

CHEMISTRY IN SRI LANKA



MAY 2010 VOLUME 27 - NO. 2

6th Convocation of the College of Chemical Sciences



Awards for
yeoman service
for Educational
activities in an
honorary
capacity



Chemistry in Sri Lanka

ISSN 1012 - 8999

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

Vol. 27 No. 2

May 2010

	Pages
Council 2009/2010	2
Outline of our Institute	2
Chemistry in Sri Lanka	2
Guest Editorial	3
Cover page	3
Message from the President, Institute of Chemistry Ceylon	4
Thirty Ninth Annual Sessions and Sixth Ninth Anniversary Celebrations 2010	5
Symposium Dedicated to Graduate Chemists	6
Scientific Sessions	7
Membership News	8
Professor Pearlyn Pereira Memorial Oration 2010 - Gold Medal Award	8
Concessions for Life Members	8
Kandiah Memorial Graduateship Award 2010	8
Abstracts of Research Papers to be presented at the 39 th Annual Sessions 2010	10
All Island Inter-School Chemistry Quiz Contest - 2009/2010	20
Student Corner: Phosphorus Chemistry	21
Publications of the Institute of Chemistry Ceylon	23
RSC News	24

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"Begining of a New Era: Challenges and Opportunities for Chemists in National Development"

Adamantane House, 341/22, Kotte Road, Welikada, Rajagiriya

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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.)**, **Licentiate (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

- directly become **Licentiate**
- 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 paid on 1st of July every year and will be in respect of the year commencing from 1st July to 30th June

Fellow	Rs. 750
Member	Rs. 750
Associate	Rs. 600
Licentiate	Rs. 500
Technician	Rs. 400
Membership for Life	Rs. 7500

Entrance Fee

All the grades	Rs. 500
Processing Fees*	Rs. 200
Processing Fee for Chartered Chemist designation	Rs. 1000
Institutional Members	Rs. 2500

*per application for admission/transfer to any grade

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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 1500 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 September 2010.

- 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 from the members suggestions for improvement of the publication.

Employability of the Graduates

Professor S Mohandas

former Vice Chancellor University of Jaffna



Out of about 350,000 pupils who enter grade 1, about 300,000 reach the end of the grade 11 free access school system. After two or more years of schooling in grades 12 and 13, about 200,000 school pupils (plus repeaters) sit the GCE (A/L) Examination. Of these about 120,000 qualify for admission to universities and only one sixth of those who meet the standards are admitted to fifteen conventional national universities. For most pupils, admission to a university is the aim and this is achieved by only about 6% of the children joining school at grade 1. Of the 20 – 22,000 students who enter the universities 40% are from Arts stream. Almost all the art graduate are unemployed immediately after graduation.

Around the year 2000, the unemployment rate among graduates was 58% for graduates below 25 years and 35% for those in the 25-30 age group. In 2005 the number reported as unemployed was 42,585 out of whom 63% were arts graduates. It may have been reduced to some extent in 2006, because of the govt. decision in 2005 to give state employment to the unemployed graduates. This decision continued thereafter annually was entirely mitigatory in purpose. It can therefore be considered as an official admission of the low demand in the labour market for university graduates, particularly those graduating from arts courses. Such mitigatory measures can be justified as meeting societal exigencies although the net cost to the economy may not be beneficial. Nevertheless the annual additions to the ranks of unemployed world have continued to keep the graduate unemployment rate high until the recent Presidential and General Elections. At present the total annual output of graduate from the state system alone have exceeded 16,000 of which approximately 5000 graduated from OUSL and external degree programmes of the conventional universities; 85% were arts graduates. Conventional system annually produces approx. 11,000 graduates of which 40% are arts graduates.

A number of factors are assumed to be reason for the high scale of university graduate unemployment, viz, the age at which they complete the degree, inadequate knowledge of the English language, reluctance of the private sector employers to recruit due to their inadequate knowledge of English and Information and Communication Technology (ICT).

The prospect of unemployment after graduation could be reduced by (i) improving the English usage skills of the students, (ii) making obtaining high marks in the General English paper compulsory for university admission, (iii) making good performance in the English Language compulsory for getting a degree and (iv) emphasis of communication and organization skills through giving more importance to project work in the school system. Although English is now made compulsory in almost all the universities to pass the degree, graduates admit that they are unable to satisfy the private entrepreneurs. This is why at present almost all special degree graduates and professional degree graduates are employed in the private sector soon after they sit for the final examination with a higher salary. As such it is recommended that all the general degree graduates shall be given an intensive course in English to improve their writing and speaking skills. In an alternative, increase the intake of special degree or professional degree and for three year science degree undergraduate education, 4th year should be introduced to devote for skills training in industries as practiced in a few universities to pass the degree. At the same some universities offer a three-year-specialization degree and one such course is BSc Environmental Science. Graduates from these 3 year specialization degree programmes also compete with 4 year special degree students to secure jobs in the private sector or go far higher studies. In this context it is very appropriate to mention that the graduates of the Institute of Chemistry Ceylon with Level 1, 2, 3 and 4 competent as any other special graduates of the conventional universities with Level 1,2,3 and 4 for job markets or for higher education.

Cover Page

The second day has been reserved to hold the symposium dedicated to all passed out Graduate Chemists (664 to date and highest member to pass out this year, 92) to coincide with my 25 years of close association with the main educational program of the College of Chemical Sciences, the educational arm of the Institute, The symposium has been planned on the theme "Moulding Chemical Education for National Development in Sri Lanka"

See page 4

Message from the President, Institute of Chemistry Ceylon

It is indeed a very happy occasion for me today to send a message as the President to the 39th Annual Sessions and 69th Anniversary celebration of the Institute of Chemistry Ceylon scheduled from 16th - 18th June 2010. The theme for the current year, 2009/ 2010, has been decided as - "Beginning of a new era: Challenges and Opportunities for Chemist in National Development". This theme was coined at a time the country has just gained victory over terrorism and successful end to 26 year old war which has cost many lives. Most of the people were hopeful about the possibility that the end of war will mean the beginning of a new era, a chance to rethink the future of Sri Lanka in most peaceful terms with new optimism blossoming. With the United Nations General Assembly declaring the 2011 as International year of Chemistry to celebrate the achievements of Chemistry and its contributions to well - being of humanity with tagline - Chemistry our life, Our future and along with the idea that Chemistry is the heart of Science, which is the foundation in which technology for the National Development is built, it would be appropriate to focus our attention to growing challenges Chemists and Chemistry are faced with and see how to convert these challenges to opportunities that would contribute to National Development. Some of the grand challenges faced by chemists I consider to be important includes (i) development of highly selective, energy efficient, and environmentally benign new synthetic methods (ii) develop inexpensive and unlimited energy sources (iii) better understanding of the atmosphere and the biosphere so that we can maintain a livable environment (iv) designing molecular devices and new materials (v) development of robust and selective sensors to help protect the nation against disease and terrorism and (vi) communicating the importance and excitement of chemistry to the general public.

The 39th Annual Sessions is scheduled to commence on the 16th June 2010 with a formal inauguration at the newly refurbished Central Bank Auditorium housed in Centre for Banking Studies at Rajagiriya. We are extremely fortunate to have two scientists (both Inorganic Chemists) of high repute from U. S. A. during the Annual Sessions.. The Chief Guest will be Prof. T. David Westmoreland, Associate Professor in Chemistry, Wesleyan University Connecticut, USA and Guest of Honor, Prof. Paul R Sharp, Professor in Chemistry, University of Missouri - Columbia USA. Prof. Sharp will be accompanied by his wife and will arrive in Sri Lanka ten days prior to the Annual Session to travel around Sri Lanka to see historical sights and natural beauty of Sri Lanka. At this juncture, I wish to extend my sincere thanks to them for accepting my invitation without any hesitation and also informing at the very outset their ability to find travel grants to visit Sri Lanka for the event.

An important and noteworthy event at the inauguration would be that two past Presidents, namely Prof. Siromi Samarasinghe and Dr. Lakshmi Arambawela will receive Distinguish Service Awards for their recognizable service to the Institute during the last two decades. Additionally, Dr. Douglas A. Nethsinghe, one time active member of the Chemical Society, a Soil Chemist by profession and a well known to have won a

Fundamental Rights case in the Supreme Court against the Minister of Industries and Plantations (who was the Prime Minister of this country at the time judgment was announced), will be conferred an Honorary Fellowship.

The second day has been reserved to hold the symposium dedicated to all passed out Graduate Chemists (664 to date and highest member to pass out this year, 92) to coincide with my 25 years of close association with the main educational program of the College of Chemical Sciences, the educational arm of the Institute. The symposium has been planned on the theme "Moulding Chemical Education for National Development in Sri Lanka" and significant number of Graduate Chemists from Sri Lanka and abroad will participate as resource persons. The Chief Guest for the occasion will be Prof. Paul R Sharp and Prof. T. David Westmoreland as Guest of Honor. The symposium will be held at Mt Lavinia Hotel at Horizon and large member of Academics and Graduate Chemists are expected to be in the audience, a Cocktail reception will follow at Adamantane House in the late evening to mark this occasion with large member of Graduate Chemists in attendance.

Technical session will be on the final day at the Adamantane House, Rajagiriya. This will serve as a platform to share research findings of Chemists in Sri Lanka and this will undoubtedly set more challenging goals for their way forward. Technical session will end with late J. P. R. Fonseka Memorial Oration organized to honour a, former President of the Institute who passed away in 2009, and the oration will be delivered by Prof. H. D. Gunawardhana, Senior Professor, University of Colombo on the topic "Value Addition of non - renewable natural resources of Sri Lanka".

The Annual Dinner and the Induction of the new President, Prof. M. D. P. De Costa, for the year 2010/ 2011 will be held on the same day at Galle Face Hotel at Palm Lounge. Prof. H. D. Gunawardhana, my undergraduate teacher and Mrs. Gunawardhana will be the Chief Guest.

We have had a very successful year judging from several activities that have been held. In addition to college activities mainly organized by the Students Association, several training seminar programs, Sinhala and Tamil New year Celebrations for the first time in the history of the Institute, a 'Pola' on the day of the new Graduateship course commenced, Late Prof. Pearlyn Pereira Oration and unveiling of photographs of the Distinguished Service Awardees are some key activities organized by the Council.

I take this opportunity to thank all the Council members, members of all committees and temporary and permanent staff of the Institute for the unstinted support extended to me in many ways for the successful progress during the year. I will be failing in my duties if I do not acknowledge financial support given by Graduate Chemists and Sponsors to make the Annual session truly a memorable one. Finally, I wish to extend my best wishes and fullest co-operation to run the Institute activities to Prof. M. D. P. De Costa President Elect, who will be the President for the year 2010 / 2011, commencing 1st July 2010.

