistry. He obtained his Ph.D. in Physical Organic Chemistry in 1967 and D.Sc. in Natural Products Chemistry in 1987 from the University of Hull, UK. Professor Sotheeswarn has served many universities in various capacities. He was an Associate Professor of the University of Peradeniya, a Professor and the Head of the University of the South Pacific, Fiji, and an Adjunct Professor at the University of Fiji and Fiji National University. He has taught Chemistry at the University of Tasmania, Australia and Dalhousie University, Canada.

Professor Sotheeswaran started helping the Graduateship in Chemistry (GIC) programme of the Institute of Chemistry Ceylon (IChemC) almost from the inception of the programme in the early 1980s. He was appointed as the Foundation Professor of the IChemC in 2006. After retiring from the University of the South Pacific in 2009 having distinguished service for 23 years, he joined the IChemC as a Full-time Senior Professor in Organic Chemistry. He was appointed as the Dean of the College of Chemical Sciences (CCS) in 2011 and continued his service until 2014.

Professor Sotheeswaran's contribution to the CCS teaching has been remarkable. He introduced research work as part of the GIC programme and introduced the course now titled "Research Methods in Chemistry", and coordinated the course until 2014.

Professor Sotheeswaran has authored four monographs on popular topics related to organic chemistry and two CCS publications based on his lectures at the CCS for the benefit of the students following the GIC programme. These include "Environmental Organic Chemistry", "Marine Organic Chemistry", "Organosulfur Compounds in Nature", "Chemistry in the Kitchen", "Functional Group Analysis in Organic Chemistry" written jointly with Professor Leslie Gunatilaka and "Conformational Analysis and Reactivity of Organic Molecules" written jointly with Dr. Ireshika De Silva. His publications are very popular among CCS students.

Professor Sotheeswaran also brought in funds (Us $ 2,000) from overseas for his research work at the CCS which helped the students in their research work on Biofuels. A CCS graduate, Ms. Rukshika Hewawasam undertook her Ph.D. studies using a part of these funds on Biofuels and has just completed her Ph.D. oral examination at the University of Peradeniya. A few papers were published on this topic and a popular poster paper was presented at the Royal Australian Chemistry Institute (RACI) Centenary conference held in Melbourne in July 2017.

In addition to his contribution towards the educational programmes at the CCS, Professor Sotheeswaran contributed immensely to the development of the IChemC as well. He served the Institute as the Vice President in 2010/2011 and as the President in 2011/2012. During his presidency in 2012 an International Conference on Chemical Sciences was held which was very successful. He was the Chair of the House and Finance Committee of the Institute of Chemistry from 2010-2015.

Professor Sotheeswaran has a wide exposure to many research areas including Natural Products (Phytochemistry), Environmental Chemistry, Organic Synthesis and Herbal Medicines. He has supervised several Ph.D. students and M.Sc. students at the Universities of Sri Lanka and the South Pacific, and many undergraduate students at the CCS. He has published 110 publications in refereed International Journals and more than 115 communications in International and Regional Conferences. He has won the Sri Lankan President's Award for the team work in harnessing Natural Products resources of Sri Lanka and developing a Centre of Academic Excellence in Natural Products Chemistry at the University of Peradeniya during the ten-year period 1975-1985. He was awarded the Fellowship of the National Academy of Sciences of Sri Lanka (NASSL)

in 2014.

He has served as the temporary advisor to the World Health Organization in Geneva, Weimar (East Germany), Singapore, South Korea and Manila. Professor Sotheeswaran is a Life Member and the Fellow of the IChemC and a Charted Chemist. Further he is a Life Member of the Federation of Asian Chemical Societies (FACS) and Chemical Society of the South Pacific.

Professor Priyani Paranagama

Professor Priyani Ashoka Paranagama graduated from the University of Kelaniya in 1986 with B.Sc. Honours degree in Chemistry with Second Class Upper Division. She joined the University of Kelaniya in 1990 as an Assistant Lecturer and proceeded to the Industrial and Technological Institute (ITI) to obtain her MPhil degree in Organic Chemistry in 1991. At ITI she was involved in analyzing spices and essential oils available in Sri Lanka. She obtained her PhD from University of Glasgow, UK in 1994 in the field of Bio Organic Chemistry and her PhD was based on mode of action of neem based biopesticides. In 2005 she was awarded the Fulbright fellowship to carry out her postdoctoral research at University of Arizona, USA on secondary metabolites of endophytic fungi and endolichenic fungi.

