A publication of the Association of Carbohydrate Chemists & Technologists (India)

CARBOHYDRATE NEWSLETTER

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Editor

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From the Editor's Desk

Dear colleagues and friends,

Chemists can play a very important role in modern medicine and therapeutics. The importance of chemical tools in basic biology/biomedical research is being increasingly revealed. The origin of the term 'Chemical Biology', which is mostly talked about in recent times, can be traced to the enormous scientific and technological advances of the nineteenth and twentieth century. The fundamental principals of chemistry form the foundation for understanding the structure and function of biologically important molecules. 'Chemical Biology' thus leads to the understanding of biology through chemistry and also at the same time it serves the purpose of harnessing biology to advance chemistry. This was envisaged by our founder President Late Dr. H. C. Srivastava and the Association is providing a common platform to chmists, biologists and technologists in India for interactive research.

Carbohydrates are considered to be one of the most vital molecules in multicellular organisms. In fact, all cells in nature carry sugar chains, in the form of polysaccharides, glycoproteins/proteoglycans, glycolipids etc. which directly or indirectly take part in various cell-cell events for the development of the organism. Unfortunately, informatics research on carbohydrates is slow in comparison to DNA and proteins, largely due to difficulties in the analysis of glycan structures.

Nature has designed enzymes and receptors which are highly specific in their interactions with carbohydrates. Studies on the interactions between carbohydrates and proteins are vital in understanding the potential controls of many biological processes. The structural information or diversity in oligo- or poly- saccharides is much more compared to the peptides of similar size. There is always a great demand on the synthetic chemists to synthesize biologically significant products and this has stimulated this exciting field. Particularly important is the contribution of organic chemistry in chemical synthesis and molecular design as a complement to Structural Biology, Genomics and Proteomics.

Glycotechnology is yet another emerging area where understanding of biomedicine and development of new products is the major mandate. Most mammalian glycoconjugates (i.e. oligosaccharide chains linked to proteins and lipids) that are involved in cellular functions/ interactions and cell recognition and also non-mammalian glycoconjugates and polysaccharides, are targets for drug design and potential pharmaceuticals. For example, plants and seaweed have poly- and,oligo-saccharides with many pharmacological effects, several

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microbial antibiotics and anti-cancer drugs contain sugar components, and cell walls of micro-organisms are targets for immunotherapy. Polysaccharides from the agricultural industry are of extreme commercial interest to the tune of few thousand crores. These gums and mucillages are set to gain further prominence as dietary fiber supplements, nutraceuticals and green fuel sources through biotechnology.

This year the XXIst carbohydrate conference is going to be held at the Chemistry Department, Delhi University. I look forward to your active participation in the conference. Details about the conference are available inside or at our website.

Finally, I take this opportuniety to wish you all a very happy Dasera and Deepavali.

Asish Kumar Sen

Presidential Address

Dear Friends,

I take this opportunity to welcome you on the behalf of the executives of ACCT(I) and my own behalf.

You are aware that the seed of the Association was sown at ATIRA, Ahmedabad in 1984 by late Dr. H. C. Srivastava which has now taken a form of a tree by proper watering, manuring and weeding by my very able predecessor Prof. N. K. Mathur and Prof. B. P. Chatterjee.

The Associations main contribution has been to bring Academician & Technologists to one platform for the exchange of ideas, solving of the R&D problems and also encourage the budding scientists for their new inventions. Our interaction with the industry for the future growth of the country is lacking and for which we have to find a solution. Is it due to the indifference of scientists to the applied aspects of their research or lack of communication between the scientists and industry? We know India can not progress in 21st century without unlocking curious minds. India lacks a strong research culture. The Indian syllabus doesn't leave any scope for thinking because our curricular is based on classical concepts. We have become so career conscious that we have become alien to the scope and concept of research and development. The problem is compounded at the doctoral level as students are found to be totally dependent on their guides because thy lack originality and an analytical thinking. An ambience should be created where ideas are valued. The element of questioning should be inculcated in student's right from the school level.

Research culture is very strong in the west because of funding for research work primarily comes from the industry. That is how students develop links with the industry both at the UG and PG level and increase their chances of employment. In India, industry sponsored research projects are few. They are mainly funded by the UGC or different Government departments like DST, DBT, Atomic or Defense research organizations. The question is why industries don't invest in university's research projects? Is it merely a lack of confidence? The Government should make a policy that projects exceeding a budget of five crores should be carried out jointly by a university, industry and research laboratory.

I have shared my thoughts with you for improving the research culture. My friends from Lucknow University have taken the initiative to organize CARBO XX in collaboration with the ACCT(I). The theme of the CARBO XX is 'Prospects and Perspective of Carbohydrates in 21st Century'. We know carbohydrates are the fuel of life, being the main source of energy for living organisms and the central pathway of energy storage and supply for most cells. They are the major products through which the energy of the sun is harnessed and converted into a form that can be utilized by living organism. According to rough estimates, carbohydrates represent approximately 95% of the annually regrowing biomass of about 200 billion tons. Of these only 3% are used by human, the rest decays and is recycled along natural pathways. Polysaccharides, proposed as the first biopolymers to have formed on earth, are a major group in carbohydrate chemistry. The special physical texture and the hydrophilic character are responsible for their multivarious roles in the R&D on carbohydrates. However, to cover many interdisciplinary aspects, there is a need of a group of scientists with different background. Not a single university or an institute in India is wholly devoted to the study of multifaceted aspects of carbohydrates. In my view this is the right time to approach the Government of India for establishing a new institute to study the vast natural bio-polymers in totality.

