SHARKARA

April-June 2020 Volume 52, No.02

NATIONAL SUGAR INSTITUTE

Department of Food & Public Distribution
Ministry of Consumer Affairs, Food & Public Distribution
Government of India
Kanpur - 208 017, INDIA
Email : nsikanpur@nic.in
Visit us at : http://nsi.gov.in

Follow us:

SHARKARA

VOLUME-51, No .02

APRIL - JUNE, 2020

It contains…….

CONTENTS PAGE

From Director's Desk.....

Globally, the humanity is passing through trying times due to outbreak of Covid-19. The implications of it are having far reaching consequences on social and economical fronts. With uncertainity looming large, efforts are being made to draw a balance in activities in every sphere so as to keep the ball rolling. Although, till now, sugar industry has not been impacted to a greater extent but if the situation continues, it may also have to face the music. With exports getting tougher and again a bumper sugar production expected during sugar season 2020-21, the demand-supply situation may be tougher even after considering sugar sacrifice through cane juice, B Heavy molasses or other routes. For facilitating higher sugar sacrifice and boosting ethanol production, important consideration would be ethanol capacity building.

The pandemic will force many changes and innovations so as to cope up with the requirement in the changed scenario. Safe food from "Farm to Fork" is required to be on the top of the agenda for sugar industry as well. This will require formulation of SOP's for hygienic processing and packaging of the sugar. The packaging of sugar is going to assume greater significance and more consumer packs are likely to come from the industry ensuring hygiene and weight. With next sugar season couple of months away, sugar factories in different sugar producing states are required to work out strategies for harvesting, processing, product, packaging and marketing well in advance. As I emphasize time and again, sugar industry has to look beyond white sugar so as to produce other valued added, nutritive sugars and sweeteners including jaggery. Jaggery fortified with turmeric, cinammin, giner and flax seeds etc. can be marketed as "Jaggery with Immunity Boosters".

Stay safe. Stay healthy and happy at your places.

(Narendra Mohan)
Director

OUR PROVISIONS:

WEBINARS ORGANIZED:

1. A WEBINAR on **"Impact of COVID 19 on Indian Sugar Industry"** was successfully organized jointly by National Sugar Institute, Kanpur & M/s Shrijee Process Engineering Works Ltd., Maharashtra on 29th April, 2020. Prof. Narendra Mohan, Director delivered the inaugural address emphasizing stress on safe processing and packaging conditions. Galaxy of experts participated and deliberated on the issue. The Webinar concluded with some thought provoking ideas to be adopted as short and long term measures keeping in view the situation which has been prevailing due to pandemic.

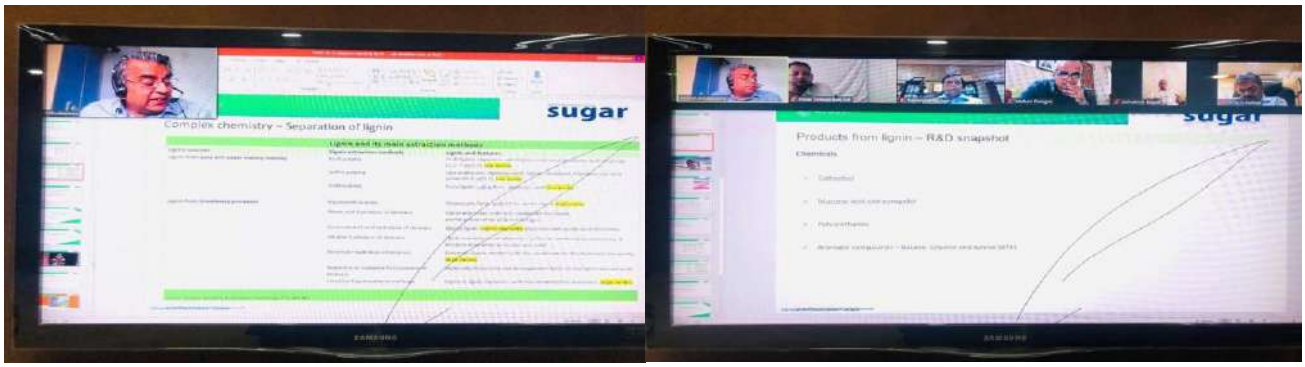


2. A WEBINAR on **"Domestic and Industrial Sanitization amidst Pandemic"** was successfully organized by the institute jointly with Christ Church College, Kanpur on 14th May, 2020. This Webinar was intended to provide an insight on the domestic and industrial sanitization at various levels of the sugarcane value chain with a perspective on the evolving situation, implications and the booster steps required to pull out of this turmoil. Shri Sanjay Awasthi, President, The Sugar Technologists Association of India delivered the key note address and highlighted various precautionary measures to be taken for maintaining sanitary conditions in the sugar units.