Prof S.P.Deraniyagala
President/Institute of Chemistry Ceylon

Department of Chemistry,
Wesleyan University,
Connecticut, USA



Department of Chemistry,
University of Missouri,
Columbia, USA



SYMPOSIUM DEDICATED TO GRADUATE CHEMISTS

17TH June 2010 (Thursday)

Venue: Mt. Lavinia Hotel @ Horizon

Moulding Chemical Education for National Development in Sri Lanka

- 8.00 a.m. Registration of participants
- 8.30 a.m. **Welcome Address**
Prof. S.P. Deraniyagala
President, Institute of Chemistry Ceylon
- 8.40 a.m. **Chemical Education and the Role of Research**
Chief Guest: Prof. Paul R. Sharp
Professor of Chemistry, University of Missouri-Columbia, Columbia, USA
- 9.15 a.m. **Biosynthesis of Vitamin B1 in Baker's Yeast: A Novel Finding for the Existing Knowledge of an Enzyme**
Dr. Dinuka Abeydeera (Graduate Chemist, 2001)
Post-doctoral Research Associate, Texas A & M University, USA
- 9.35 a.m. **Chemistry is the Best Foundation for your Long Career**
Mr. H. G. A. Prabath Samarasinghe (Graduate Chemist, 1995)
Managing Director, Nexus Business Solutions (Pvt.) Ltd.
- 9.55 a.m. **A Unique, Exemplary and Effective Contribution to Human Resource Enhancement of Graduate Chemists**
Prof. J. N. O. Fernando
Hony. Dean, College of Chemical Sciences, Institute of Chemistry Ceylon
- 10.30 a.m. Refreshments
- 11.00 a.m. **Chemical Education for the 21st Century: Local and Global Perspectives**
Guest of Honour: Prof. T. David Westmoreland
Associate Professor of Inorganic Chemistry, Wesleyan University, Connecticut, USA
- 11.35 a.m. **Organometallics for a Better Future**
Dr. Mathivathini Kandiah (Graduate Chemist, 1998)
Post-doctoral Fellow, University of Oslo, Norway
- 11.55 a.m. **An Integrated Value Driven Process of Chemical Education, with an Appreciation of Nanotechnology, is Vital for National Development**
Mr. Mevan Pieris
Hony. Director, Institute of Chemistry, Ceylon & Chairman, Global Conventions (Pvt.) Ltd.
- 12.30 p.m. Lunch
- 1.30 p.m. **L-Theanine Content in Sri Lankan Tea – An Effective Marketing Tool**
Dr. Nimal Punyasiri (Graduate Chemist, 1988)
Senior Research Officer, Biochemistry Division, Tea Research Institute, Talawakele
- 1.50 p.m. **Essential Oil Processing Technology, Traditional Methodology should not be Ruled Out, a Sri Lankan Perspective**
Mr. K. R. Dayananda (Graduate Chemist, 1984)
Senior Research Officer, Industrial Technology Institute, Colombo 7
- 2.10 p.m. **Role of Chemistry in Health and Well-being of a Society**
Mr. N. M. S. Hettigedara (Graduate Chemist, 1991)
Assistant Superintendent of Police, Police Hospital, Narahenpita & Consultant Nutritionist/Dietician
- 2.30 p.m. **Chemistry of Palmyrah for National Development**
Dr. A. A. P. Keerthi (Graduate Chemist, 2003)
Senior Lecturer, Department of Chemistry and Biochemistry, Nizhney Nogorod State Medical Academy, Saitm, Malabe
- 2.50 p.m. **Chemistry in Fashion Garments**
Mr. K. T. Arulananthasivam (Graduate Chemist, 2002)
Research & Development Manager, Brandix Finishing Ltd, Seethawaka Industrial Park, Avissawella
- 3.10 p.m. **Discussion/ Concluding Remarks**
Prof. S. Sotheeswaran
Visiting Professor of Organic Chemistry, College of Chemical Sciences, Institute of Chemistry Ceylon

SCIENTIFIC SESSIONS

18th June 2010 (Friday)

Venue: Adamantane House

- 9.00 a.m. **Processing induced changes in starch granular structure of some indigenous tubers**
R M I S K Senavirathna, S Ekanayake, E R Jansz and J Welihinda
- 9.20 a.m. **Proximate Composition and Some Mineral Constituents in *Achyranthes aspera* seeds**
R Madanayake, D Rajapakse and S Wimalasena
- 9.40 a.m. **Screening of endosperm iron dense rice varieties for better human nutrition**
H M T Herath, D Rajapakse, S Wimalasena and M K B Weerasooriya
- 10.00 a.m. **Protein, Fat, Iron and Zinc Contents of Rice Varieties Harvested during *Maha* Season of year 2005/2006**
H M T Herath, D D Edirisooriya, D Rajapakse, S Wimalasena and M K B Weerasooriya
- 10.20 a.m. **Effect of spices on oxidative stability and fatty acid composition in cooked herring (*Clupea harengus*)**
H P S Senarath, E M R K B Edirisinghe and M S W de Silva
- 10.40 a.m. TEA
- 11.00 a.m. **J.P.R. Fonseka Memorial Oration**
“Value addition of non-renewable natural resources of Sri Lanka”
Prof. H.D. Gunawardhana, Senior Professor of Chemistry, University of Colombo
- 12 noon LUNCH BREAK
- 1.00 p.m. **The study on removal of congo red dye from the effluents of textile industry using an adsorptive method**
U S K Weliwegamage and H M K C Herath
- 1.20 a.m. **Development of a colorimetric method to determine phosphate in water**
S P Deraniyagala, V G Thangavadivale and R M S M Rajapaksha
- 1.40 a.m. **A modified method for the determination of total fatty matter in soap**
M D P De Costa, K D P Hemalal, K R N N Warnasekera, K S Kalhari, R Rajapaksha, D M U J Abeyasinghe and A M D Attanayake
- 2.00 p.m. **Performance evaluation of market available oxidative hair dye: An improvement to the SLS method**
M D P De Costa, K D P Hemalal, K R N N Warnasekera and K S Kalhari
- 2.20 p.m. **Determination of thermodynamic parameters of the interaction of 2-hydroxybenzoic acid and 2-hydroxy-3,5-dinitrobenzoic acid with Bovine Serum Albumin (BSA) in excited state**
R P Perera, K R S Tenna Hewa and V N P Liyanage
- 2.40 p.m. TEA
- 3.00 p.m. **Spectroscopic studies of the interaction between 4-phenyl-1-(2-phenylallyl)pyridinium bromide with ibuprofen**
R P Perera, T A N Peris and V N P Liyanage
- 3.20 p.m. **Antimicrobial activity of some phenolic lichen compounds**
V M Thadhani, V Karunaratne, I Choudhary and S Khan
- 3.40 p.m. **Possible bio-fungicide to control Anthracnose caused by *Collectotrichum gleosporioides***
M K B Weerasooriya and T A N S Thambugala
- 4.00 p.m. **Antimicrobial activities of endolichenic fungi isolated from *Usnea* sp. at Hakgala montane forest**
P A Paranagama, B T S D P Kannangara and T G I Sandamali
- 4.20 p.m. **Antibacterial activity of the secondary metabolites of endolichenic fungi isolated from *Pseudocypellaria* sp.**
P A Paranagama and N A S Karunaratne

Membership News

The following persons have been either transferred or admitted to the categories of membership and designation between September 2009 and December 2009.

Admission to Member

Mr. R W S M N Manorathne
Mr. S A T Bandara
Ms. S N Kalaimathy
Mr. A G P A Aravinna

Admission to Licentiate

Mr. M P Wijesinghe
Mr. N S Bopage
Mr. J I P Perera
Mrs. L V Athiththan
Mr. M K S P Fernando
Mr. M M R M Marasinghe
Mr. N W A S Premathilaka
Mr. R A I S De Silva

Transfer to Member

Mr. D N P Welikala
Mr. M G A N Perera
Dr. A P Keerthi
Dr. (Ms) M G CC Padumadasa
Mr. W S C A Fonseka
Dr. S D M Chinthaka
Ms. S K Hettihewa

Transfer to Fellow

Dr. L Larunanayake
Mrs. S P Haputhanthree

Chartered Chemist

Mr. A M W W S K Wataketiya

Admission to Associate

Mr. P T K Arachchige

Professor Pearlyn Pereira Memorial Oration 2010 Gold Medal Award

The Professor Pearlyn Pereira Memorial Oration was delivered by Professor M Dayal P De Costa of the Department of Chemistry, University of Colombo on 26th May 2010 at Adamantane House. His presentation was entitled "Mechanistic studies of photo-induced electron transfer and development of fluorescence probes based on hydroxamic acids for analysis of metal ions". The complete oration will be published in the September issue of Chemistry in Sri Lanka.

Concessions for Life Members :

The following clinics/Laboratories will provide concessions for Laboratory test Reports and OPD Examinations:-

Medisense Laboratory, Malay Street, Colombo 2

Ohlums clinic and Laboratories, 288, Galle Road, Colombo 4

Medisport, Jayantha Weerasekera Mw., Colombo 10

Asiri Surgical Hospitals, Kirimandala Mawatha, Colombo 5 for OPD Medical Test Reports, ECG and Xrays

This facility is currently confined only to Life members & their spouse, and children below 18 years. Members are requested to become Life Members and enjoy these concessions which provides a 10% discount on the normal clinic/hospital charges. Life Members also become automatically entitled to our Institute's Benevolent Fund benefits.

Kandiah Memorial Graduateship Award - 2010

Kandiah Memorial Awards - 2010

Three Kandiah Memorial Awards are made annually to commemorate Prof. A Kandiah, the first President of the Chemical Society of Ceylon. Professor Kandiah served in the University of Ceylon from 1933 and was the Professor of Chemistry at the University of Ceylon from 1934 until his death in 1951.

The Kandiah Memorial Awards for Basic Chemistry and Applied Chemistry are awarded for the best research contribution in Chemistry carried out by a postgraduate student registered at a Higher Education Institute and for work carried out in Sri Lanka with the exception of special analysis (less than 20% of findings) that cannot be done in the country.

The Kandiah Award for Basic Chemistry is made for research predominantly in Basic Chemistry (Organic, Inorganic, Physical & Analytical).

The Kandiah Award for Applied Chemistry is made annually for research in related areas such as polymer, food, biochemistry, biotechnology etc. where interdisciplinary research is involved, provided that chemistry has a central role & comprises at least 50% of the content.

The Kandiah Memorial Graduateship Award is awarded to the best piece of research in the chemical sciences carried out by a Graduate Chemist of the Institute of Chemistry Ceylon registered with a Higher Educational Institute for a postgraduate degree.

Kandiah Memorial Graduateship Award - 2010



Mr N D A Wageesha of Department of Biochemistry, University of Sri Jayewardenepura, Nugegoda has been awarded the Kandiah Memorial Graduateship Award in recognition of his research on '*Hypercarotenaemia in Sri Lankan children below 5 years of age and experimental studies on Hypercarotenaemia in rats and mice*'. The research was carried out under the supervision of Dr. S Ekanayake of the Department of Biochemistry, University of Sri Jayewardenepura.

Mr. Wageesha obtained his Graduate Chemist qualification in 2007 from the College of Chemical Sciences, Institute of Chemistry Ceylon with a Second Class lower division honors. Presently he is working as a Research Assistant, Department of Biochemistry, Faculty of Medical Sciences, University of Sri Jayewardenepura.