In 2003 she was promoted as a Professor and subsequently in 2011 as a Senior Professor, and in 2012 to the Chair of Chemistry. From 2009 to 2012 she served as the Head of the Department of Chemistry, University of Kelaniya. She has completed 25 years of service to the University of Kelaniya.

She is a Fellow of the Institute of Chemistry Ceylon and a Chartered Chemist (CChem) of the Royal Society of Chemistry. She is a member of several professional bodies in Sri Lanka. She was awarded the Dr. C. L. de Silva Gold medal for outstanding research in Chemical Sciences in 2015 and the M. U. S. Sultanbawa Gold Medal for achievements in her research career in 2008. She delivered the Professorial Oration on "A Journey through Sri Lankan Medicinal Plants, Essential Oils and Endolichenic Fungi; Bioactivity and Value Addition" at the Institute of Chemistry Ceylon in 2016. She participated in the conference organized by The World Academy of Science (TWAS) on shaping careers in Science in 2016. Professor Paranagama participated at this conference as one of the 40 outstanding scientists from developing countries. This conference was to discuss how the first international funding given to researches helped to propel their careers and the science in their home countries. She is a recipient of several national and international research grants, and received several honours and awards. She has published over 47 research papers in indexed journals, written or edited 7 books and published over 100 communications.

Her research interests are isolation and characterization of bioactive natural products from plants and endolichenic fungi, development of biopesticides, value addition of natural products and analysis of toxicity of trace metals. She has successfully supervised over fourteen postgraduate students and is currently supervising eight postgraduate students.

Professor Paranagama is involved in the educational programs conducted by the Institute of Chemistry Ceylon since 1995. She shared her knowledge and experience lecturing at College of Chemical Sciences. Furthermore, she held positions of the Institute of Chemistry Ceylon such as Secretary of the Council in 2004 and Secretary of the Admission and Ethical Practices Committee in 2009. Professor Paranagama is a Council member from 2003 to date, and a member of the Academic Board and the Board of Examiners. She served as a Fulltime Visiting Senior Professor from January 2015 to October 2017. Professor Paranagama was the Dean, College of Chemical Sciences from June 2016 to October 2017. She was actively involved in preparation of documents for the institutional review of the Institute of Chemistry Ceylon in 2016. She served as the coordinator of many training seminars / workshops organized at the Institute of Chemistry Ceylon. She was the co-investigator of three research grants awarded from the Institute of Chemistry Ceylon and two of these research projects have been successfully completed. She has served as a supervisor for many undergraduate research students at the College of Chemical Sciences and enhanced their knowledge, experience and skills. In February 2018, she was appointed as the Director, Institute of Indigenous Medicine.

Dr. Suppiah Sentheshanmuganathan

An individual who lost his father at the tender age of 2 grew up working very hard to strive for nothing but the best. His hard work, perseverance and commitment to reach great heights, which has opened many doors to pursue his higher education and in his career advancement. An individual who has published 55 papers on his research both in Sri Lanka and globally.

Completed his education in Jaffna a year ahead of his age he could not enter medical College as he did not pass the Tamil language. He decided to major in Chemistry with a minor in Mathematics. There were 7 spots and he was one of them to enter University with a full scholarship. His marks in math was 110% as he attempted two additional questions. He topped his graduating class of 1950 and was a recipient of the memorial Kahn Prize. He joined the Medical Research Institute (MRI) in 1951 a prestigious position which lead to overseas scholarships to pursue his PhD. This was the beginning of many scholarships, higher education which he strived to achieve, experiences, knowledge, presentations and travels around the world.

At the University of Sheffield, UK, his research was funded by the Guinness Brewery to find the source of the bitter particle in beer. His presentation in 1956 at the British Bio Chemical Meeting in Dublin was his first to a non-Sri Lankan audience. The first Sri Lankan in 1957 to present the same at the University of Oxford. In 1958 he was offered a Post-Doctoral Fellowship at the Rutgers University, New Jersey to work on yeast, returning back to Sri Lanka with a PhD.

In 1964 he was one of the two Sri Lankans to receive the Fulbright Scholarship granted by the US State Department. He was selected to International Science Conferences in China where he met with Chairman Mao and in India with Prime Minister Indira Gandhi.

Back in Sri Lanka working at MRI he was also a part time lecturer at the Colombo Medical College and The Institute of Chemistry Ceylon. This is when he realized the need for a diploma program for Laboratory Assistants who wanted to pursue a career in Chemistry. It is his initiative to start the Diploma in Laboratory Technology in Chemistry (DLTC) programme at the College of Chemical Sciences. He was appointed the director of this programme and subsequently became the coordinator. Dr. Sentheshanmuganathan was appointed as the President of the IChemC from 1972 – 1973. He received an Honorary Fellowship of the Institute of Chemistry Ceylon in 2015 at the 44th Annual Sessions of the Institute.