Presentations were also made by Prof. Narendra Mohan, Director, National Sugar Institute, Kanpur, Dr. (Mrs.) Meet Kamal Dwivedi, Associate Professor of Chemistry and Dr. R. K Dwivedi, Associate Professor of Physics, Christ Church College on the subject matter.


3. A WEBINAR on **"Sugar Market & Consumption Under Covid-19"** was organized by the institute on 16th June, 2020. Mr. Peter De Klerk, Senior Economist International Sugar Organization, UK delivered the key note address highlighting the myth and realities associated with sugar consumption. He also presented scenario as regards sugar consumption and global sugar price amidst pandemic.

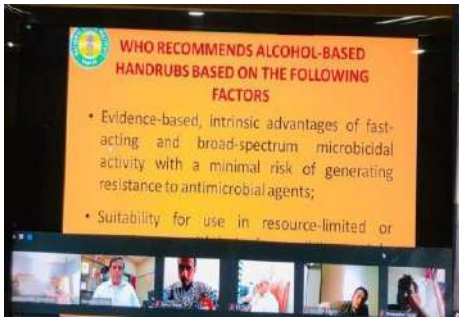
4. An on line session was organized by the institute with Mr Arvind Chudasama, Editor, International Sugar Journal, London on the topic **"Exploiting Ligno-cellulosic Feed Stocks for Lignin and Chemicals"** on 4th June, 2020. Mr. Chudasama gave a snapshot of R&D being carried out on utilization of lignin for production of plasticizers, aerogels & carbon filter etc. The highlighted the present status of work being carried out on commercial exploitation of the value added products in other countries viz. USA, Brazil and Australia.

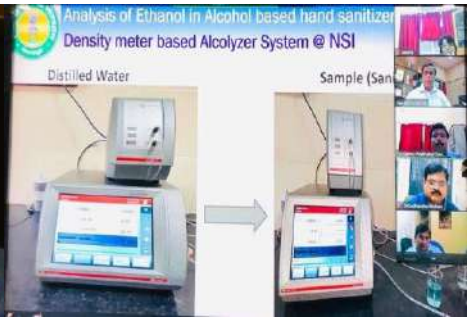


5. A presentation on **"Re-orienting Technological Approach for Process and Products Diversification to Mitigate Corona Crisis"** was given by Director, NSI in Webinar organized by Indian Institute of Sugarcane Research, Lucknow (IISR) on the topic "Sugarcane Sector in Post Covid-19 and way forward" on 12th June, 2020. He stressed upon three R's – Revisit, Re-create and Re-orient to mitigate the Corona crisis.

ONLINE WORKSHOP ORGANIZED:

An online workshop was organized on 9th June, 2020 on the topic **"Sanitizer Production and Quality Control"** with a view to help the industry to produce sanitizer as per the World Health Organization (WHO) guidelines to fight Covid-19 and also to inspire young entrepreneurs for setting up such units.





The training programme was attended by large number of participants wherein they were taught on various formulations of hand sanitizers, analytical procedures for testing quality of raw material and end product. Information was also provided to them on broad infrastructure required for setting up sanitizer units.

ONLINE LECTURE:

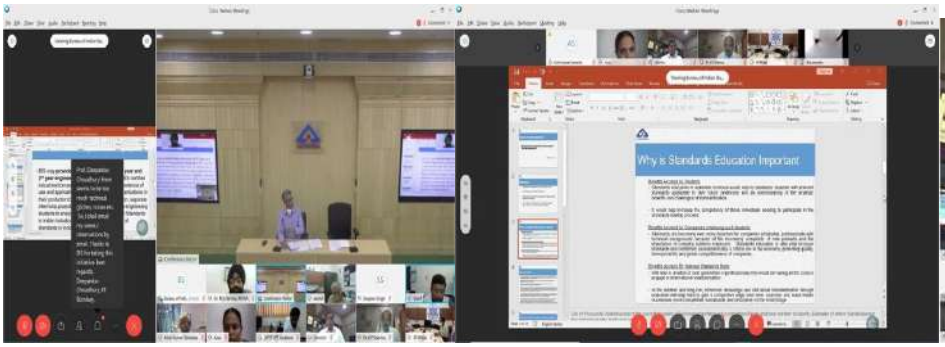
1. Director, NSI delivered lecture on **"Sugar and Sweeteners- Processing and Quality Considerations Amidst Pandemic"** during Faculty Development Programme organized by SR Institute of Management and Technology, Lucknow on 19th June, 2020, wherein he focused on cane juice bottling and production of fortified jaggery as immunity booster. He made an elaborate presentation on necessity of providing safe and nutritious sweetners from the sugar industry.