Abstract Kandiah Memorial Graduateship Award - 2010

Hypercarotenaemia in Sri Lankan children below 5 years of age and experimental studies on Hypercarotenaemia in rats and mice

¹N.D.A. Wageesha, ¹S. Ekanayake, ¹E.R. Jansz, ²S.P. Lamabadusuriya

¹Department of Biochemistry, University of Sri Jayewardenepura, Nugegoda

²Department of Paediatrics, University of Colombo, Colombo

Hypercarotenaemia is clinically diagnosed by yellowing of the dermal tissue particularly in the palms and soles but not the sclera of the eye. It is reported in Sri Lanka particularly, but not exclusively, in infants and young children. This study focused only on hypercarotenaemia due to ingestion of carotenoid rich foods and hypercarotenaemia due to liver and thyroid pathology was excluded.

The main objectives of the present study were;

1. To study the prevalence of hypercarotenaemia in Sri Lankan infants/children and to determine the genetic basis of hypercarotenaemia.
2. Based on studies using rats and mice, to determine whether a defect in intestinal absorption/malabsorption of carotenoids could be a factor contributing to hypercarotenaemia in infants and children.

Thirty six hypercarotenaemic subjects were tested for carotenes and their metabolites in their serum by using RP-HPLC. The carotenoids were classified as α and β carotenes, monohydroxy metabolites and polyhydroxy metabolites. These varied from 119 $\mu\text{g/dL}$ to trace amounts, 149 $\mu\text{g/dL}$ to trace amounts, 214 $\mu\text{g/dL}$ to non detectable or less than 0.5 $\mu\text{g/dL}$, 823 $\mu\text{g/dL}$ to 7.0 $\mu\text{g/dL}$ respectively. It was possible to predict the contribution of carotenoid rich foods to the condition by the presence of α -carotene (carrot), β -cryptoxanthin (papaw). There was no hypervitaminosis due to vitamin A.

Longitudinal studies after withdrawal of carotenoid rich food were carried out. Serum carotenoid levels declined at slightly varying rates, while vitamin A levels were more or less maintained, probably due to the liver 15-15'-dioxygenase activity.

Classically hypercarotenaemia is termed to be genetic or metabolic. Findings of the present study

indicate that hypercarotenaemia observed in the studied subjects was due to a genetics cause. This is supported by identical hypercarotenaemic twins having similar serum carotenoid profiles. Seventeen siblings of other hypercarotenaemics fed on similar diets did not show hypercarotenaemia indicating a genetic influence in the development of hypercarotenaemia. From the results obtained it is not clear whether the gene responsible is recessive or dominant. The low number of siblings in this study probably prevented the Mendelian ratio being shown.

A preliminary prevalence study of hypercarotenaemia among pre-school children aged below 5 years in the Western Province indicated that the prevalence among all the subjects was 1.5% and those on carotenoid rich food approximately 2%.

Preliminary tests on stools of three hypercarotenaemic and 4 non-hypercarotenaemic subjects showed that α and β carotenes are not detected (LOD = 0.5 $\mu\text{g/dL}$) in hypercarotenaemic patient's stools while the stools of three non hypercarotenaemics showed 1.53 $\mu\text{g/dL}$ and 0.7 $\mu\text{g/dL}$, 1.74 $\mu\text{g/dL}$ and 1.0 $\mu\text{g/dL}$, 1.0 $\mu\text{g/dL}$ and trace amounts and 1.8 $\mu\text{g/dL}$ and 1.4 $\mu\text{g/dL}$ of β and α carotenes respectively per one gram of freeze dried stool.

In the animal study, it was not possible to induce hypercarotenaemia in Wistar rats or ICR mice breed, despite being fed on high carotenoid rich diet. Carotenoids were undetectable in serum, liver, adipose tissue around the kidneys, bile (in mice), and digesta (in rats). However both types of rodents showed high levels of α and β carotenes in the faeces, thus indicating that one natural way of preventing hypercarotenaemia is by controlling the absorbtion. However very fast metabolism of absorbed carotenoids cannot be ruled out especially if the final excretion product does not have the characteristic carotenoid chromophore.

Scientific Sessions : A - 01

Processing induced changes in starch granular structure of some indigenous tubers

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Most of the tuber varieties which were consumed by our ancestors are good sources of starch but now underutilized. Even though the starch of raw flour obtained from tubers is extensively studied, reported data on processed flour is scarce. Thus the main objective of this study was to observe the processing induced changes in some properties of starch of the following tubers; hulankeeriya (*Maranta arundinacea* L), buthsarana (*Canna indica*), raja ala (*Dioscorea alata*) violet and white varieties.

Tubers were (=5kg) collected in bulk from Kurunegala, Matale and Kandy areas. The cleaned tubers were boiled (3:7w/v water; as for consumption) for 20-40 minutes, peeled, cut in to small pieces and dried (40-45°C) and milled (IKA A11 basic, Brazil). Raw flour was obtained by the same procedure without boiling. Starch from the dried flour was isolated following digestion with pepsin and centrifugation. The final sediment was washed repeatedly with water and 60% ethanol, centrifuged (2000 rpm, 20 minutes) and dried.

Stained (I/KI) raw and processed starch granules were studied using a light microscope (Olympus bx 50, Japan) under x10, x40 magnifications. The length and breadth of raw and processed starch granules (n=50) were also measured using a scaled microscope (Olympus ch 30, Japan) to study the swelling and degradation of the granular structure. Molecular size distribution of starch was studied by solubilizing starch and introducing into a SepharoseTM CL-6 B (Amersham Biosciences, Sweden) column (30cm/2.5 cm, flow rate-1.7mL/min, void volume with Blue dextran 2000, bed volume with glucose) and fractions analysed with phenol sulphuric acid method. Amylose content was determined colourimetrically by reacting with KI/I/NaOH solution.

The amylose content of the tubers ranged between 39-69 g/100g starch with hulankeeriya and raja ala (white) having the lowest and the highest values respectively. In raw flour the average lengths and breadths of starch granules ranged from 21.9-69.4 μ m -19.2-44.3 μ m with the largest granules being observed in buthsarana, smallest in hulankeeriya and the 2 raja ala varieties having similar granular size. The raw starch granules of raja ala (white and violet) were ellipsoid and rod like in shape whereas hulankeeriya and buthsarana were round-oval and ellipsoid respectively. Processing

had caused starch granular swelling and disintegration. Though the largest granular particles were observed in raw buthsarana, the starch granules had the lowest percentage (330%) of swelling with the highest swelling percentage (540%) being observed in raja ala white variety indicating high water binding capacity.

Buthsarana and hulankeeriya starch granules were highly gelatinized and disintegrated following processing. An interesting observation was that the boiled starch granules of raja ala (violet and white) were cell enclosed as with legume starches which could explain the low postprandial glucose response and low serum glucose peaks¹.

Molecular size distribution patterns indicated that hulankeeriya and buthsarana raw flour had 92% & 95% of higher molecular weight starch granular particles with the rest being medium molecular weight starch (MMWS) particles. In contrast raja ala white and violet varieties had 84% & 60% high molecular weight starch particles respectively with the rest being MMWS. Boiling had caused medium molecular weight starch granules percentage to increase (more than 30% in 2 raja ala varieties) with a low percentage increase in low molecular fraction compared to raw starch. This could be attributed to breakdown of starch granules due to gelatinization on processing and to inherent amylase activity.

The above results indicate that the starch of tuber varieties have different structural characteristics and thus susceptibility to geletinization, which could depend on the botanical source of the starch. The starch of raja ala varieties which were cell enclosed, with higher MMWS (mainly amylose) compared to other two tubers studied and had increased swelling capacity (high water binding capacity) thus could be recommended to be incorporated /utilized in the preparation of foods with a lower glycaemic responses.

Acknowledgement The grants NSF/RG/2005/AG/10, NRC (05-03), IPICS SRI: 07 are gratefully acknowledged.

References:

1. Senavirathna, R.M.I.S.K., Ekanayake, S., Jansz, E.R and Welihida, J., 2009, *Proceeding of the 65th Annual Sessions Sri Lanka Association for the Advancement of*

Proximate composition and come mineral constituents in *Achyranthes aspera* seeds

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Achyranthes aspera (Sinh. Karalheba, Tamil Nayari,) belongs to family *Amaranthaceae* and is reported as a plant of high nutritional as well as therapeutic value. The dehusked seeds are also used for treatment of headaches, insomnia, epilepsy and infectious diseases. It also has hyperglycemic and hyperlipidemic activity. The seeds have been consumed as a food supplement during long periods of meditation by hermits in India.

The nutritional value of the plant found in Sri Lanka has not been reported. The moisture, protein, fat, ash, crude fibre and carbohydrates were determined using AOAC methods, using oven drying method, Kjeldhal method, Soxhlet extraction, drying in a muffle furnace at 550 °C, Acid and alkaline hydrolysis followed by ashing and carbohydrates by difference respectively. The potassium, calcium and iron contents in the ash were determined using atomic absorption spectroscopy while phosphorous content was determined using Vanado Molybdate method. Total and

reducing sugar was estimated using Lane & Eynon method and starch was determined using acid hydrolysis followed by estimation of sugars. The dietary fibre was estimated using enzyme digestion method. The percentages of moisture, protein, fat, ash, crude fibre and carbohydrate were $10.2 \pm 0.2\%$, 28.2 ± 0.3 , 4.6 ± 0.2 , 3.8 ± 0.1 , 3.7 ± 0.1 and 49.5 ± 0.2 respectively. The potassium, calcium and iron contents in the seeds were 348 ± 0.1 mg, 44 ± 0.5 mg and 0.004 ± 0 mg per 100 g respectively. The phosphorus content is 10.8 ± 0.1 mg/100g. The percentages of starch, total sugars, dietary fibre, soluble dietary fibre and insoluble dietary fibre were 6.3 ± 0.0 , 2.5 ± 0 , 18.8 ± 0.1 , 1.9 ± 0.0 and 16.9 ± 0.2 respectively.

The study shows that *Achyranthes aspera* is a good source of protein, dietary fibre, potassium and calcium than rice. After studying the therapeutic and toxic factors it can be used in the formulation of a food product with high nutritional value.

Screening of endosperm iron dense rice varieties for better human nutrition

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Iron and zinc are the micronutrients, which have several vital functions in the body. Most of the iron in the body is present in the haemoglobin, serves as a carrier of oxygen to the tissues from the lungs where as zinc plays a vital role in growth, development and functioning of immune system in humans.

Iron deficiency anaemia is the most prevalent nutritional deficiency amongst the population of Sri Lanka. It is estimated that one third of the population is iron deficient, based on haemoglobin content in blood (in women <120 g/l and men <140 g/l). The most vulnerable groups to iron deficient are infants, children, adolescents, women of childbearing age and especially pregnant women. It is mainly caused by low iron content in the diet during rapid body growth and poor absorption of iron from staple cereals. Dietary phytates by forming metal-phytate bonds, contribute to a mineral depletion and deficiency in populations of those who rely on whole grain and legume based products.

Rice is the staple food among Sri Lankans. One of the major nutritional problems is nutritional anaemia, prevalent in rice consuming countries because of inadequate and unbalance dietary intake of iron. Milling removes the most of the iron in the grain. Therefore

improving the iron content in rice grain and its bio-availability is a way of combating iron deficiency anaemia in the population. The present study explains the potential to use rice as a vehicle to upgrade the nutritional status of population.