In the next two days we are going to be intellectually exposed to the seven different topics which include Carbohydrates in chemical transformation, plant and microbial polysaccharides, sugars of biological importance, industrial polysaccharides, glycobiology and glycotechnology, and transition metal saccharide chemistry and biochemistry.

I look forward to your active participation in CARBO XX.

Thanking you all.

Dr. P. L. Soni

Secretary's report on the XX Carbohydrate Conference

The XX Carbohydrate Conference (CARBO XX) was organized by the Chemistry Department, Lucknow University, Lucknow, in collaboration with the Association of Carbohydrate Chemists and Technologists (India), during November 24-26, 2005. The theme of the conference was "Prospects & Perspectives of Carbohydrate in 21st century" which provided the rare opportunity for chemists, biologist, technologist and research scholars working in the field of carbohydrate chemistry to come to a common platform to exchange their views and new findings.

Dr. J. S. Yadav, Director, I.I.C.T., Hyderabad, inaugurated the conference and delivered the keynote address. He spoke on the synthesis of various drugs, including Tami flue, starting from simple sugars as precursors. The Chairperson of the conference, Prof. (Mrs.) Anakshi Khare, Head, Department of Chemistry, Lucknow University, Lucknow, delivered the welcome address. She emphasized on the increased appreciation of the role of carbohydrates in biological and pharmaceutical sciences. Dr. J. S. Yadav then released the souvenir of the CARBO XX and book entitled "Trends in Carbohydrate Chemistry" edited by Dr. P. L. Soni (President, ACCTI). Mr. A. P. Dadoo, MD, Hindustan Gum, Bhiwani, was the guest of honour while Prof. R. P. Singh, Vice Chancellor, Lucknow University, presided over the function. Prof. B. P. Chatterjee, I.A.C.S., Kolkata, was honoured with the 'Life Time Achievement Award' of the Association for his pioneering work and contribution in the field of glycobiology. He also delivered a plenary lecture on "glycobiology- a new horizon of carbohydrate research in 21st century. Dr. Naveen K. Khare, organizing secretary of the conference, delivered the vote of thanks.

In the technical sessions, plenary lectures were delivered by Prof. Y. D. Vankar, I.I.T., Kanpur, and Dr. Hasi Das, I.G.I.B, New Delhi, who spoke on "newer synthetic approaches towards glycosidase inhibitors" and "mannose binding lectin in rheumatoid arthritis" respectively. The theme of the conference received overwhelming response from the carbohydrate chemists from government and private laboratories, academics and industries of India. During the conference, various emerging topics were discussed by the prominent scientists, like Prof. I. S. Aidhen, IIT, Chennai, Prof. V. K. Singh, IIT, Kanpur, Prof. P. R. Sudhakaran, Kerala University, Dr. A. K. Sen, IICB, Kolkata, Prof. C. P. Rao, IIT, Mumbai, Prof. Rekha Singhal, University of Mumbai, Dr. K. P. R. Kartha, NIPER, Chandigarh, Prof. S. N. Moorthy, CTCRI, Thiruvananthpuram, Dr. Vasudev Singh, CFTRI, Mysore, Dr. R. A. Vishwakarma, NII, New Delhi, Dr. Pradeep Kumar, NCL, Pune, Dr. R. P. Tripathi, CDRI, Lucknow, Dr. Ashok K. Prasad, Delhi University, Dr. Kanwal J. Kaur, NII, New Delhi, Dr. Anup Misra, CDRI, Lucknow, Dr. K. C. Koshel, ONGC, Dehra Dun. Dr. Pradeep K. Srivastava, CDRI, Lucknow presented his well known SCIENTOON®, which made the mood of delegates lighter.

Approximately 175 delegates from various R & D organizations, Universities and industries attended the conference. There were nine technical sessions where a large number of papers and posters of high standard were presented. Considering the large number of requests for the oral presentation, many young participants had to be accommodated in poster session but they were extremely satisfied over the extended time given to them during the poster session. Most presentations were lively and informative and crossed the time barrier during discussion.

The general body meeting of the Association (ACCTI) was held in the evening of Nov. 24, 2005. The activities and related matters of the Association was discussed. It was decided to make the "Life time achievement award" more prestigious by awarding a cash amount of Rs. 25,000.00 to the recipient every year. Mr. Uday Merchant, M.D., M/s Lucid Colloid Ltd., Mumbai, kindly consented to sponsor this award. The Association gratefully acknowledged his kind gesture.

After 3 days of scientific sessions, the conference came to a successful end with the vote of thanks from the Secretary of the Association Dr. A. K. Sen. The two 'Young Scientist Awards' of the Association were given to Ms. Shalini K. Ghodke (University of Mumbai) and Mr. A. A. K. Srivastava (CDRI, Lucknow) for the best oral and poster presentations respectively. The 'Lucid Colloid Award' was given away to Ms. T. A. Bhatt (Sardar Patel University). The participants of the XX Carbohydrate Conference thanked the members of the organizing committee for their ardent and dedicated commitment in making this conference a memorable one with the resolution to meet again in XXI Carbohydrate Conference at Delhi University in 2006.

Date: May 10, 2006

Prof. Naveen K. Khare
(Organizing Secretary)

Acknowledgement

ACCT(I) gratefully acknowledges the support of the following companies who have kindly agreed to sponsor the publication of the Carbohydrate News Letter.

Encore Natural Polymers Pvt. Ltd., Mumbai

Lucid Colloids Ltd., Mumbai

Hindustan Gum & Chemicals Ltd., Bhiwani

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Manufacturer of Guar Gum and other Hydrocolloids
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Welcomes

The Delegates

to

The CARBO-XXI Conference at Delhi

and

Wishes a Grand Success for the Meet

Minutes of the Annual General Body Meeting

The Annual General Body meeting of the Association of Carbohydrate Chemists and Technologists (India) was held on 24th November, 2005 at the University of Lucknow, Lucknow. The meeting was attended by 39 members of the Association.