2. A lecture was delivered by Dr. Sudhanshu Mohan in Webinar organized by DG Girls Collage, Kanpur on **"Chemistry of Covid-19 and its Control"** on 7th June, 2020. He elaborated the role of chemistry in combating the corona crisis including use of various formulations of hand and general sanitizers, particularly keeping in view their possible affect on human health.

BRAIN STORMING SESSION:

Director, NSI participated online in a Brain Storming Session conducted by Bureau of Indian Standards, New Delhi (BIS), on the topic **"Integration of Standards in the Curriculum of Technical Education".** An action plan has been prepared by BUS for introducing syllabus of standards and standardization in

various courses and for creating awareness about the various standards for quality control and consumer protection. Director, National Sugar Institute informed that institute has already taken lead by introducing courses on "Quality Control" and formulating newer standards for Sulphur-less Sugar, Brown Sugar and Organic Sugar.



NATIONAL TECHNOLOGY DAY:

National Technology Day was organized at the institute on 11th May, 2020. Technical staff participated and discussions were held on **"Innovations for Clean and Green Sugar Industry".** Prof. Narendra Mohan, Prof. D. Swain and Dr. Ashutosh Bajpai shared their views about the topic.



COLLABORATIVE RESEARCH:

A Memorandum of Agreement (MoA) was signed between National Sugar Institute, Kanpur and M/s UY Trienviro Pvt. Ltd., Kanpur on 22nd May, 2020 to take up pilot plant studies for developing technologies for condensate treatment so as to convert it as a replacement of fresh or even as potable water.



****

OUR RESEARCH AREAS:

1. Studies on isolation of Lignin from sugar industry based biomass and development of the process for the conversion of derived lignin and fermentable sugar to value added product - Vanillin is a primary compound of vanilla extracts. It is essential in various applications in food flavor formulations, chocolate, confectionery, baking, beverage, dairy and fresh products, perfumes and fragrance, odors masking, formulation for home and personal care, toiletries, detergency, feed applications, pharmaceutical and agrochemicals intermediated. Instead of natural production from vanilla orchid bean, vanillin can be chemically derived via controlled oxidation of lignin. With objective to enable full valorization of sugarcane bagasse to access values added products, we have extended our research activities towards exploring an efficient method to access vanillin from sugarcane bagasse based lignin. The authentic/standard sample has been procured and some experimental work related to its characterization via FTIR and TLC experiments has been performed. The work is being carried out in order to establish a protocol towards identification and characterization of target compound that is to be derived from sugarcane bagasse.

2. Studies on access of bio-plastic as polyethylene substitute from sugarcane bagasse - The literature survey has been completed. The work related to sketch plan based on literature survey and compilation of list of required materials is ongoing. The study is aimed at obtaining a valued added product from the by-product of the sugar industry.

3. Studies on the feasibility of utilization of sugarcane bagasse as a potential feedstock to access cosmetic ingredients - Under this study, efforts have been made to establish an efficient protocol to synthesize plate form chemical, β-C-xylosylic ketones directly from sugarcane bagasse based xylan polysaccharide. Through optimization studies have been carried out and as an out come, we have developed a chemical method for producing β-C-xylosylic ketones using sugar cane bagasse as starting material. The principal steps of which are mild sulphuric acid hydrolysis of the hemicellulose fraction of the sugarcane bagasse to yield the hydrolysate, followed by executing glycosylation process with 1,3-Diketones. The process can be carried out with different solid : liquid ratios and provides a step of acclimatizing glycosylation process with 1,3-Diketones, which results in a greater yield of β-C-xylosylic ketones from sugarcane bagasse. The present work envisages a new aspect for the use of sugarcane bagasse as a by-product of sugar industry, by converting it into sugarcane bagasse hydrolysate as a direct source of xylose sugar to access value-added xylose-based C-glycosides, which have known beneficial biological properties, in particular for combating ageing of the epidermis, and/or combating drying out of the skin, among the others.