A sample of forty-two rice varieties, grown in a Complete Randomized Block Design (CRBD) at Bombuwala (iron rich soil) and Batalagoda (iron non-rich soil) during Yala and Maha season of year 2006 and 2007 were screened in duplicates for stable high iron rice varieties. The results were pooled and analyzed considering the overall variation in two seasons in two locations. The iron content ranged from 1.75 mg/100g to 3.23 mg/100g and zinc content ranged from 2.51mg/100g to 3.91 mg/100g. A significant difference ($p < 0.05$) in iron content and zinc content were observed for the variables of variety, location and season. Fifteen high iron rice varieties of Kalubala Wee (3.23 mg/100g), Pachchaperumal (2.99 mg/100g), Dahanala (2.98 mg/100g), Rathu Heenati (2.95 mg/100g), Murungakayan (2.94 mg/100g), Kattamanjal (2.89 mg/100g), Rathal (2.82 mg/100g), AT 307 (2.80 mg/100g), Madathawalu (2.79 mg/100g), Bg 358 (2.73 mg/100g), Suduru samba (2.72 mg/100g), Sudu Heenati

(2.65 mg/100g), Suwanda samba (2.55 mg/100g), Basmati 370 (2.54 mg/100g), Kalu Heenati (2.51 mg/100g) and Wanni dahanala (2.43 mg/100g) were selected and polished at a degree of polishing 8 – 10 % by calibrating the Polishing Machine (Model: Satake) with percentage removal of bran to time intervals. These samples were acid digested and analyzed for their iron and zinc contents by Inductive Coupled Plasma- Optical Emission Spectroscopy (ICP-OES). Phytate content was determined in eluted fraction from anion exchange column followed by wet digestion and quantification by spectrophotometric technique.

Results indicated that iron and zinc contents in polished rice varieties ranged from 0.23 to 0.47

mg/100g and from 1.2 to 2.9 mg/100g respectively. Phytic acid contents of polished rice varieties ranged from 200 mg/100g – 300 mg/100g.

Although the loss of iron occurs during milling process (around 85 %), some rice varieties have a potential to retain more of its iron content after milling. These varieties are the genetically endospermic iron rich rice varieties. They are the Suduru samba (0.47 mg/100g), Basmati 370 (0.37 mg/100g), Kalu Heenati (0.42 mg/100g), Rathu Heenati (0.44 mg/100g) and Sudu Heenati (0.37 mg/100g). Above varieties are better for human consumption to combat iron deficiency.

Scientific Sessions : A - 04

Protein, Fat, Iron and Zinc contents of rice varieties harvested during *Maha* season of year 2005/2006

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Iron deficiency anaemia, protein malnutrition, low growth and mental development in childhood and increased prevalence of non-communicable diseases such as diabetics, cancer and coronary heart diseases are the major reported national health problems in Sri Lanka. Rice is the staple food of Sri Lanka and it reaches the general population. Therefore development of rice varieties with improved health promoting functional properties such as high Fe and Zn, high protein, high antioxidant, low glycemic index, low phytates etc. becomes important.

Breeding of new rice varieties so far have been based on properties such as enhanced yield potential, resistance to biotic stresses, tolerance to abiotic stresses with acceptable plant characteristics and consumer acceptable grain quality parameters. Since the available rice germplasms are not so far screened for health promoting functional properties, twenty two rice varieties grown in Complete Randomized Block Design (CRBD) with two replicates during *Maha* season of year 2005/2006 at Regional Rice Research and Development Centre (RRRDC), Bombuwala, were evaluated for health promoting functional properties and their grain quality characteristics. The traditional varieties analyzed were Rathal, Herath Banda, Kalu Heenati, Sudu Heenati, Devaraddari, Batapolal, Beath Heenati, Rathu Heenati, Molligoda, Kahata wee and Murungakayan while improved varieties analyzed were At 306, Bw 267-3, Bg 360, Bw 272-6b, Bw 361, Bg 300, Bg 359, Bw 99-1046, Bw 363, Bg 352, Ld 356.

Whole grain was used for the evaluation of physical parameters and for the quantitative determination of iron and zinc contents while the whole grain milled to particle size 0.5 mm was used for the evaluation of other chemical parameters.

Established procedures given in AOAC (2000) were used for the estimation of proximate composition, iron and zinc contents. Pericarp colour was determined by visual observation and grain size was determined by grain length to width ratio. Data were statistically analyzed by ANOVA followed by Duncan's Multiple Range Test.

The present study showed that protein content of traditional and improved varieties ranged from 9.3 (Herath Banda) - 11.1% (Kahata wee) and 8.6 (Bw 361) - 10.4 (Bw 272-6b) % and fat content of the same 2.1 (Kalu Heenati) - 3.6% (Beath Heenati) and 2.4 (Bg 359) - 3.2 (Bw 272-6b) % respectively. Further there were statistically significant differences ($P < 0.05$) between above parameters amongst rice varieties. Results show pericarp colour of the grain does not affect the nutritional composition of rice varieties.

Iron content of traditional rice varieties 2.7 (Molligoda) – 5.1 (Rathal) mg/100g were higher than that of improved rice varieties 2.3 (Bw 361) – 3.4 (Bg 300) mg/100g where as zinc content of traditional and improved ranged from 2.2 (Molligoda) – 3.4 (Rathal) mg/100g and 2.1 (Bg 359) -3.3 (Bw 363) mg/100g respectively. There was a significant varietal difference ($P < 0.05$) between iron levels and zinc levels. Traditional rice varieties of Kalu Heenati, Rathal, Devaraddhari, Rathu Heenati and Murungakayan contained high iron contents and respective values being 3.6, 5.1, 3.9, 3.8 and 3.8 mg/100g. Among them protein content of Rathal (10.3 %), Devaraddhari (10.57 %) and Kalu Heenati (10.99%) were remarkably high and had a red colour pericarp. Therefore these varieties are better for consuming and to be used in breeding trials.

Effect of spices on oxidative stability and fatty acid composition in cooked herring (*Clupea harengus*)

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Lipid oxidation is the one of main causes for changes in organoleptic and nutritional qualities especially in seafoods. The present study was conducted to investigate the effect of five selected spices; Chillie (*Capsicum annum*), Black pepper (*Piper nigrum*), Turmeric (*Curcuma longa*), Clove (*Syzygium aromaticum*) and Cinnamon (*Cinnamomum zeylanicum*) on fatty acid composition and oxidative stability of lipids in cooked Herring (*Clupea harengus*). Lipid fraction was extracted from raw and cooked Herring (after 1 and 24 hours of cooking). Fatty acid composition, Peroxide value (PV), % Free Fatty Acid (%FFA) of extracted lipids were determined using AOCS method.

All the samples except Cinnamon - added sample (247.27 meq/kg $\pm$ 11.6), showed lower peroxide content after one hour of cooking when compared with control (242.27 meq/kg $\pm$ 22.2). Lower PV was observed in samples added with Clove (42.71 meq/kg $\pm$ 6.3), Pepper (56.90 meq/kg $\pm$ 9.9) and BHT (75.91 meq/kg $\pm$ 10.9) than raw sample (90.24 meq/kg $\pm$ 5.3). Storage of sample for 24 hours showed considerable increase in peroxide content especially in control (439.63 meq/kg $\pm$ 18.1), Cinnamon - added sample (414.44 meq/kg $\pm$ 22.6) and Chillie- added sample (209.31 meq/kg $\pm$ 14.0). After one hour of cooking, sample added with Pepper (11.52 $\pm$ 1.42) showed lowest FFA and Chillie (33.21 $\pm$ 2.2) being highest compared to the control (23.11 $\pm$ 1.5). FFA increased after 24 hours in all samples except Chillie, Turmeric and Cinnamon added samples. Peroxides are primary products of lipid oxidation. Increase in PV indicates the oxidative rancidity to be in progress during storage and lower values of PV signify high oxidative stability. Statistical analysis of PV and FFA between the control and spice - treated samples indicated a significant difference ($p < 0.05$) after 1 hour and even after 24 hours. Herring contains high amount of

docosahexaenoic (C22:6 n-3, DHA) (27.24% $\pm$ 0.8) followed by palmitic (C16:0) (24.14% $\pm$ 1.3), oleic (C18:1) (18.81% $\pm$ 0.2), and eicosapentaenoic (C20:5 n-3, EPA) (6.68% $\pm$ 0.1) acids. Predominant fatty acids in all samples were DHA, palmitic and oleic acids. In all samples, Saturated Fatty acids (SFAs) accounted for 32 – 40%, while Monounsaturated Fatty acids (MUFAs) contributed to 20 – 25 %. PUFA contributed to higher percentage ($\geq 40\%$) of fatty acid composition in all samples except samples added with Chillie and Cinnamon. The fatty acid composition results showed stability of individual fatty acids during storage. The highest and lowest values of DHA were reported with Pepper (31.14% $\pm$ 0.8) and Chillie (15.74 % $\pm$ 1.6) respectively. Palmitic acid contributed to second largest proportion of total fatty acids in all samples except Cinnamon – added and Chillie – added samples where sample added with Pepper (25.21 % $\pm$ 0.2) showed lowest and Cinnamon - added sample (27.89% $\pm$ 0.7) highest values. In all samples, increment in SFA and reduction in PUFA were observed with the storage. Significant difference ($p < 0.05$) in individual fatty acids, total SFA and PUFA was observed between the control and Spice – treated samples. The results revealed that selected spices have different effects on fatty acid composition in cooked Herring. Among selected spices, Clove and Pepper have an outstanding effect on oxidative stability of lipids in cooked Herring and storage of those samples for one day does not affect the stability of lipids.

Key words: Spices, Lipid oxidation, Fatty acid composition, Cooked Herring

Reference:

AOCS. (1992). Official methods and recommended practices. Association of American Oil Chemists Society, USA.

Acknowledgement: Post Harvest Technology Division of the NARA is highly acknowledged for providing laboratory facilities. Financial assistance granted by the IRQUE/QEF/D4RG/2009/03.

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The study on removal of congo red dye from the effluents of textile industry using an adsorptive method

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Adsorption of dyes on locally available low cost inorganic adsorbents is an alternative technology to remove colour from its aqueous solution. Apatite, dolomite and activated carbon have been used as adsorbents for the removal of Congo Red dye (direct anionic dye) from its aqueous solution. The effects of various experimental parameters on removal of dye were investigated. The optimum conditions were found as initial dye concentration 40 ppm, pH 7, 80 g/L adsorbent dose and <50 µm adsorbents' particle size. Among the all three adsorbents dolomite shows the best removal of dye about 99% at optimum conditions. Adsorption data for a wide range of adsorption concentrations have been treated using Langmuir and Freundlich isotherms.

Adsorbent	R_L	n	$1/n$	K_f
Activated carbon	0.025	2.571	0.389	0.98
Apatite	0.012	2.304	0.432	1.67
Dolomite	0.043	14.49	0.069	0.35

Table 1: The Langmuir & Freundlich isotherm parameters for different adsorbents

The linear plots of Langmuir isotherms were obtained and separation factor R_L was calculated using Langmuir equation. The value of R_L are 0.012 and 0.043, which fall in the range, $0 < R_L < 1$ summarized in Table 1 that indicates adsorption process as favorable. The Langmuir adsorption isotherm studies showed that the Q_0 limiting amount of adsorbate per mass of adsorbent/mg g⁻¹ of activated carbon, apatite and dolomite for congo red dye were 2.36mg/g, 2.82 mg/g, and 2.72 mg/g respectively. Values of K_f and n were calculated from the Freundlich plots. The larger the value of adsorption capacity, K_f , the higher the adsorption. Result from this experiment shows that Freundlich intensity parameter, $1/n$ values are close to zero, indicating beneficial adsorption. This study indicates that apatite and dolomite could be employed as a low cost alternative to commercial activated carbon.