President, Dr. P. L. Soni, gave the introductory speech. Dr. A. K. Sen, Secretary of the ACCT(I), then read out the minutes of the previous AGB meeting held during the XIXth Carbohydrate Conference at the Forest Research Institute, Dehra Dun. The minutes were accepted unanimously: Proposed by Dr. Vasudeva Singh and seconded by Prof. (Mrs.) Anakshi Khare.

Dr. A. K. Sen then described the previous year's activities of the Association and was appreciated by the members. The treasurer of the Association Dr. P. K. Gupta then presented the 'Statement of Accounts-2004'. He pointed out that an additional amount of Rs. 40,000.00 was converted to Fixed Deposit. After a brief discussion, the 'Statement of Account' was accepted unanimously; Proposed by Prof. N. K. Mathur and Seconded by Prof. B. P. Chatterjee.

The 'Statement of Accounts' of the Carbohydrate News Letter was then placed by Dr. A. K. Sen, Hon. Editor of the News Letter. It was accepted unanimously by the members; Proposed by Dr. Hasi Das and Seconded by Dr. Vasudeva Singh. There was a brief discussion on CNL and the Website of the Association. Mr. Uday Merchant questioned the need of CNL when the website is accessible to everyone. The members felt that since CNL directly reaches the members and the others, it has a special impact and therefore should be sustained. Dr. A. K. Sen then requested the members to relieve him from the responsibility of being the editor of CNL but, this was not accepted. A new advisory committee was then formed by the members comprising of Prof. B. P. Chatterjee, Dr. Hasi Das, Mr. N. C. Dhuldhoya, Dr. V. P. Kapoor, Prof. (Mrs.) A. Khare, Dr. Vasudeva Singh, Dr. P. L. Soni, Dr. K. P. R. Kartha, Prof. P. R. Sudhakaran, Prof. Naveen Khare, Dr. Brij Raj. Sharma, Prof. Rekha S. Singhal, Dr. S. P. Gupta, Prof. C. P. Rao. It was also suggested that popular lectures presented at the carbohydrate symposiums might be reproduced in CNL.

Since 2003, ACCT(I) is giving away the Life Time Achievement award to the accomplished scientists in the form of citation and a medal. Mr. Uday Merchant, MD, Lucid Colloid, Mumbai, expressed his desire to contribute Rs. 25,000.00 every year to be given as cash to the recipients of Life Time Achievement award. The proposal was gratefully accepted by the members. However, the members felt that there should be certain procedure for the selection of the awardees. Prof. P. R. Sudhakaran, Dr. P. L. Soni, Dr. A. K. Sen, Prof. Ashok Prasad, Dr. K. P. R. Kartha, Dr. Vasudeva Singh, Prof. C. P. Rao, Mr. Uday Merchant and many others took part in the discussion. Finally it was decided that the following criteria is to be followed to select the right candidate; (i) only one person will be awarded each year, (ii) the person should be a member of the Association for the last five years at least, (iii) age should not be more than 65 years, (iv) persons from institutions, universities, industries may be selected, (v) he or she should have involvement with the Association, (vi) nominations will be invited from the persons which will be reviewed by a competent committee for final selection. The members also realized that the process might be reviewed from time to time whenever necessary.

It was decided that the venue of the CARBO XXI will be Delhi University. Dr. Ashok K Prasad, and Dr. Hasi Das will jointly host the conference. It was also decided that Dr. K. P. R. Kartha would organize the CARBO XXII at NIPER, Chandigarh. The tentative venue for 2008 conference is NCL, Pune.

The meeting lasted for two and a half hours and was concluded with a vote of thanks to the chair.

Dr. A. K. Sen
General Secretary, ACCT(I)

Announcement

XXIST CARBOHYDRATE CONFERENCE

It is indeed a great pleasure to invite you along with your family to the CARBO XXI to be held during November 26-29, 2006 at the Department of Chemistry, University of Delhi, Delhi. The theme of the conference is 'Recent Developments in Carbohydrate Chemistry'. The conference will provide an open forum for the academicians, scientists, technologists and industrialists to exchange their ideas and foster interactive research among the participants and others.

Please do keep these dates free and come to enrich our scientific programme & the scintillating social-cultural evenings.

For more information please contact :

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Important dates: Last date for sending registration fee: 30.09.2006

New Sources of Industrial Gums: Part II - *Cassia fistula* (Amaltas) seed gum

Dr. V. P. Kapoor

Emeritus Scientist - CSIR
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The *Cassia fistula Linn.* (*Fam. Leguminosae*; *Sub. Fam. Caesalpinodeae*) is a beautiful deciduous tree of 5-8 meters high and 3-4 feet girth which is generally known as Amaltas and found throughout India. It bears beautiful yellow flowers from April to June and its pods are pendulous, cylindrical, 25-45 cm x 1.5-3.0 cm in size, which contain 50-100 seeds. It provides useful timber which is good for making wheels, plough, rice ponders and handles of various tools. Its bark contains 10-12 % tannin and is used as such or as admixture with avaran bark for tanning purpose. The seeds have been identified as a potential source of water soluble galactomannan gum.