He retired from MRI as the Director of the Bio Chemistry Department. Presently residing in Toronto Canada with his three children and four grandchildren, he worked at a Chemistry laboratory where his experience and education was recognized as equal. It is not everyone who is able to work in their field in a foreign country at the age of 65. His expertise was further recognized by the Canadian Government. The Government sent him to China three times to solve scientific problems.

As an individual who recognizes the benefits of financial assistance and the importance of education, he wanted to give back to the Institute of Chemistry Ceylon where he served. He strongly believes an education is the Passport to life which will lead to a better and a brighter future. His bursary has encouraged and given the opportunity to the students at the Collage of Chemical Sciences to pursue their education without any hindrance. He has instilled this 'words of wisdom' in his children and grandchildren.

35TH BATCH OF 129 GRADUATE CHEMISTS PASS OUT IN 2017

First Class Honours Pass (10)

Ms. K Chandrakanthan, Ms. P S Ishtaweera, Ms. L N Dayaratne, Ms. N C Paranamana, Ms. K M K G Perera, Ms. W A K Gunarathne, Ms. K A S S Kuruppu, Ms. K M Wijesinghe, Ms. M K B K Perera, Ms. C T R Silva

Second Class Honours (Upper Division) Pass (60)

Ms. N S Adhihetty, Ms. N N Anandakumar, Ms. T S C De Silva, Mr. G H G M P Dias, Ms. J A H Erangika, Ms. D I V D Gammune, Ms. I V Handungoda, Ms. H A J Kaushalya, Mr. M S A Latheef, Ms. W C S Munindradasa, Ms. S I Ranasinghe, Mr. M N M Sadam, Mr. A D A I Samaranayake, Ms. V S Samarasiri, Ms. N B P Senanayake, Ms. D L S Shasinka, Ms. A U D De S Waidyaratne, Ms. A O M Wengappuli, Ms. R A H Gayara, Ms. T D Jayasinghe, Ms. H S K Jayawardena, Ms. M H M T D Karunathilaka, Ms. K N M L N Kosgahakumbura, Ms. R Y Madurawala, Ms. M W S T Monarawila, Ms. J E Nallarajah, Ms. D N Peramunagama, Ms. K A D M Perera, Ms. M A D T Perera, Ms. P K Premasiri, Ms. K G Rajawasam, Ms. D V D Samarasinghe, Ms. G K M M Abeythunga, Mr. V A S Chathuranga, Ms. P R Dissanayake, Ms. V U Godakanda, Ms. G Y M Gunasekara, Ms. V T Hewage, Ms. D Kulasekara, Ms. S P Lokusuriya, Ms. J H J B Ramanayake, Mr. R A D Y R Ranathunga, Mr. S M S T K Wanasinghe, Mr. W S D Fernando, Ms. R B H S Premadasa, Ms. W R H Weerasinghe, Mr. D V H Dharmakeerthi, Ms. S M Silva, Ms. L G V Ashani, Ms. H G A S Hapuheenna, Ms. M T Fernando, Ms. K M K Wickramaratne, Ms. M C Haputhanthri, Mr. J A L I Sampath, Ms. P W A I D Panvilawaththa, Ms. T K H Gurukandage, Ms. W M L B Lahiruni, Ms. P S Ukwaththage, Ms. H M Balasooriya, Ms. J A U N Jayasooriya

Second Class Honours (Lower Divion) Pass (20)

Mr. D L S Dinuka, Mr. W T C C Fernando, Ms. E O Gunathilake, Mr. M C B Peiris, Ms. P V D N S Saparamadu, Mr. S T A Shiraz, Ms. S K R S Tissera, Ms. K G T S Waidyathilaka, Ms. P L S Wasana, Mr. A R S Wijewardana, Ms. G C Kariyawasam, Ms. R M O Nayanathara, Ms. R A H R Perera, Ms. J D Dasanayake, Ms. K J M Gunawardhana, Ms. R M S Rathnayake, Mr. K A K Sanjuka, Ms. R S S Wijewardena, Ms. S A T Sandaruwani, Ms. W G M I P S Yatawaka

Third Class Honours Pass (17)