Development of a colorimetric method to determine phosphate in water

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Phosphate, which is one of the three major nutrients needed for plant growth, is added to fertilizers. Phosphate can be leached from both phosphate rich soil and sewage to surface and ground water. High phosphate content in surface water can cause eutrophication, which is a serious threat to aquatic life. Accordingly, it is necessary to have an accurate and sensitive method to determine phosphate levels in natural waters. Phosphate is determined by gravimetric, titrimetric and colorimetric methods. The two standard methods used in phosphate determination are the phosphovanadomolybdate method and the molybdenum blue method.

In this study, the reaction between Iron(III) thiocyanate complex and phosphate was used in the determination of phosphate in water, a method similar to that was developed by us to determine fluoride. The decrease in the absorbance of the Iron(III) thiocyanate complex at 480 nm was monitored with varying amounts of phosphate. The calibration plot used was a plot of absorbance at 480 nm versus the concentration of phosphate at in the solution where the pH was maintained at the range of 2.92-2.98 by using a pH 2.20 buffer, with $R^2 = 0.9970$. The experiment carried out in room temperature (29 °C).

Since water contains anions such as Cl^- , NO_3^- , CO_3^{2-} , SO_4^{2-} , OH^- , NO_2^- , I^- and F^- can have an effect on the method, the effect of these anions was investigated as interference ions of the developed phosphate determination method. The results indicate that Cl^- (0-50,000 ppm), NO_3^- (0-200,000 ppm) and SO_4^{2-} (0-5000 ppm) ions do not cause a significant error in the determination of phosphate. The effect of interference anions such as hydroxyl (which causes an absorbance loss of 25.4% when the concentration of it is 10 ppm) and carbonate (which causes an absorbance loss of 30.1% when the concentration of it is 20 ppm) can be eliminated at the working pH range. A significant effect was seen with fluoride ions (a 14.5% absorbance loss when the concentration of fluoride was 1 ppm). However, at the working pH range, the fluoride ion is converted to HF and thus causing the effect of fluoride is negligible. The developed method was compared with the phosphovanadomolybdate method using standard phosphate samples, and the new method was found to produce results comparable to the phosphovanadomolybdate method.

A modified method for the determination of total fatty matter in soap

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It is essential to have quick methods for the analysis of products in industry, since most of the products are now been manufactured using machines. Therefore, earlier the detection of the quality of the product in the production line, the lesser the wastage. This will make the industry more environmentally friendly by keeping wastage to a minimum and increasing the profits. Both these are essential features in Industry. The objective of this study was to shorten the time required to determine the TFM value maintaining the accuracy of the analytical process. The standard method for the Determination of TFM given in C.S. 27: 1968 and SLS 34:1981 was modified accordingly.

According to the SLS method (SLS 34:1981) the TFM can be determined by decomposing the soap with strong acid and extracting the separated fatty matter with diethyl ether. In this method a specified weight of the soap is dissolved in hot water, the solution is poured into a separating funnel while it is hot, and sulfuric acid is added in excess to release the fatty acid. However, before adding diethyl ether to extract the fatty matter from the mixture, it should be cooled to room temperature in order to ensure smooth extraction of the fatty matter. Thereafter, the extracted fatty matter dissolved in ethanol and titrated with ethanolic sodium hydroxide. The above steps are time consuming and the analysis generally takes more than four hours. We have made some changes to the procedure, and the modified method is given below.

The soap is dissolved in hot water in a beaker and sulfuric acid is added in excess. The mixture is allowed to stand for five minutes and then cooled to room temperature in ice bath. The mixture is poured in to a

separating funnel with some diethyl ether and the fatty matter is extracted with diethyl ether (50 cm³ x 3). The diethyl ether is removed by evaporation and the flask is heated in an oven at 120 °C until the difference in weight, after drying in the oven for an additional 15 minutes does not exceed 5 mg. This process takes only 45 minutes while the method given in C.S. 27: 1968 taken at least four hours. The accuracy of the proposed method was assessed by comparing TFM value of a number of brands of soaps determine by the two methods.

Table 1: Averages and Standard deviations analysed by the two methods

Brand	Number of samples used in analysis	Average TFM by standard method	Standard deviation of standard method	Average TFM by proposed method	Standard deviation of proposed method
A	5	78.89	1.0968	78.61	1.0642
B	5	50.68	1.2941	50.60	1.3636
C	5	68.19	1.1712	68.26	1.2420
D	5	61.28	0.6306	61.39	0.8027

All the samples were done in duplicate. The average values and Standard Deviation (SD) obtained for the proposed and the official standard methods are given in Table 1. The difference of the average TFM value of five samples by the two methods is less than $\pm 1.80\%$ for all the brands analyzed and the standard deviations are within the experimental error, indicating that the accuracy of the proposed method is similar to that of the official SLS method. However, the proposed method is much shorter in terms of time taken for the analysis. This will be a very useful modification for Industry, since they are in need of analyzing samples in a shorter time in order to ensure the quality of their product while keeping wastage to a minimum. A similar method to that proposed method is used by researchers and in some standard method by scientist around the globe.

Performance evaluation of market available oxidative hair dye: An improvement to the SLS method

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Oxidative hair dye colorants are essential elements in hair dyeing preparations for the permanent dyeing of human hair. The hair dyeing process is achieved, in general, by the reaction of certain developing compounds with certain coupling compounds in the presence of a suitable oxidizing agent such as hydrogen peroxide. In order for procedures using permanent oxidative dyes to work properly, a number of parameters and conditions are important to consider in the use of these dyes in admixture with couplers in hair color preparations for human hair. Among these the final color and color intensity that is produced after application to

the subject's hair are most important parameters.

PPD is a primary intermediate widely used in oxidative hair dye compositions. When coupled with a conventional coupling agent, such as 3-aminophenol, it forms a unique color which is very intense in depth, yet neutral in shade. However, PPD is known to be both an allergen and a sensitizer. As of today, no primary dye intermediate, as a supplement or replacement for PPD, has been found which satisfies the above-listed requirements for oxidative colorants used in the dyeing of human hair. Therefore PPD is the most frequently used dye in the hair dye found in the Sri Lankan market.

The SLS method (SLS 1123:1996) for the analysis of PPD in hair dye takes more than six hours and it also involves the use of large amounts of solvent, thus adding to the cost of analysis. The objective of this study was to shorten the time required to determine the PPD content while maintaining the accuracy of the original method. The method given in the Sri Lanka Standard (SLS 1123:1996) was modified as given below.

In the SLS method, PPD is extracted by heating a known weight of the dye in 25.00 cm³ of carbon tetrachloride. However at least 6-8 extractions are necessary for complete extraction and at the end of each extraction the solvent is separated from the solid material by filtration. This extraction process takes a long time and we have modified the method by using soxhlet apparatus. The extraction is completed within 2-3 hours and requires only 75 cm³ of carbon tetrachloride compared to more than 200 cm³ in the

SLS method. The results obtained for determination of PPD in each of different bands of dye are given below with the results obtained by the SLS method for comparison.

Table 1: Comparison of PPD values of different brands by SLS and proposed methods

Brand	PPD by SLS method	PPD by proposed method	Percentage Difference
A	24.93	25.12	0.77
B	26.58	26.22	1.32
C	25.01	25.05	0.15
D	7.91	7.84	1.67
E	7.79	7.84	0.63
F	9.72	9.80	0.81
G	9.84	9.92	0.81

The difference of the average PPD (active ingredient) seven samples by the two methods is less than $\pm 1.67\%$ for all the brands analyzed and are within the experimental error, indicating that the accuracy of the proposed method is similar to that of the official SLS method. However, the proposed method is much shorter in terms of time taken for the analysis. This will be a very useful modification for Industry.

Scientific Sessions : A - 10

Determination of thermodynamic parameters of the interaction of 2-hydroxybenzoic acid and 2-hydroxy-3,5-dinitrobenzoic acid with Bovine Serum Albumin (BSA) in excited state

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The study of the interactions of salicylic acid (SA/2-hydroxybenzoic acid) and Dinitrosalicylic acid (DNS/2-hydroxy-3,5-dinitrobenzoic acid) with BSA was carried out at three different temperatures (298, 303 and 308 K) and at pH 7.45. Physiological pH (pH 7.45) was maintained at the experimental conditions, using Tris.HCl buffer. BSA has tryptophan residues in its protein structure. Highly fluorescence active tryptophan is the main amino acid residue in the BSA which refers to the fluorescence of BSA. It was found that SA and its derivatives such as DNS could interact and induce unfolding of BSA in both ground and excited state. Interactions of SA and DNS with BSA were evaluated using fluorescence spectroscopy technique. Quenching constants k_q for SA and DNS at 298 K, 303 K and 308 K in pH 7.45 buffer, was calculated according to the Stern-Volmer equation and extended Stern-Volmer equation in the basis of quenching of the fluorescence of BSA. Calculated k_q values for SA and BSA interaction at 308 K was 8253 s⁻¹. Calculated k_q value for low concentrations and high concentration of DNS and BSA interaction at 308 K was 8.53×10^4 mol⁻¹dm³ and 11.90×10^4 mol⁻¹dm³ respectively. The Association constants (K) for SA and BSA were calculated using modified Stern-Volmer equation. The obtained K value for SA and BSA interaction at 308 K was 9.73×10^3 mol⁻¹dm³. The K values for low concentrations of DNS and BSA interaction at 308 K was 11.22×10^5 mol⁻¹dm³ and for high concentrations of DNS and BSA interaction at

308 K was 2.07×10^6 mol⁻¹dm³. The standard enthalpy change (ΔH°) and the standard entropy change (ΔS°) were estimated using van't Hoff equation. The ΔH° and ΔS° for BSA and SA interaction were -342.68 kJ mol⁻¹ and -1.04 kJ mol⁻¹ K⁻¹ respectively. The ΔH° and ΔS° for BSA and DNS interaction at low concentrations were -38.08 kJ mol⁻¹ and -9.95 J mol⁻¹ K⁻¹ respectively and for high concentrations the values were -19.90 kJ mol⁻¹ and -56.69 J mol⁻¹ K⁻¹ respectively. The Standard Gibbs free energy change (ΔG°) was estimated using ΔH° and ΔS° values observed from the van't Hoff equation. The ΔG° value for BSA and SA interaction was -23.10 kJ mol⁻¹. For the interaction of BSA and DNS at low and high concentration were -35.01 kJ mol⁻¹ and -37.36 kJ mol⁻¹ respectively. The ΔG° has considerably large negative value and explains the ease of the interaction of SA and DNS towards BSA. These results show that DNS is a strong quencher than SA and has strong affinity towards BSA. Electron withdrawing effects of nitro groups would enhance the anionic form of the DNS and shows higher binding capacity towards the protein. This phenomenon could explain cytotoxicity of DNS in cells than SA.