The *Cassia fistula* seeds are dicotoledons medium sized (7-0 mm x 5-6 mm x 2-3 mm), light or dark brown. They have a very hard and shinning and large flat germ crumpled in the hard endosperm. The seeds are medium sized as the weight of 100 seeds is 17.8 g. The seeds contain moisture 6.3 %, protein 17.2 %, pentosan 9.0 % and water soluble gum 35.9 %. It has been found to be a potential source of seed gum as seeds contain 50-55 % endosperm which is mainly galactomannan gum. Its endosperm content is comparatively higher than commercial Guar and Carob gums, which range from 35-42 % and 42-46 %, respectively. Rest of the seed meal (50 %) contains mainly pentose, fiber and protein (26 %) which may be utilized for cattle and poultry feed. The composition of the seed is presented in Table 1.

Like Guar and Dhaincha, the endosperm of the seeds is responsible for the water soluble gum. Rest of the seed meal having seed coat and germ mainly contains pentose, fiber and protein. The endosperm of the seeds can be easily separated from the seeds by mechanical means employing various grinders and sieves. The separated endosperms are pulverized under humidity to different desired mesh-size. The endosperm of the seeds can be separated by dry milling process as processed with the guar seeds. As the Amaltas seeds are comparatively bigger and moderately hard, it is more appropriate to adopt wet milling process under which seeds are soaked in 40-50 % ethanol for 6-8 hours, dried in air for 3-4 hours and followed for milling process. It was observed that the yield of gum was 39-44 % in dry milling process in comparison to 32-38 % in wet milling process, but wet milling process afforded purer gum than dry process product. The comparative analysis of seed gum isolated by dry and wet milling process is presented in Table 2.

Table 1 - Composition of the *Cassia fistula* seed

Seed part	Protein %	Moisture %	Ether extract %	Ash %	Crude fiber %	Type of carbohydrate
Seed coat (16-21 %)	14.70	3.53	2.44	3.98	32.84	Pentose
Endosperm (50-55 %)	4.03	8.06	0.61	0.75	1.63	Galactomannan
Germ (20-26 %)	38.00	5.83	3.56	4.47	15.81	Pentose

Table 2 - Analysis of *Cassia fistula* seed gum isolated by dry and wet milling process

	Dry process gum	Wet process gum
Yield on seed basis	39-44 %	32-38 %
Moisture	7.3 %	8.1 %
Protein	6.1 %	4.0 %
Pentosan	4.9 %	0.7 %
Ash	1.2%	0.6 %
Acid insoluble matter	5.1 %	4.6 %
Loss on drying	10 % (max)	10 % (max)
Starch	Negative	Negative
Viscosity 2% (w/v)	800-1300 cP	1000-1800 cP
Constituent sugars	Galactose Mannose, Xylose	Galactose Mannose

According to the published reports, the gum is a galactomannan type of polysaccharide containing galactose: mannose in ratio 1:3 - 1:4. Like Guar and other commercial gums, the main chain consists of β-D-mannopyranose units to which single side branches of α-D-galactopyranosyl groups are attached. Its galactose / mannose composition is nearer to commercial Tara and Carob gums having lesser side branches of galactose thereby providing more unsubstituted blocks of mannan main chain for synergistic interactions.

Viscosity of a gum is an important characteristic which determines the utility of gum in industry. Keeping this in view,

a detail study on the viscosity behaviour of Amaltas seed gum has been carried out with different grades of gum (200, 150, 120, 90, 60 and 50 mesh-sizes) at different conditions of concentrations, shear rated, time, pH and temperature. The gum is dispersible in water at room temperature and vigorous stirring is required to prepare a homogeneous solution. As the concentration of gum is increased it takes more time for complete dispersion. 1, 2, 3 and 4% of gum solutions of all grades of gum samples were prepared for determination of their viscosity behaviour. The results showed that the viscosity increased with the increase of mesh size of the gum viz. 2% solution of 50 mesh size gum showed viscosity of 820 cP followed by 60 mesh gum, 925 cP; 90 mesh gum, 1200 cP; 120 mesh gum, 1510 cP; 150 mesh gum, 1680 cP and 200 mesh gum, 1800 cP. Like Guar and Carob seed gums, it showed sharp increase in viscosity with the increase in concentration. For 1% solution viscosity ranged from 70-250 cP, which rose to 820-1,800 cP for 2% followed by 3,700-9,000 cP for 3% and 12,700-21,000 cP for 4%. At higher concentration it became gel.

Like Guar and Carob gums, Amaltas gum solutions exhibited different viscosities at different shear rates, a property attributed to non-newtonian solutions. Different grades of the gums at 2% concentration had 1,280-2,100 cP viscosity at 0.3 rpm. It fell down to 820-1,800 cP at 12 rpm and finally 800-1,350 cP at 60 rpm. The apparent viscosity of Amaltas gum solution of any given rate of shear is independent of time and prior shear testing. It makes no difference whether the final rate of shear is applied from low shear rate to higher shear rate or vice versa, provided shear rates are not much to degrade the molecular structure.

Like other seed gums, Amaltas gum loses viscosity on keeping. It becomes half after 9-10 hours and almost one-third after 20 hours. The tendency of gum solution to lose viscosity on keeping can be checked by addition of preservative. When solution was preserved with 0. % (w/v) methyl paraben and 0.02% propyl paraben, the solution retained 83% of initial viscosity after 20 hours.

Since Amaltas gum is non-ionic it showed the expected stability over wide range of pH. It showed maximum viscosity at neutral solution (pH 7). Viscosity decreased to some extent on acidification but above pH 9, it lost viscosity rather sharply. The change in viscosity with pH has also been observed in most of the commercial gums.

Amaltas gum solution showed decrease in viscosity above room temperature. For example, 2% gum solution showed sharp decrease in viscosity due to increase in temperature and at 60°C the viscosity became half of the original. Above 80°C, viscosity fell sharply again which may be due to the degradation of the molecule. Most of the seed gums lose viscosity at higher temperature.