Mr. I U Gamagedara, Ms. A J Y I Hansani, Ms. W A P Mandodari, Ms. S Nassar, Ms. M S F Nuzla, Ms. W M Pabasari, Ms. M K P I Sewwandi, Ms. C D Walpita, Mr. L M Kariyawasam, Ms. L P Dissanayake, Ms. T N N Jayawardana, Ms. A M A V A Unantenna, Mr. D S Weerasinghe, Ms. D S Wanniarachchi, Ms. R M D T Rathnayaka, Ms. D M O V Dissanayake, Ms. J H M L Sanjeewani

Pass (22)

Mr. M Perera, Ms. R Meenila, Mr. M A Silva, Mr. A P J P Vaas, Ms. T A K Vidanage, Mr. D R Amaratunga, Ms. D R Gamage, Mr. D S M G S M Nawarathna, Mr. N A D P M Neththasinghe, Ms. H B D R Samarasinghe, Mr. K W K M B W M R M L Weragama, Ms. E M N V Gunasekara, Mr. S Y M L J W Bandara, Mr. H K M N Dhammika, Ms. M J R Perera, Ms. P R A A M Silva, Ms. S Vithiyalini, Mr. W A K C Wijesooriya, Mr. K R A D Perera, Ms. L H T Sanjeewani, Mr. R A S Priyanath, Ms. S Adikari

FOURTEENTH CONVOCATION AWARDS LIST 2017

GRADUATESHIP PROGRAMME (OVERALL) AWARDS

First	Shireen Jayasuriya Memorial Gold Medal for the Best Performance	Ms. K Chandrakanthan
Second	Graduateship Silver Jubilee Commemoration Award	Ms. P S Ishtaweera
Third	Graduate Chemist (25th Batch) Silver Jubilee Award	Ms. L N Dayaratne

AWARDS FOR OVERALL EXCELLENCE IN ALL LEVELS (THEORY)

Professor J K P Ariyaratne Memorial Award for Inorganic Chemistry	Ms. L N Dayaratne
Professor Leslie Gunathilake Award for Organic Chemistry	Ms. K Chandrakanthan
Haniffa Award for Physical Chemistry	Ms. L N Dayaratne
Professors Saman& Asoka Pathirathna Award for Analytical Chemistry	Ms. P S Ishtaweera

AWARDS FOR OVERALL EXCELLENCE IN PRACTICALS

Prof. R. S. Ramakrishna Memorial Award	Ms. P S Ishtaweera
Mr. & Mrs. Sivarajah and Family Award	Ms. N C Paranamana
B A Jayasinghe Memorial Award	Ms. L N Dayaratne, Ms. W A K Gunarathne, Ms. K Chandrakanthan

Good Performer CCS Awards

Ms. K A S S Kuruppu, Ms. V S Samarasiri, Mr. D V H Dharmakeerthi, Mr. J A L I Sampath, Mr. M S A Latheef

LEVEL 3 & 4 OVERALL (THEORY) AWARDS

First	Royal Society of Chemistry (Sri Lanka) Section Award	Ms. K Chandrakanthan
Second	Professor and Mrs. H.W Dias Award	Ms. C T R Silva
Third	R Nayomi Jayathissa Memorial Prize	Ms. P S Ishtaweera

GRADUATESHIP ALL ROUNDER AWARDS

Dr. R O B Wijesekara Felicitation Award for the Best All Rounder	Ms. L N Dayaratne
Prof. Noel G Baptist Memorial Prize for the Second Best All Rounder	Ms. R Y Madurawala
Chamikara Wijesinghe Award for the third Best All Rounder	Mr. R A D Y R Ranathunga
Certificates of Honourable Mention	Mr. V A S Chathuranga