References:

Peiris, Manindu N.; Perera, Rohan P.; Liyanage, V. N. P.; De Costa, M. D. P. *Sri Lanka Association for the Advancement of Science - Annual Sessions Study of the Unfolding of Bovine Serum Albumin Induced by N-methylphenyl Pyridinium Derivatives, 2007*

Spectroscopic studies of the interaction between 4-phenyl-1-(2-phenylallyl)pyridinium bromide with ibuprofen

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The interaction between 4-phenyl-1-(2'-phenylallyl)pyridinium bromide (APP-MPP⁺) and 2-(4-isobutylphenyl)propionic acid (ibuprofen) was studied under three different temperatures (298 K, 303 K and 308 K) at two different pH's (pH 5.50 and pH 7.45). Fluorescence based method was used to investigate the mode of interaction between these two molecules at the excited state with the change of temperature and pH. Quenching constants k_{sv} , and the binding constants K were calculated according to Stern–Volmer equation based on the quenching of the fluorescence. The analysis of fluorescence data indicates that the presence of both dynamic and static quenching mechanisms upon binding. The important thermodynamic parameters, such as the standard enthalpy changes (ΔH°) and the standard entropy changes (ΔS°) were estimated for the interaction at low and high concentrations of APP-MPP⁺ separately by using van't Hoff equation and hence calculated the standard Gibbs free energy change (ΔG°)

values. The obtained values at pH 5.5 were summarized in table 1. The negative sign for ΔG° indicates that the binding process is spontaneous.

Temperature /K	k_{sv} / 10^4 s^{-1}	K / $10^4 \text{ dm}^3 \text{ mol}^{-1}$	ΔG° / kJ mol^{-1}	ΔH° / kJ mol^{-1}	ΔS° / $\text{J mol}^{-1} \text{ K}^{-1}$	n
At low [APP-MPP ⁺]						
298	1.97	5.23	-26.90	75.09	342.25	1.09
303	2.58	8.39	-28.61	75.09	342.25	1.11
308	3.39	13.40	-30.32	75.09	342.25	1.12
At high [APP-MPP ⁺]						
298	3.46	46.95	-32.36	189.57	744.43	1.28
303	4.44	167.80	-36.09	189.57	744.43	1.38
308	7.72	562.86	-39.81	189.57	744.43	1.44

Table 1: Thermodynamic and quenching parameters for quenching of ibuprofen by APP-MPP⁺ at pH 5.50

References:

Mayadunne, E.P.; Elshan, N.G.R.D.; Liyanage, V.N.P.; Perera, Rohan P.; Ratnasooriya, W.D.; Pharmacological Characterization of a New Class of Vesicular Monoamine Transporter Inhibitors. *University of Colombo, Annual Sessions, 2008*.

Antimicrobial activity of some phenolic lichen compounds

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²HEJ Research Institute, University of Karachi, Pakistan

Lichen represents taxonomically and physiologically a very diverse group as it consist of a symbiotic association between 3 different kingdoms (fungi, algae and or cyanobacteria). Lichens have a prolonged history of being used as a medicinal herb. In many European countries numerous species have been used for treatment of stomach disease, diabetes, whooping cough, pulmonary tuberculosis, cancer treatment and skin diseases. Their use in medicine has later been justified, by presence of micobiotic activity due to phenolic constituents.

Four lichens species which have been reported to show antimicrobial activity at least up to the genera level were selected to screen for the compounds which included *P. grayana*, *Cladonia* sp., *H. obscurata* and *R. montagnei*. Several phenolic compounds were isolated (Figure 1). These included the mononuclear aromatic compounds namely methyl orsellinate **1**, methyl--orcinolcarboxylate **2**, *para*-depsides atranorin **3**, lecanoric acid **4**, erythrin **5**, a *meta*-depside sekikiac acid **6**, the depsidone lobaric acid **7** the ubiquitous dibenzofuran usnic acid **8** and a triterpenoid, zeorin **9**. Compounds **1-9** were screened for their antibacterial activity against *Escherichia coli*, *Bacillus subtilis*, *Shigella flexenari*, *Staphylococcus aureus*,

Pseudomonas aeruginosa, and *Salmonella typhi* and antifungal activity against *Trichophyton longifusus*, *Aspergillus flavus*, *Microsporum canis*, *Fusarium solani*, *Candida albicans*, and *Candida glabrata* with respect to their standards. The depside sekikiac acid **6** showed good activity against the *E.coli*, *B. subtilis*, and *S. typhi* whereas lobaric acid **7** and usnic acid **8** showed significant activity against the same organisms. Methyl orsellinate **1** showed significant activity against fungi *T. longifusus*, *A. flavus*, *M. canis*, and *F. solani*. Out of all the compounds tested methyl--orcinol carboxylate **2** showed the widest range of antifungal activity.

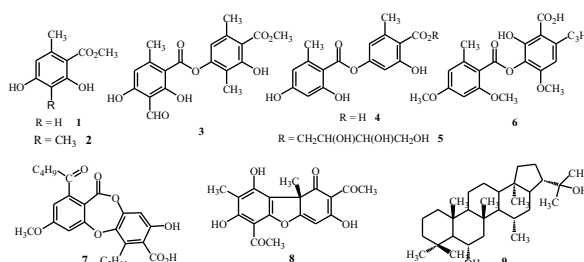


Figure 1. Structures of compounds isolated from lichens

Possible bio-fungicide to control Anthracnose caused by *Colletotrichum gleosporioides*

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Since early 1990's pathogen, *Colletotrichum gleosporioides* has been considered as a major causative agent of the disease, . anthracnose which takes heavy toll of annual production in many agricultural countries. Currently, management of disease by heavy usage of fungicides has create many undesirable problems such as development of fungicide resistance, food poisoning, residue contamination in market product, environmental pollution and escalating cost in crop production. Therefore less expensive, environmentally friendly bio-fungicide could serve as a good alternative to synthetic fungicides.

With this objective tuber extracts of 4 medicinal plants were screened for their fungicidal activity against *Colletotrichum gleosporioides* by poison food technique. Except *Costus speciosus* (Thebu) other three extracts *Acorus calamus* (Wada kaha) : *Zingiber zerumbet* (Wal inguru) *Curcuma zedoaria* (Haran kaha)

have demonstrated remarkable fungicidal activity against the tested fungus. Fungicidal activity of three tuber extracts were in following order *Acorus calamus* > *Zingiber zerumbet*, > *Curcuma zedoaria*. Minimum Inhibitory Concentration (MIC) and Minimum Lethal Concentration (MLC) data of the tuber extracts. were also determined . They are as follows. MIC values of *Acorus calamus*: *Zingiber zerumbet* and *Curcuma zedoaria* ((g/ml) were 2.2, 2.6, and 3.4 respectively. MLC values were -2.4, 2.8 and 3.6 respectively. These result suggest that tubers of *Acorus calamus* ; *Zingiber zerumbet* and *Curcuma zedoaria* can be used as possible bio-fungicide to control anthracnose caused by *Colletotrichum gleosporioides*.

Key words; , *Colletotrichum gleosporioides*, anthracnose, Fungicidal activity, *Acorus calamus* ; *Zingiber zerumbet*. *Curcuma zedoaria*

Antimicrobial activities of endolichenic fungi isolated from *Usnea* sp. at Hakgala montane forest¹P.A. Paranagama, ²B.T.S.D.P. Kannangara, ²T.G.I. Sandamali¹Department of Chemistry, University of Kelaniya, Kelaniya²Department of Botany, University of Kelaniya, Kelaniya

Endolichenic fungi live asymptotically within the lichen thallus, much the same way as endophytic fungi live within healthy plant tissues. Although the significance of the endolichenic fungi within the lichens still remains unknown, some studies have reported the production of bioactive compounds by these fungi. Therefore, the present study was conducted to evaluate the bioactivity of selected endolichenic fungal extracts against selected bacteria and fungi.

Six endolichenic fungi, *Chrysosporium* sp.1, *Chrysosporium* sp.2, *Curvularia* sp., *Fusarium* sp., and two sterile fungal species isolated from the lichen *Usnea* sp. at Hakgala montane forest were evaluated for their *in vitro* antimicrobial activities. Ethyl acetate extracts of endolichenic fungi grown in potato dextrose broth (PDB) and potato dextrose agar (PDA) medium were tested against two Gram positive bacteria; *Staphylococcus aureus* and *Bacillus subtilis* for antibacterial activity and against two fungi; *Colletotrichum musae* and *Aspergillus flavus* for antifungal activity using well diffusion method. All the fungal extracts were screened for their *in vitro* antimicrobial activity at a dose of 500 µg. Fungal extracts which showed bioactivities were further tested against bacteria and fungi at different concentrations of the extract to determine the minimum inhibitory concentration (MIC) and minimum lethal concentration

(MLC). Chloramphenicol and captan were used as positive controls in antibacterial and antifungal assays respectively. DMSO was used as the negative control and to dissolve fungal extracts. Extracts of *Curvularia* sp. and *Chrysosporium* sp.1 showed inhibitory activity against pathogenic bacterium *Staphylococcus aureus* with MIC values of 400 µg and 200µg respectively. Also, *Curvularia* sp. and *Chrysosporium* sp.1 showed inhiibitory activity against toxigenic baterialum *Bacillus subtilis* with MIC values of 300 µg and 200 µg respectively. Minimum inhibitory cconcentrations of Chloramphenicol antibiotic against *Staphylococcus aureus* and *Bacillus subtilis* were 100 µg and 75 µg respectively. According to the results obtained for the minimum inhibitory and minmium lethal concentration values, *Chrysosporium* sp.1 extract appeared to contain more inhibitory substances than that of *Curvularia* sp., against the growth of *B. subtilis* and *S. aureus*. Compared to the results obtained for chloramphenicol, *Chrysosporium* sp. 1 showed moderate bioactivity and *Curvularia* sp. showed slight lower bioactivity against the two bacteria.

Extracts of *Chrysosporium* sp.1, *Curvularia* sp. and sterile sp.2 showed strong antifungal activity against the pathogen *Colletotrichum musae*. Only the extract of *Curvularia* sp. showed weak antifungal activity against aflatoxigenic fungus, *Aspergillus flavus*. Minimum

inhibitory concentrations of fungal extracts of *Curvularia* sp., sterile sp.2 and *Chrysosporium* sp.1 against *Colletotrichum musae* were 100 µg, 100 µg and 100 µg respectively. Minimum lethal concentrations of fungal extracts of *Curvularia* sp., sterile sp.2 and *Chrysosporium* sp.1 against *Colletotrichum musae* were 300 µg, 200 µg and 300 µg respectively. Minimum inhibitory concentration of *Curvularia* sp. extract against *Aspergillus flavus* is 500 µg. Minimum inhibitory concentration of captan against

Aspergillus flavus and *Colletotrichum musae* were 10 µg and 100 µg respectively. Antifungal properties of ethyl acetate extract of *Curvularia* sp. were not effective as commercial fungicide captan on the growth of *Aspergillus flavus*. Other fungal extracts did not show any noticeable *in vitro* antimicrobial activity against test bacteria and fungi.