Amaltas gum showed good synergistic interaction with small proportion of Xanthan gum and formed gel at a higher concentration. It also showed good complexing properties with borax. It is due to the lower proportion of galactose content in the galactomannan which provides more un-substituted mannose blocks in the main chain for synergistic interaction with other polymers and monomers.

Amaltas gum has been evaluated for its binding properties for formulation of pharmaceutical tablets in relation to conventional binders like gum Arabic, gum Tragacanth, sodium CMC and gelatin. Different parameters such as % fines, tablet hardness, % friability and disintegration time were worked out. The gum showed overall superiority in viscosity and binding properties as compare to conventional binders.

Seed gum industry is a fast developing segment because of its varied industrial applications throughout world. The present international concern for safe, non-toxic and eco-friendly products initiated a trend for more usage of agro-chemicals in comparison to synthetic ones. Considering the rising demand of vegetable gums in coming years it is a need of the hour to concentrate on new sources of seed gums. Presently, the industry is utilizing Guar, Dhaincha and *Cassia tora* seeds for commercial production of the gums, whereas, there exists a lot of scope to utilize other leguminous seeds for the purpose. Indian plant wealth has enough potential to meet out the demand and the seed of *Cassia fistula* (Amaltas) is one of the examples. It is a very popular ornamental tree, which is generally planted throughout the country along the road side, railway tract and for avenue and shades. The seeds are produced in huge amount but go waste without utilization. The seeds possess full potential to be used as an alternative/ new source of commercial gums. No doubt, in initial stages, there will be problem of organized seed collection and regular supply of the raw material but it can be solved through systematic approach involving appropriate marketing agencies and concern expertise. I hope, some of the innovative entrepreneurs will surely come forward to promote this novel national cause. It would not only promote earning foreign exchange but also boost rural economy with self employment opportunity to rural masses.

Honours

Prof. Harikrishna Chandulal Trivedi has taken over as the Vice-Chancellor of Bhavnagar University, Bhabnagar, Gujarat- 364002, from June 2006. At present, he is the Vice-President of the Association.

Write to us.....

News items, about meetings, positions available, your comments, review articles (2-3 pages), scientific matters etc.

Life Time Achievement Award

The Association of Carbohydrate Chemists & Technologists (India) is privileged to honour the most successful chemists, biologists and technologists in the country who are working in the area of Glycoscience. In the XVIIIth Carbohydrate Conference held in Kolkata, ACCT(I) felicitated Prof. N. K. Mathur, ex-professor Jodhpur University, Prof. Nirmolendu Roy, Indian Association for the Cultivation of Science, Kolkata, Dr. K. R. Bhattacharya, Central Food Technological Research Institute, Mysore and Dr. V. P. Kapoor, National Botanical Research Institute, Lucknow, with the life time achievement award. In 2004, at the XIXth Carbohydrate Conference held in Dehra Dun, Dr. P. L. Soni, Forest Research Institute, Dehra Dun and Prof. Anakshi Khare, University of Lucknow, was awarded the life time achievement award for their outstanding contribution to Carbohydrate Chemistry. In 2005, at the XXth Carbohydrate Conference held at the University of Lucknow, Prof. Bishnu Pada Chatterjee, Indian Association for the Cultivation of Science, Kolkata, was awarded the life time achievement award for his commendable contribution to Glycobiology.

Prof. Bishnu Pada Chatterjee who is popularly known as BP is a senior professor at the Department of Biological Chemistry, In Indian Association for the Cultivation of Science, Kolkata. He started his research career in IACS, Kolkata in 1969 and was awarded Ph.D. degree from the Calcutta University in 1973 for the research on structural elucidation of *Pneumococcus* type XXII polysaccharide. He then moved to the University of Cologne, Germany for Post-doctoral training on carbohydrate binding proteins during 1976-78. Immediately after that he joined IACS as lecturer in the Department of Macromolecules, which is known as the department of Biological Chemistry now.

His main research interest is 'Lectin-carbohydrate Interaction' which is a major platform in modern glycobiology. He has published nearly 150 articles in various international and national journals and guided 15 Ph.D. students. Presently he is engaged in active research with a group of nine students.

He is a recipient of prestigious DAAD fellowship and JSPS senior fellowship. He has visited many European countries and Japan in various capacities and attended international seminars. He has been actively associated with the ACCT(I) for many years as Vice President and President. He is a member of several other learned societies including International Lectin Society. Presently, he is the treasurer of the Indian Biophysical Society and General Secretary of the Indian Science Congress Association-the highest national scientific body in India funded by DST.

He has received many awards notably Ramendra Sundar Oration Medal, P. K. Bose Oration medal etc. for his notable contribution in biological chemistry.

New Members

I am privileged to welcome all the new members during October 2005 and August 2006. The full list of members in detail is now available at the website of the Association [http://www.geocities.com/acctindia]. Members are requested to send their complete address, telephone no., e.mail address etc. to the editor, CNL, to make the list more meaningful. To strengthen the Association we need more members. So please come forward, motivate your colleagues/friends/students to become members of the Association. Thank you.