4. Studies on pot-efficient synthesis of alkyl levulinates (Als) using sugarcane bagasse derived cellulose - With aim to convert sugarcane bagasse to value added platform molecule implementing bio refinery concept, we have been devoted to develop a method for the conversions of bagasse based cellulose to alkyl levulinates. Targeted alkyl levulinates are a kind of short fatty acid esters which can be

used as plasticizing agents, solvents, or as a blending fuel additive. Apart from that, their reactive ester and carbonyl groups enable them to be used for the synthesis of several downstream chemicals or drugs. Initially, we carried out several experiments to establish an optimum condition for synthesizing methyl levulinate from bagasse (@ 5 gm scale of dry bagasse) utilizing various metal catalysts under Parr Auto Clave reactor condition. Out of various catalyst tested, a copper salt was found to be efficient to facilitate such reactions, albeit lower yield. The synthesized compounds were analyzed by recording NMR spectra and mass spectrometry towards determination of its structure. As per plan, the work related to enhancing the product yield had to be started.

5. Mechanical Clarification of Juice – Purpose of mechanical clarification of cane juice to remove most of the suspended impurities like dirt & fine particle of bagasse etc. from cane juice by using centrifuge technique before cane juice clarification. The experiments were conducted at 6000 rpm during crushing season 208-2019, and a paper has already been published. During the crushing season 2019-2020, the studies were further taken up and various mixed juice samples were centrifuged at 1500 and 2500 rpm for duration of 10, 15 and 20 minutes. After maintaining the level of 300 ppm phosphate, heating up to 70^0C, adding flocculent @ 1 ppm, the samples were centrifuged and it was observed that colour and turbidity removal were around 15 % and 75 % respectively

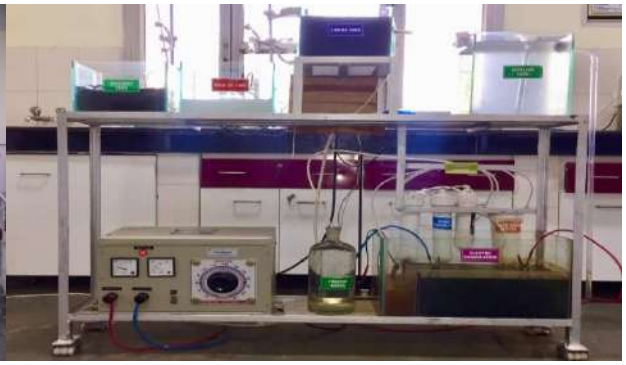
The results of the physico-chemical analysis indicated that the best results were observed at 2500 rpm for 20 minutes duration. The superior quality of mixed juice obtained from mechanical centrifugation is likely to minimize the consumption of chemicals for further clarification and better efficiency at subsequent unit operations.

6. Standardization of method for determination of Preparatory Index: There are several methods in vogue for determination of preparatory index of sugarcane. Data on methods been adopted in various countries and as recommended by ICUMSA etc. has been compiled. Required equipment have been procured for taking up the studies on laboratory scale.

7. Development of Super Short Retention Time Clarifier The study is aimed at developing a Super Short Retention Time (SSRT) Clarifier to reduce the retention time as required in the conventional clarifier (i.e. from 2 hrs. to around 30 minutes) which may result in the reduction in colour development, sugar loss and temperature drop also. One research paper entitled “Observation on working of super

short retention time clarifier" was published in proceedings of 'NISSTA' annual convention held on May, 2019 on the basis of the trial conducted during 2018-19 crushing season. Further trials on modified design were conducted at Experimental Sugar Factory (ESF) during current season 2019-20. The quality of juice and consistency of muddy juice was observed to be satisfactory with lower drop in temperature across the clarifier

8. Studies on deterioration patterns on different sugars – The division has started to study the deterioration patterns of various sugar samples- raw, plantation white and refined sugars on storage and to find out its reasons for difference in the rate of deterioration. These sugar samples have been collected, packed and stored at the identical conditions. On regular intervals, the analysis of various parameters such as Colour, Ash, Pol, pH, reducing sugar content, SO_2 content and turbidity as per plan of work is being carried out. It is expected that the information collected as a result of study shall pave way for developing SOP's for storage of different sugars. Side by side, it shall also help in guiding about packing of sugar in consumer packs which is going to be important as a result of Covid 19 outbreak.