Acknowledgement

The financial support from University of Kelaniya is greatly appreciated.

Scientific Sessions : A - 15

Antibacterial activity of the secondary metabolites of endolichenic fungi isolated from *Pseudocypellaria* sp.

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²College of Chemical Sciences, Institute of Chemistry Ceylon, Rajagiriya.

Even though lichens have been used in traditional medicine for many centuries the studies done on the antibacterial activity of the metabolites of endolichenic fungi¹ are none. The study was carried out using five endolichenic fungi isolated from the lichen *Pseudocypellaria* sp. collected from Hukkgala montane forest². The fungal species however, are not identified up to the species level. The fungi *Chrysosporium* 1 sp., *Chrysosporium* 2 sp., *Aspergillus* 1 sp., *Aspergillus* 2 sp., and *Phorma* sp. were grown on Potato Dextrose Agar (PDA) and Potato Dextrose Broth (PDB) media. Each fungal media was extracted using ethyl acetate and the extract was tested for the antibacterial activity against the two bacterial species, *Staphylococcus aureus* at 5.30×10^6 CFU ml⁻¹ and *Bacillus subtilis* at 4.63×10^6 CFU ml⁻¹. The disc diffusion method³ was performed for the crude extracts and thereafter the well diffusion method was followed for other extracts.

DMSO was used as the negative control and chloramphenicol as the positive control for the antibacterial assays. The Minimum Inhibition Concentration (MIC) of the positive control is 50 µg and the Minimum Leathal Concentration (MLC) of that is 100 µg. The two extracts of *Aspergillus* 2 sp. which showed the highest activity against the two testing bacteria, were used for further investigations. The MIC was determined for both extracts against both species as 100 µg and MLC determined for the PDA extract was 400 µg and that of the PDB µg extract is 500 against both bacterial species. Each extract of *Aspergillus* 2 sp. was dissolved in 80% methanol in

water and it was partitioned using n-hexane and chloroform separately. The chloroform fraction which showed the highest activity was subjected to activity guided fractionation using column chromatography. The most active column fractions were further separated using preparative TLC to isolate the active compound.

One active compound was isolated from preparative TLC which showed the highest activity against *Staphylococcus aureus* when compared to *Bacillus subtilis*. The structural elucidations of the active compound will be performed using spectroscopic techniques such as ¹H-NMR, ¹³C-NMR, FT-IR and MS.

Acknowledgment

Financial Assistance from University of Kelaniya and College of Chemical Sciences

References

1. Studies on Arid Lands Plants and Microorganisms, Part 16. For Part 15, see: Xu, Y.-M.; McLaughlin, S. P.; Gunatilaka, A. A. L. J. Nat. Prod.
2. Paranagama, P. A., Kannangara, B. T. S. D. P., Rajapaksha, R. S. C. G., (2008). Nature and Bioactivities of Endolichenic Fungi in *Pseudocypellaria* sp., *Parmotrema* sp. and *Usnea* sp. at Hukkgala Montane Forest. Letters in Applied Microbiology, 48: 203-209.
3. Duraipandiyan, V., Muniappan, A., Ignacimuthu, S. (2006) Antimicrobial activity of some ethnomedicinal plants used by Paliyar tribe from Tamil Nadu, India. BMC Complementary and Alternative Medicine 2006, 6:35

Deans Emergency Fund

The Deans Emergency Fund was established to provide financial relief to G I C students in case of emergency. The Institute of Chemistry Ceylon welcomes donations to this fund from members, students and well wishers.

All Island Interschool Chemistry Quiz contest - 2009/2010

The preliminary written paper of the All Island Interschool Chemistry Quiz contest 2009/2010 was held on 14th November 2009 for year 13 students. On the basis of the results of the preliminary written paper the final contest (oral) was held on 5th March 2010 at Adamantane House.

The results of the All Island Interschool Chemistry Quiz contest are as follows. The Prizes and trophies for winners will be awarded at the 39th Annual Sessions of the Institute of Chemistry Ceylon which will be held on 16th June 2010 at the Central Bank Auditorium, Rajagiriya.

Best Student in each Province (Based on Preliminary Written Paper)

Province	Name	School
Western Province	G L Y Mewantha	Royal College, Colombo 07
	N Liyanarachchi	Royal College, Colombo 07
	K K M Fernando	Ave Maria Convent, Negombo
Central Province	S Udapitiya	Mahamaya Girls College, Kandy
Southern Province	B M A D Deshani	G/Sanghamitta College, Galle
Sabaragamu	N D B Gayan	R/Kalawana Gamini M M V, Kalawana
North Central Province	P Sathiyaseelan	V/Rambaikulam Girl's M.V., Vavuniya
North Western	U K J U Bandara	Maliyadeva Boy's College, Kurunegala
	L T R Liyanage	Maliyadewa Balika Vidyalaya, Kurunegala
Uva	A M N Bandara	Bandarawela Central College, Bandarawela
	D Harshani	Bandarawela Central College, Bandarawela
Eastern Province	V Sanjeev	Bt/St.Michael's College - Batticaloa
	M Thamaneeyan	Bt/St.Michael's College - Batticaloa
Northern Province	K Mayuresan	J/Uduppidy American Mission College, Valvettiturai

Best Individual Performances (Based on Preliminary Written Paper)

K Mayuresan	J/Uduppidy American Mission College, Valvettiturai
V Sanjeev	Bt/St.Michael's College, Batticaloa
M Thamaneeyan	Bt/St.Michael's College, Batticaloa

Winners

**: Challenge Shield donated by Mr N M S Hettiedara
Maliyadeva Balika Vidyalaya, Kurunegala**

AMGT Abesinge	ALTR Liyanage
HPSM Gunarathne	DMTK Bandara
WMNS Samarasinghe	DMMW Dissanayake

1st Runners up

**: Challenge Shield donated by Link Natural Products Ltd
Sangamitta College, Galle**

SPY Pathirana	PTC Madushanka
RDS Gunarathna	MAI Amaratunga
KK S Sandeepani	BMAD Deshani

Phosphorus Chemistry

Professor Sudantha Liyanage

Dean/ Faculty of Applied Sciences,

Professor in Chemistry, University of Sri Jayewardenepura



PHOSPHORUS CHEMISTRY	
General properties	
Name, symbol, number	phosphorus, P, 15
Element category	nonmetal
Group, period, block	15, 3, p
Standard atomic weight	30.973762(2) g mol ⁻¹
Electron configuration	[Ne] 3s ² 3p ³
Electrons per shell	2, 8, 5
Physical properties	
Density	(white) 1.823, (red) ~ 2.2 – 2.34, (violet) 2.36, (black) 2.69 g cm ⁻³
Melting point	(white) 44.2 °C, (black) 610 °C
Sublimation point	(red) ~ 416 – 590 °C, (violet) 620 °C
Boiling point	(white) 280.5 °C
Heat of fusion	(white) 0.66 kJ mol ⁻¹
Heat of vaporization	(white) 12.4 kJ mol ⁻¹
Atomic properties	
Oxidation states	5, 4, 3, 2, 1, -1, -2, -3 (mildly acidic oxide)
Electronegativity	2.1 (Pauling scale)
Ionization energies (more)	1st: 1011.8 kJ mol ⁻¹
	2nd: 1907 kJ mol ⁻¹
	3rd: 2914.1 kJ mol ⁻¹
Covalent radius	107±3 pm
Van der Waals radius	180 pm
Magnetic ordering	(white, red, violet, black) diamagnetic
Thermal conductivity	(300 K) (white) 0.236, (black) 12.1 W m ⁻¹ K ⁻¹
Bulk modulus	(white) 5, (red) 11 GPa

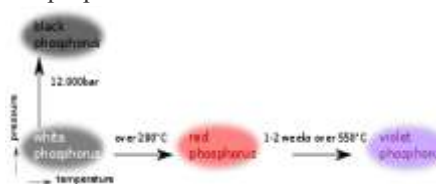
Scientists were fascinated when they heard of Brand's discovery of phosphorus. They tried to repeat his research. Some tried to talk him into selling his discovery to kings and princes. The new element seemed to be a way of getting rich and becoming famous.

But Brand was never interested in these ideas. Instead, he gave away all of the phosphorus he prepared. Other scientists soon began to experiment with the element. One of the first discoveries they made was how dangerous phosphorus is. One scientist wrote that a servant left some phosphorus on top of his bed one day. Later that night, the bed covers burst into flame. The phosphorus had caught fire by itself.

Eventually, Brand's method of making phosphorus became widely known. The element joined iron, gold, silver, arsenic, and the handful of other elements known to early chemists. Little is known about what happened to Brand after his discovery. In fact, there is no record of where or when he died.

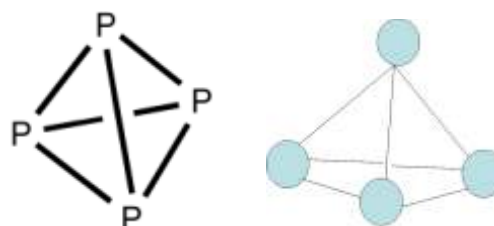
Phosphorus is a fascinating element that occurs in at least three very different forms. If left exposed to the air, it catches fire on its own. It also glows in the dark. Today, its most important use is in the manufacture of phosphoric acid (H₃PO₄). Phosphoric acid, in turn, is used to manufacture fertilizers and a number of other less important products.

Phosphorus exists in at least three allotropic forms. Allotropes are forms of an element with different physical and chemical properties. The three main allotropes are named for their colors: white phosphorus (also called yellow phosphorus), red phosphorus, and black phosphorus (also called violet phosphorus). These allotropes all have different physical and chemical properties.



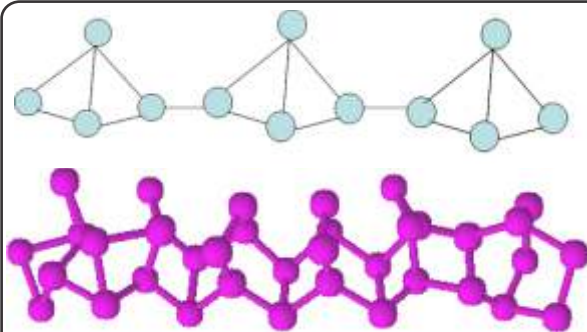
White phosphorus

White phosphorus is a white, waxy, transparent solid. It is soft, very reactive and consists of P₄ molecules its melting point is 44.1°C (111°F) and its boiling point is 280°C (536°F). It has a density of 1.88 grams per cubic centimeter. If kept in a vacuum, it sublimates if exposed to light. It is so unstable that it turns yellow then reddens in light, and glows in the dark - hence "phosphorescence". It gives off a beautiful greenish-white glow. It does not dissolve well in water; hence white phosphorus is kept under water to isolate it from the air. It dissolves in other liquids, such as benzene, chloroform, and carbon disulfide. White phosphorus sometimes appears slightly yellowish because of traces of red phosphorus. This allotropic form of phosphorus is also the most useful in the production of other compounds of phosphorus.