No.	Name	Address	Membership No.
LIFE MEMBERS			
1.	Prof. Sarat Chandra Nayak	Head, Department of Chemistry B. N. M. A. College Paliabindha, Bhadrak- 756167 (Orissa) Email: saratnayak31@rediffmail.com	LM/134/2005
2.	Dr. P. R. Sudhakaran	Depart of Biochemistry Kerala University, Thiruvananthapuram (Kerala)	LM/135/2005
3.	Prof. Tanmaya Pathak	Department of chemistry Indian Institute of Technology, Kharagpur 721302	LM/136/2005
4.	Dr. (Mrs.) Chitra Mandal	Indian Institute of Chemical Biology 4, Raja S. C. Mullick Road, Kolkata - 700032	LM/137/2005
5.	Dr. Arun Kumar Shaw	Scientist, Medical and Process Chemistry Division Central Drug Research Institute M. G. Road, Lucknow 226001	LM/138/2005
6.	Dr. Abha Rani Gupta	Tropical Forest Research Institute P.O. R F R C , Mandla Road, Jabalpur (M. P.)	LM/139/2005
7.	Mr. M. S. Desai	Excel Chemical Industries C1 - 21/12 GIDC Estate Near Bank of India, VATVA, Ahmedabad - 382445	LM/140/2005
8.	Mr. Deepak Bipinchandra Shah	Plot No. 11/B, G.I.D.C. Estate Kalol, North Gujarat, Pin 382725	LM/141/2005

Young Scientist Awards

To encourage young students, the Association of Carbohydrate Chemists & Technologists (India) gives a cash award of Rs. 1000.00 (Rupees one thousand only) and a citation for the best oral/poster presentation at the 'Carbohydrate Conference' every year. Only research scholars, research associates etc. (below the age of 30) are eligible for this award.

At the XXth Carbohydrate Conference, held during 24-26 November, 2005, at the Chemistry Department, University of Lucknow, paper entitled; 'Studies on Effect of Processing & Storage on Resistant Starch (RS) Content in Chapatti- An Indian Unleavened Bread' by Shalini K. Ghodke, Laxmi Ananthanarayan and Lambert Rodrigues was judged as the best oral presentation. The paper entitled 'Synthesis of Glycosyl Amino Ester as Possible Inhibitors of DNA Topoisomerase II' by Ankur A. K. Srivastava and R. P. Tripathi was judged the best poster presentation.

We express our heartiest congratulation to Mr. Ankur A. K. Srivastava and Ms.Shalini K. Ghodke.

Ankur Ashok Kumar Srivastava is presently working at the Chemistry Department, Central Drug Research Institute, Lucknow, under the guidance of Dr. R. P. Tripathi.

Ankur has an excellent academic career with a 1st class throughout. He obtained his B. Pharm from Nagpur University in 2004 and M. Pharm in 2006 from Manipal College of Pharmaceutical Sciences, MAHE, Karnataka. He was born in December, 1981.

Besides studies, Ankur took active participation in inter and intra collegiate competitions like debate, quiz, singing, sports etc. His quest is to achieve his goal by hard work.

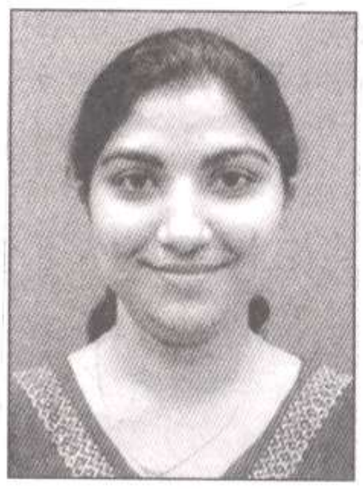
Shalini K. Ghodke is a senior research fellow at the University of Mumbai, Institute of Chemical Technology (UICT). She is doing her Ph.D. (Tech.) in Food Engineering and Technology on "Studies in chemistry and preservation of whole wheat staple food", under the guidance of Prof. Laxmi Ananthanarayan.

Born in June, 1981, she obtained her B.Tech. (Food Sciences) from Marathawada Agricultural University, Parbhani and M.Tech. (Food Engineering & Technology), UICT, University of Mumbai with first class and distinction.

She has attended many national and international symposiums and received several awards for her paper and poster presentations. Apart from her academic excellence, she likes to read, meet people, cook, hike & trek and listen to good music.

Ms. Lucid Colloids Limited Award

To encourage research on hydrocolloids, Ms. Lucid Colloids Limited, Mumbai, offers a cash award of Rs. 5000.00 (Rupees five thousand only) and a citation for the best paper presentation on hydrocolloids since 2003. At the XXth Carbohydrate Conference, held during 24-26 November, 2005, at the Chemistry Department, University of Lucknow, the paper entitled 'Studies in Graft Copolymers of Sodium Salt of Partially Carboxymethylated Guar Gum: Comparison of the Reactivity of Acrylate Monomers' by Ms. Trushna A Bhatt, J. H. Trivedi and H. C. Trivedi, was selected for the award. We express our heartiest congratulation to Ms. Trushna A. Bhatt.



Trushna Ashwinbhai Bhatt is on the verge of completion of her research work on "Studies on Graft Copolymer of Sodium salt of partially carboxymethylated Guar Gum", from the Department of Chemistry, Sardar Patel University, Vallabh Vidyanagar, under the guidance of Prof. H. C. Trivedi, Vice-Chancellor, Bhavnagar University, Bhavnagar.

Born in November, 1979, she obtained her Bachelors degree from St. Xavier's College, Ahmedabad and Masters in Physical Chemistry from Sardar Patel University, Vallabh Vidyanagar.

Presently she is a junior research fellow in the Chemistry department under the 'Center of excellence in applied polymer' scheme, sanctioned by UGC, New Delhi. She has attended a number of national and international symposiums/workshops and presented her research work.

Apart from research she has interest in dancing, music, singing and gardening.

Patents

Fermented and Dehydrated ready mixes: useful for making Indian traditional products like Idli & Dosa.

A process know-how developed by Central Food Technological Research Institute, Mysore - 570 020.