RESEARCH PAPERS/PRESENTATIONS/BOOK CHAPTERS:

1. A research paper on **"Bio-Ethanol from Sugar Industry-Our Options"** by Narendra Mohan & D. Swain published in 'Sharkara' January – March, 2020.

2. A research paper on **"Micronutrient Fortification of Sugar"** by Narendra Mohan, Ashok Kumar Garg & Anushka Agarwal accepted for publication in proceeding of South African Sugar Technologist Association, 2020.

3. A review on **"Bioenergy from Sugar Industry"** by Narendra Mohan, D. Swain & Anoop Kumar Kanaujia published in International Journal for Scientific Research and Development, Vol. – VIII, Issue 2, 2020.

4. A research paper on **"Techno-economic Process for Producing Superior Quality White & Other Specialty Sugars"** by Narendra Mohan & Prem Shanker Katiyar published in Sharkara April-June, 2020.

5. A research paper on **"Investigations on Microbial-flora Variation in Water Generated at Various Sugar Production Stages"** by Seema Paroha and Shikha Singh published in International Journal of Microbiology and Applied Sciences.

6. A research paper on **"Diversity of Microflora in Different Combinations of Pressmud for Biogas Production"** by Seema Paroha, Ankita Kachhwaha and Shikha Singh published in International Journal of Microbiology Research.

7. A research paper on **"Sugar Beet-The Potential Feed stocks for Alcohol Production"** by Seema Paroha, Shikha Singh and Alka Gupta published in International Journal of Agriculture Sciences.

8. A concept paper on **"Advances in Sugarcane Industry: By-product Valorization"** by Narendra Mohan & Anushka Agarwal sent for publication as chapter for the book titled 'Sustainable Food Waste Management: Concepts & Innovation' to be published by springer nature, Singapore.

9. A concept paper on **"Sugar & Sweeteners – Processing and Quality Considerations Amidst Pandemic"** was presented by Director, NSI during the online Faculty Development Programme organized by SRM Group of Management on 19th June 2020.

10. Book chapter on **"Quality of Indian Sugars: Opportunities & Challenges"** by Anushka Agarwal & Narendra Mohan published as chapter in book entitled "Emerging Technologies in Food Science - Focus on the Developing World'' by Springer, Singapore, June 2020.

11. A paper on **"Techno-economic Process for Producing Superior Quality White & Other Specialty Sugars"** by Narendra Mohan & Prem Shanker Katiyar published in Sharkara April-June, 2020.

12. Book chapter on **"Advances in Sugarcane Industry: By-product Valorization"** by Narendra Mohan & Anushka Agarwal sent for publication as chapter for the book titled 'Sustainable Food Waste Management: Concepts & Innovation' to be published by springer nature, Singapore.

13. A presentation on "**Alternate Uses of Bagasse: Particle Board and Bio-degradable Moulded Products"** by Vinay Kumar was made during the Webinar on Alternate Uses of Bagasse, held on 2nd July 2020.

14. A presentation on "**Bio-plastic: Product Diversification in Sugar Industry"** by Dr. V. P Srivastava was made during the Webinar on Alternate Uses of Bagasse, held on 2nd July 2020.

15. A presentation on "**Bagasse as Dietary Fibre"** by Dr. (Mrs.) Seema Paroha was made during the Webinar on Alternate Uses of Bagasse, held on 2nd July 2020.

16. A presentation on **"Re-orienting Technological Approach for Process and Products Diversification to Mitigate Corona Crisis"** was made by Narendra Mohan during the webinar organized by Indian Institute of Sugarcane Research, Lucknow (IISR) on the topic "Sugarcane Sector in Post Covid-19 and way forward" on 12th June, 2020

17. A presentation on **"Impact of COVID 19 on Indian Sugar Industry"** was made by Narendra Mohan during the webinar organized by NSI-Shrijee on 29th April 2020.

****

BUREAU OF SUGAR STANDARDS:

The Institute on behalf of Bureau of Indian Standards prepares and issues Sugar Standard Grades to the entire Sugar Industry of the country for every sugar season. These Sugar Standard Grades are issued to facilitate quality control and to protect the interest of the common consumers. On the basis of these grades, sugar factories mark their produce accordingly. Meeting of Expert Committee on sugar standards was held at NSI, Kanpur on 25th September 2019, wherein seven grades and their sale price were approved for the sugar season 2019-20.