SUBJECT Prizes For Individual Courses

Dharmachandra & Thamarasa Gunawardhana Memorial Prize for Selected Topics in Analytical Chemistry	Ms. K Chandrakanthan
Mevan Pieris Prize for Polymer Chemistry &Technology	Ms. K Chandrakanthan
E G Somapala Prize for Food Chemistry & Technology	Ms. K Chandrakanthan
K G Karunasena Memorial Prize for Quantum Mechanics	Ms. K Chandrakanthan
Lakshmi Award for Chemistry of Gem Minerals & Synthetic Gem Materials	Ms. K Chandrakanthan
Ms. Careen Manel Abeywardena Prize for Natural Products Chemistry	Ms. K Chandrakanthan
N M S Hettigedara Family Prize for Pharmaceutical & Medicinal Chemistry	Ms. K Chandrakanthan
Dharmarathne Wasala Prize for Computational Chemistry	Ms. K Chandrakanthan
Deepa Sotheeswaran Gaschik Prize for Agro Chemicals	Ms. K Chandrakanthan
Pincock Prize for Photochemistry	Ms. K Chandrakanthan
W R O Fernando Memorial Prize for Energetics and Kinetics	Ms. K M Wijesinghe
Dr. S Lakshman De Silva Memorial Trust Prize for Physical Organic Chemistry	Ms. K M Wijesinghe
Professor P P G L Siriwardene Prize for Further Topics in Inorganic Chemistry	Ms. K M Wijesinghe
Dr. Sudath Kumarasinghe Prize for Special Topics in Physical Chemistry	Ms. L N Dayaratne
Mr. & Mrs. H G Dias Memorial Prize for Electrochemical Technology	Ms. L N Dayaratne
Institute of Chemistry Ceylon Alumni Association North American Chapter Prize for Further Topics in Physical Chemistry	Ms. W A K Gunarathne
Mr. & Mrs. N I N S Nadarasa Prize for Advanced Topics in Organic Chemistry	Ms. M K B K Perera
Dr. Lakshman Ponnamperuma Prize for Special Topics in Inorganic Chemistry	Ms. P S Ishtaweera
Vidyajothi H R Premaratne Prize for Particle Physics	Ms. P S Ishtaweera
Prof. Paul & Rune Sharp Prize for Fundamentals of Chem. Process Engineering	Ms. C T R Silva
Mr. Cyril Suduwela Prize for Petroleum & Petrochemicals	Ms. K N M L N Kosgahakumbura
Piyadasa & Kalyanawathi De Silva Memorial Prize for Quality Management	Ms. K N M L N Kosgahakumbura
Dr. Lakshmi Arambawela Prize for Research Project beneficial for the country	Ms. R Y Madurawala
Susila Jayaweera Memorial Prize for Biochemistry II	Ms. K M K G Perera
Mr. & Mrs. Suppiah & Seethadevi Prize for Analytical Industrial Biochemistry	Ms. K G Rajawasam
Dr. Premaratne and Family Prize for Nano Technology	Ms. W C S Munindradasa
Dr. A P De Silva Prize for Chemical Education	Ms. M T Fernando
Dr. & Mrs. Swaminathan Prize for Information Technology for Chemists	Mr. R A D Y R Ranathunga Ms. C T R Silva

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ROYAL SOCIETY OF CHEMISTRY | SRI LANKA LOCAL SECTION

RSC NEWS

THE ROYAL SOCIETY OF CHEMISTRY SRI LANKA SECTION

1. Membership

According to the records sent to us from the parent body, a breakdown of the membership is as follows:-

Category	Number
CChem, FRSC	09
FRSC	03
Chem, MRSC	07
MRSC	27
AMRSC	18
Affiliate /Under Graduate.	10
Total Membership as at July 2017	74

2. Committee of Management

The following were elected to the Committee at the 56th Annual General Meeting held in July 2017.

Hony. Chairman - Mr. I M S Herath
Hony. Secretary - Dr W G Piyal Ariyananda
Hony. Treasurer - Dr. P Iyngaran

Committee Members
Mr. R M G B Rajanayake
Prof. Sudantha Liyanage
Dr. Poshitha Premarathne
Dr. M Sirimuthu
Mr S Perasiriyan
Mr. Sulith Liyanage
Mr. Wasantha Samarakoon
Mr. Viraj Jayalath
Mr. R Abeywickrama
Ms. Subodika Hemathilake

Co opted Members
Dr. M.K. Deeyamulla
Prof. W S Fernando
Mr. T M Kumara

3. Activities

3.1 Contributions to Activities of the Institute of Chemistry Ceylon
(a) Full page advertisement of "Chemistry in Sri Lanka".
(b) Contribution for the Interschool Chemistry Quiz
(c) Award for the Best Performance at the Graduateship Examination in Chemistry Levels 3/4 Theory Examination

3.2 All - Island Inter School Chemistry Essay Competition.
3.3 Inter University Chemistry Essay Competition
3.4 Book donation programme
3.5 A/L Teacher training workshop
3.6 Advanced Level Chemistry Seminar
3.7 Industrial Visit for B.Sc. Special degree students, M.Sc. students and RSC Members
3.8 Collaboration with SLAAS E-2 workshop and seminars
3.9 Supporting Chemical Societies of Universities in Sri Lanka

Dr Piyal Ariyananda
Hony Secretary

Commemoration of the Third Death Anniversary of Emeritus Professor JNO Fernando

Professor Uma Kumaraswamy delivering the Memorial Oration

ICHEMC AVURUDU FESTIVAL 2018