Idli and dosa are two fermented food products traditionally prepared and consumed, particularly in South Indian homes. These have already assumed National importance due to population movement and liking, specially for dosa. Fermentation of dosa or idli batter needs about 15 to 18 hrs in warm climate where ambient temperature of around 250°C or more is required. To overcome these problems, a ready mix had been developed earlier at this Institute, which contained chemical leavening additives for achieving appropriate taste and texture of finished products. To derive the nutritional advantages of fermentation and avoid/ minimize the addition of leavening agents and other chemical additives, a new process has now been developed wherein dehydrated ready mixes have been prepared from the fermented batters (both for idli and dosa) for their easy and quick preparation at home. This saves the human population from the drudgery of preparing batter, fermentation and preparation of products. Here the mix is re-constituted and products can be prepared instantaneously which resembles the naturally prepared idli or dosa using freshly fermented batter.

Technology has been patented by CFTRI and commercialized.

Inventors: Vasudeva Singh, H. V. Narasimha & S. Z. Ali

Efficient process of obtaining high contents of bound-phenolic acid rich dietary fibre by activating in situ amylases through step-wise increase in temperature

A process know-how developed by Central Food Technological Research Institute, Mysore - 570 020.

A fast, effective, and economical process of obtaining high contents of bound-phenolic acid rich dietary fibre from cereal malts in time duration ranging between 36-48 hours by step-wise increase in temperature by about 8-12°C for every 10-14 hours of incubation, thereby activating in situ amylases, with net temperature during incubation ranging between 43-77°C, with said stepwise increase in temperature helping to overcome the need of using exogenous enzymes.

United States Patent No. 7037537, Issued on May 2, 2006

Assignee: Council of Scientific & Industrial Research, New Delhi

Application No. 10382335, filed on 2003-03-05.

Inventors : Rayee Shyama Prasad Rao and Gudipati Muralikrishna

Please become a member of the Association of Carbohydrate Chemists & Technologists (India). Membership form is available at the Association Website :

Web Site : http://www.geocities.com/acctindia

Scleroglucan - an overview

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Exopolysaccharides produced by a variety of microorganisms are chemically well defined and have attracted worldwide attention due to their novel and unique physical properties. These exopolysaccharides find multifarious industrial applications in foods, pharmaceutical and other industries as emulsifiers, stabilizers, binders, gelling agents, lubricants, and thickening agents. These biopolymers are rapidly emerging as a new and industrially important source of polymeric materials, which are gradually becoming economically competitive.

One such polymer is scleroglucan, a non-ionic, water-soluble homopolysaccharide consisting of a linear chain of β-D-(1→ 3)-glucopyranosyl and β-D-(1→ 6)-glucopyranosyl groups. On an average, about every third of β-D-(1→3) glucose residue is linked with a β-D-(1→ 6)-glucose. The length of the polymer chain, and hence the molecular weight varies with the microbial cultures used. Generally, these polymers present weight average molecular masses ranging from (1.3-3.2) x 10^5 to (0.3-6) x 10^6 Daltons. Scleroglucan is produced by pure culture fermentation from a filamentous fungi *Sclerotium rolfsii, Sclerotium glucanicum* or *Sclerotium delphinii*. Scleroglucan has identical structure to schizophyllan, which is produced by *Schizophyllum commune.* Schizophyllan has slightly higher molecular weight than scleroglucan. It is also quite similar to curdlan produced by *Agrobacterium* species, which is composed of β-D-(1→ 3) glucose residues, but lacks the β-D-(1→ 6) glucose side groups. This reduces polymer solubility in water, but gives curdlan with better gelling properties. The aqueous solutions of scleroglucan are highly pseudoplastic, notably stable to high temperature and a broad range of pH, and tolerant to a variety of electrolytes. These properties make this polymer suitable for a number of varied industrial applications.

The production of scleroglucan was first reported by Halleck in 1967, who observed this extracellular polysaccharide to be secreted by *Sclerotium glucanicum.* Pillsbury Co. introduced scleroglucan in the market with the trade name Polytran®, and in 1976 it was commercialized by CECA S.E. (France) under the name Biopolymer CS®. Subsequently, SATIA- a division of Mero Rousselot del, (France) produced scleroglucan under the trade name of Actigum CS6®. Presently, SANOFI Bio-Industries (Carentan, France), which obtained the rights from SATIA and CECA, are the main scleroglucan producers, trading scleroglucan under the commercial names Polytran® and Actigum® respectively.

There is very little information available on the biosynthesis for scleroglucan formation in *Sclerotium glucanicum* and *Sclerotium rolfsii*, but generally this should resemble the biosynthetic steps encountered in the production of other glucans. First glucose is transferred into the cells via a hexokinase and is then phosphorylated by the action of phosphoglucomutase (PGM) and phosphoglucoisomerase (PGI). The pyrophosphorylase (UGP) catalyse the formation of uridine diphosphate glucose (UDP-Glucose), which reacts with lipid carrier and begins to polymerize.

Properties

The properties of scleroglucan may be influenced by the molecular weight and by recovery methods. Refined grades of scleroglucan dissolve readily in hot and cold water to form pseudoplastic solutions with shear thinning characteristics that tolerates high temperature, broad range of pH, and a variety of electrolytes, whereas the crude isolate from the fermentation broth produces low viscosity solutions. Mixing, temperature, pH, and concentration influence the rate at which viscosity develops. The viscosity of scleroglucan solutions is affected only slightly by temperature variations. At 0.5 and 2% concentrations, it remains practically constant between 10 and 90ºC. At low temperature close to 7ºC, solutions of scleroglucan form thermoreversible gels that may be caused by weakly interacting triple helix cross linking mechanism. The viscosity of scleroglucan is not affected over the range of pH from 1 to11. In dimethyl sulphoxide, in aqueous solutions of pH 12.5 or higher, or at temperatures higher than 90ºC, the reduced viscosity, specific rotation, and sedimentation coefficient indicate in each case that a triple helical structure is disrupted and transits to a single random coil.