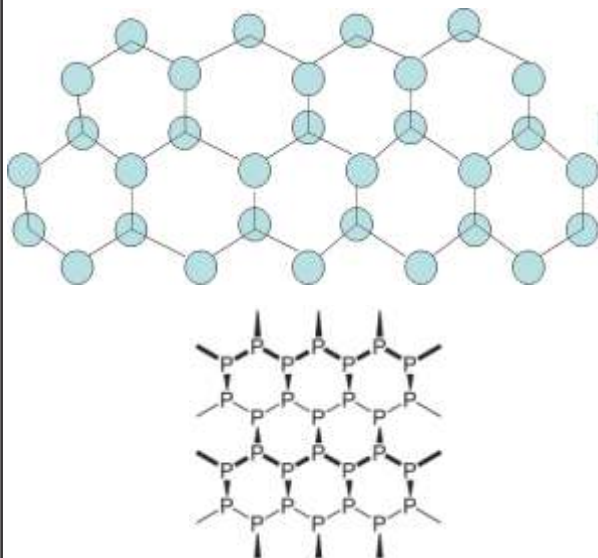
Red phosphorus

Red phosphorus is a red powder. It can be made by heating white phosphorus with a catalyst to 240°C (464°F). Without a catalyst, red phosphorus sublimates at 416°C (781°F). Its density is 2.34 grams per cubic centimeter. It does not dissolve in most liquids. It is formed by exposing white phosphorus to sunlight or heating it under pressure to above 275°C. This polymeric form is fairly stable, but the heat from simple friction is enough to convert it to explosive white phosphorus. This feature is used to great advantage in the manufacture of safety matches.



Black phosphorus

Black phosphorus looks like a graphite powder. Black phosphorus can be made by applying extreme pressure to white phosphorus. It has a density of 3.56 to 3.83 grams per cubic centimeter. One of its interesting properties is that it conducts an electric current in spite of being a non-metal. Black phosphorus is also produced by heating white phosphorus in the presence of a mercury catalyst. Black phosphorus is the least reactive, does not ignite easily and has the least commercial value.



Chemical properties

White phosphorus is the form that occurs most commonly at room temperatures. It is very reactive. It combines with oxygen and forms P_4O_6 and/or P_4O_{10} so easily that it catches fire spontaneously. As a safety precaution, white phosphorus is stored under water in chemical laboratories.

Isotopes

Only one naturally occurring isotope of phosphorus exists, phosphorus-31. Isotopes are two or more forms of an element. Six radioactive isotopes of phosphorus are known also. One radioactive isotope,

phosphorus-32, has applications in medicine, industry, and tracer studies. A tracer is a radioactive isotope whose presence in a system can easily be detected. The isotope is injected into the system where it gives off radiation. The radiation is followed by means of detectors placed around the system.

Phosphorus-32 is especially useful in medical studies, because phosphorus occurs in many parts of the body. Radioactive phosphorus can be used as a tracer to study parts of the body as well as chemical changes inside the body. Radioactive phosphorus can also determine how much blood is in a person's body. It can also help locate the presence of tumors in the brain, eyes, breasts, and skin. Finally, it is sometimes used to treat certain forms of cancer. Radiation given off by the phosphorus-32 may kill cancer cells and help slow or stop the disease.

Phosphorus-32 is important in a variety of scientific studies. For example, it is added to tyres when they are made. Then, the radiation it gives off can be studied as the tyres are used. This information tells where the tyre wears out and how long it takes to wear out.

Uses and compounds

Modern farmers use enormous amounts of synthetic (artificial) fertilizer on their crops. This synthetic fertilizer contains nitrogen, phosphorus, and potassium, the three elements critical to growing plants. These elements normally occur in the soil, but may not be present in large enough amounts. Adding them by means of synthetic fertilizer helps plants grow better. Most farmers add some form of synthetic fertilizer to their fields every year. This demand for synthetic fertilizers accounts for the major use of phosphorus compounds. A bag of fertilizer shows information about its nitrogen, phosphorus, and potassium ingredients.

Phosphorus and its compounds have other uses. These uses account for about 10 percent of all the phosphorus produced. For example, the compounds known as phosphorus pentasulfide (P_2S_5) and phosphorus sesquisulfide (P_4S_3) are used to make ordinary wood and paper safety matches. These compounds coat the tip of the match. When the match is scratched on a surface, the phosphorus pentasulfide or phosphorus sesquisulfide bursts into flame. It ignites other chemicals on the head of the match.

Another compound of phosphorus with a number of uses is phosphorus oxy-chloride ($POCl_3$). This compound is used in the manufacture of gasoline additives, in the production of certain kinds of plastics, as a fire retardant agent, and in the manufacture of transistors for electronic devices.

PUBLICATIONS OF THE INSTITUTE OF CHEMISTRY CEYLON

Monograph	Title	Author	Price
01	Textile Fibers	Mr T Rajasekeram	Rs.50/-
02	Principles of Food Preservation	Prof U Samarajeewa	Rs.75/-
03	Biotechnology	Prof C P D W Mathew	Rs.75/-
04	Recombinant DNA Technology	Prof J Welihinda	Rs.75/-
05	Natural Toxins in Foodstuffs	Prof E R Jansz & Ms A S Perera	Rs.50/-
06	Fat Soluble Vitamins	Prof E R Jansz & Ms S Malavidana	Rs.50/-
07	Nucleic Acid and Protein Synthesis	Prof J Welihinda	Rs.75/-
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09	Corrosion of Materials	Dr A M M Amirudeen	Rs.75/-
10	Vitamin C-Have all its mysteries been Unravalled ?	Prof E R Jansz & Ms S T C Mahavithanage	Rs.75/-
11	*Environmental Organic Chemistry (second edition)	Prof S Sotheeswaran	Rs.150/- (US \$3)
12	Enzyme Kinetics and Catalysis	Prof (Mrs) S A Deraniyagala	Rs.100/-
13	Insecticides	Prof (Mrs) Sukumal Wimalasena	Rs.95/-
14	Organotransition Metal Catalysts	Dr S P Deraniyagala & Dr M D P De Costa	Rs.75/-
15	Some Important Aspects of Polymer Characterization	Dr L Karunanayake	Rs.75/-
16	Hard & Soft Acids & Bases	Prof (Mrs) Janitha A Liyanage	Rs.65/-
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22	Pericyclic Reactions: Theory and Applications	Dr M D P De Costa	Rs.65/-
23	NMR Spectroscopy	Dr (Mrs) D T U Abeytunga	Rs.65/-
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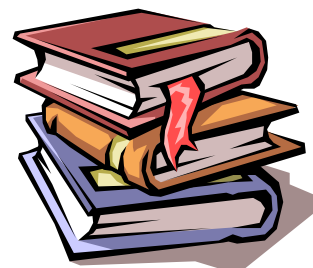
* - Second Edition /new print published on popular demand

CCS Publications

01	Functional Group Analysis in Organic Chemistry	Prof AAL Gunatilake Prof S Sotheeswaran	Rs. 175/-
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General Publications

- ★ **Chemist & The Environment** (Rs.300/-)
- ★ **Infrastructure Support Services for Industrial Development** (Rs.200/-)
- ★ **Chemical Industries in Sri Lanka – Part II** (Members: Rs. 200/-, Non-members: Rs.275/-)
- ★ **Proceedings of the Workshop on the Technological aspects of the Production & Processing of Essential oils in Sri Lanka** (Rs.100/-)
- ★ **Proceedings of the Training Seminar on Towards a Cleaner Industrial Environment in the New Millennium** (Rs150/-)
- ★ **A-Level Chemistry Facts, Patterns & Principles by Dr. Seetha I Rodrigo** (Rs.1500/-)
- ★ **Proceedings of the Prof R S Ramakrishna Memorial Training Seminar on Modern Analytical Methods**(Rs.200/-)
- ★ **Historical Accounts of the Educational Activities (1972 - 2004)** (Rs.350/-)
- ★ **Proceedings of the Training Seminar cum Workshop on Sampling, Statistics and Standardization in Chemical Analysis and Environmental Management** (Rs.150/-)
- ★ **Polymer Industries of Sri Lanka** (Rs. 200/-)
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- ★ **Herbal Medicine Phytopharmaceuticals and Other Natural Products: Trends and Advances** (Rs. 500/-)
- ★ **Chemistry in Sri Lanka** (Rs. 150/-)





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	Abbreviation	Number
Fellow Life Member.	F E L	05
Fellow C Chem.	F C C	09
Member C Chem.	M C C	09
Member	M E M	17
Associate Member	A M E	08
Affiliate /Under Graduate. A F U		02
Total Membership as at March 2009		50

2. Committee of Management

The following were elected to the Committee at the 48th Annual General Meeting held on 26th June 2009.

Chairman	- Mr. S Perasiriyana
Vice Chairman	- Dr. M A J Mendis
Hony. Secretary	- Mr. R M G B Rajanayake
Hony. Treasurer	- Dr. M P Deeyamulla
Committee Members	- Prof. W S Fernando Dr. Positha Premaratne Dr. Sudantha Liyanage Mr. W A P Silva Mr. I M S Herath Mr. P A N Punyasiri Mr. W J P D Jayalath
Hony. Auditor	- Prof. L G Chandrasena

The house appointed Mr. R M G B Rajanayake for the new post of Chairman/elect.

3. Committee Meetings

There were 11 Committee Meetings held during the period, July 2008 to June 2009. The venue of these meetings was the office of the Royal Society of Chemistry SL Section at the S L A A S Headquarters. These meetings were held to discuss the R S C SL Section's, new plans and strategies with regard to organizing the activities for the year 2008/2009 and thereafter.

4. Activities

4.1 Contributions to Activities of the Institute of Chemistry, Ceylon

- (a) Full page advertisement of "Chemistry in Sri Lanka".
- (b) Annual Dinner
- (c) Award for the Best Performance at the Graduate ship Examination in Chemistry Part II Theory Examination
- (d) Annual Sessions

4.2 Inter - University Chemistry Competition, 2009/2010

4.3 All - Island Inter School Chemistry Essay Competition 2009/2010

4.4 Book donation at Moneragala Jafna, 2009/2010.

4.5 Teacher training workshop at Ratnapura District will be held on June, 2010.

4.6 Teaching seminar for Advanced Level chemistry Students at Bandarawela will be held, 2009/2010.

4.7 Newton A. Dias Weerasinha Memorial Scholarship selections will be held in June.

4.8 General Assembly 2009 in UK

4.9 Activities connected with popularization of Chemistry

- (a) Industrial visit to Richard Peris and Company Factory at Nawinna
- (b) Web Site

The members are reminded of the web site of our Section, the address of which is as follows:

www.rsc.org/Membership/Networking/InternationalSections/Sri Lanka/index.asp.

Gamini Rajanayake
Hony Secretary

Professor Pearlyn Pereira Memorial Oration 2010 Gold Medal Award

Venue: Adamantane House

Date: 26.05.2010



Prof. M D P De Costa being awarded the Gold Medal and the prize cheque for the Prof. Pearlyn Pereira Memorial Oration by Prof. S P Deraniyagala, President, I.Chem.C.



Professor M Dayal P De Costa delivering the Professor Pearlyn Pereira Memorial Oration.

Training Seminar for A/L Teachers to meet the challenges of the new Chemistry Syllabus

Venue: Adamantane House

Date: 24.05 & 25.05.2010



New Year (Aluth Avurudhu) Celebrations!!!!

03.04.2010





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