Prehydrated scleroglucan is compatible with electrolytes such as 5% sodium chloride, 5% sodium sulphate, 20% calcium chloride, and 10% disodium hydrogen phosphate.

Fermentative Production

The optimal design of medium is very important in the growth of microorganisms, stimulating the formation of products and providing the necessary energy for metabolic purposes. The nutrients required by a fungus include macronutrients as carbon, oxygen, nitrogen, phosphorus, sulphur, potassium and magnesium that comprise an average 98% of dry cell weight of fungi.

The amount of carbon substrate converted by the cell to polymer depends upon the composition of growth medium and under certain conditions the product may not be produced at all. Generally, media containing high carbon to limiting nutrient ratio (often nitrogen) is favored for polysaccharide production. Conversion of 60-80% of the utilized carbon source into crude polymer is commonly found in high yielding polysaccharide fermentations. Usually, glucose and sucrose are used as carbon sources for biopolymer production, although other carbohydrates can also be utilized. Nitrogen is a component of proteins and enzymes and it is necessary in cell metabolism. It is supplied in the culture in the form of nitrates or ammonium salts, or more complex compounds such as yeast extract, casein hydrolyzate, soya hydrolyzate and corn steep liquor.

Phosphorus is an important element for secondary metabolism, and also regulates lipid and carbohydrate uptake by the cells. Phosphate salts, such as K_2HPO_4 or KH_2PO_4, also serve as a pH buffer in the fermentation medium. Addition of precursor molecules is of considerable importance in the polysaccharide synthesis in terms of metabolic driving force. It has been reported in case of polysaccharides that higher intracellular levels of nucleotide phosphate sugars under nitrogen-limited conditions enhance metabolite flux of exopolysaccharide synthesis.

Optimization of fermentation parameters alone is not enough to ensure a high yield of scleroglucan. The next crucial step after the completion of successful fermentation is the recovery of scleroglucan. The method used for recovery of the exopolysaccharide depends on characteristics of the producing organisms, the type of polysaccharide and desired grade of purity. Crude grade products may be obtained by drying entire fermentation broth. Unattached exopolysaccharide may be separated from the cells either by differential centrifugation or by filtration. Spray or drum drying or addition of water-miscible non-polar solvents such as acetone, ethanol, isopropyl alcohol can precipitate polymer and accomplish the removal of water. Often addition of electrolytes (salt) helps in precipitation by neutralizing the charges on the polysaccharides. Recovery of solvents is essential for the economic reasons. If desired the precipitate can be further purified by dissolving it in water and then dewatering, drying and milling.

Applications

Initial application of scleroglucan was in the oil recovery where it proved to be more effective and stable than xanthan over a wide range of temperature and pH. In oil recovery, scleroglucan increases the viscosity, and thus the hydraulic pressure of (sea) water or brine used to extract oil. Xanthan is also used for the same purpose, although it is not considered to be as effective as or as stable. Scleroglucan is not at present as economical as xanthan, but the potential use of crude scleroglucan (biopolymer-cells) might be an economical alternative for use in oil recovery and drilling.

Scleroglucan in food may be used as a thickener, gelling or stabilizing agent, however xanthan has similar properties and applications and at present dominates the market. If the problem of high cost and low productivity of scleroglucan be overcome, then it could replace xanthan in many food stuffs such as jams and marmalades, soups, confectionery products and water based gels, frozen foods, dairy products such as yogurt or ice-cream, low calorie or non fat products, or in fabricated/structural foods. Scleroglucan could be especially useful in food manufacturing where a heating process is involved, because of thermal stability that it exhibits.

The use of scleroglucan as an anti-tumour, antiviral and antimicrobial compound has also been investigated. Scleroglucan has the caloric equivalent of starch. Scleroglucan has shown immune stimulatory effects compared with other biopolymers, and its potential contribution to the treatment of many diseases should be taken into account in therapeutic regimens. Short and long term feeding studies with rats and dogs show no toxicity, blood abnormalities, or significant tissue pathology. Eye and skin tests involving guinea pigs, rabbits and humans demonstrate no significant adverse reactions or sensitization. With chicks and dogs, scleroglucan in the diet lowered the cholesterol levels and increased the excretion of lipid. Recently, the attractive properties of the polysaccharide in controlled drug release and especially in immunopharmaceutical applications have created a demand in the medical market, though in terms of quantity this market is comparatively limited. Currently scleroglucan is not used in the food industry to any great extent because of its high cost, despite its thickening and stabilizing abilities that might be exploited in several foodstuffs. It is possible that genetic engineering techniques could improve the biopolymer yields and reduce the production costs, allowing much wider use of the biopolymer as a replacement of Xanthan.

In cosmetic industry, scleroglucan applications may be used in the formulations for hair sprays and in various skin care preparations creams protective lotions emollients, demulcents, and antisoilants.

In agriculture, scleroglucan is a useful antisettling agent for phytosanitary products; it facilitates the preparation of spraying mixtures and particularly improves contact of the droplets sprayed onto leaves. It may also be used in pesticide, defoliant sprays, and seed coatings.

'I believe in a word, that the true scientific method confines the mind without suffocating it. Leaves it as far as possible face to face with itself. And guides it while respecting the creative originality and spontaneity which are its most precious qualities'.

- Claude Bernard