On the basis of the approved Standards, Bureau of Sugar Standards Grades distribution commenced from 1st October, 2019. Bureau of Sugar Standards issued 24 Sugar Standard Grades to 05 sugar factories during April-June, 2020.

Price schedule for the sugar season 2019-20:

1	Sugar Standard Grades to be issued	L-31, L-30, M31, M-30, S-31,S-30 & SS-31
2	Set of New Sugar Standard Grades containing 7 grades +3 empty glass bottles + 3 Velvet Cork in packing case	Rs.19000/= each set
3	Single Sugar Standard Grade	Rs.2500/= each
4	Empty Sugar Standard Glass Bottle	Rs.400/= each
5	Packing case	Rs.600/= each
6	Velvet Cork	Rs.100/= each
7	Postal expenses, forwarding charges, if any	Extra as applicable
8	Payment	For Indian Sugar Standards 2019-20, payment shall be acceptable only through **BHARAT KOSH.** In any circumstances, **no Demand Draft / Cheque / Cash amount shall be accepted.**
9	Delivery of Sugar Standard Grades	Monday to Friday (10.00 AM to 5.00 PM)
10	Taxes	GST extra as applicable @18%.

The institute has taken up revision of various existing BIS standards viz. molasses tanks, raw, plantation white, refined and icing sugar etc. on behalf of Bureau of Indian Standards. BIS standards for some other sugars viz. organic sugar, brown sugar & low sulphur sugar are being drafted in consultation with various stake holders.

OUR ADVISORY:

Besides conducting teaching and training programmes, carrying out research in relevant field, another main function of the institute is:

1. To function as a "Think-tank" to sugar and allied industry for proposing modernization and trouble free functioning of the process on Advisory basis / through Extension Services.

2. To formulate strategies and promotes measures for expansion of capacities, energy conservation, co-product utilization etc. for sugar and allied industries.

3. To assist Govt. of India and various state governments through technical contribution in policy formulation and control of Sugar Industry.

CONSULTANCY SERVICES:

Due to travel and other travel restrctions, the consultancy services of the institute were affected severely. During April-June, 2020 consultancy services were provided to the following:

1	M/s Triveni Engineering & Industries Ltd., Unit – Deoband, Distt – Saharanpur, U.P.
2	M/s Shree Kedarnath Sugar & Agro Products Ltd., Distt – Bagalkot, Karnataka.
3	M/s Badami Sugars Ltd., Distt – Bagalkot, Karnataka.
4	M/s Gobind Sugar Mills Ltd., Aira, Distt – Kheri, U.P.
5	M/s Dwarikesh Sugar Industries Ltd., Distt – Bijnor, U.P.
6	M/s Uttarakhand Sahkari Chini Mills Sangh Ltd., Distt – Dehradoon, Uttarakhand.

ANALYTICAL SERVICES:

The institute now has a Centralized NABL Accredited Analytical Laboratory to carryout analysis of sugar, molasses, alcohol and other related products as ICUMSA and other standards protocol. The laboratory also has BIS approval for carrying out analysis of sugar and other sweeteners. During the period, analytical services were rendered to following:

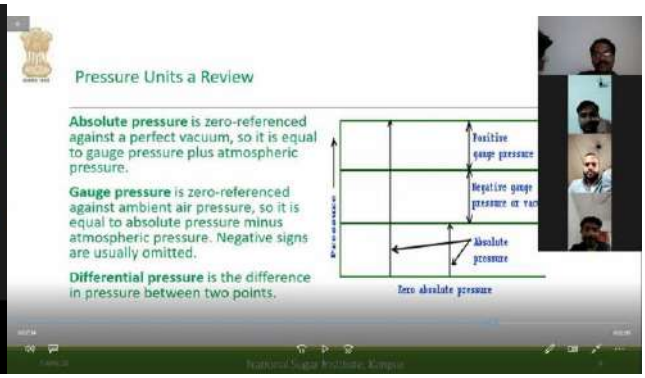
1	M/s Dalmia Bharat Sugar & Industries Ltd., Unit – Shri Datta Sakhar Karkhana, Asrule Porle, Distt – Kolhapur, Maharashtra.
2	M/s Dalmia Bharat Sugar & Industries Ltd., Unit – Ninaidevi, Maharashtra.
3	M/s Sanitini Bio-products Pvt. Ltd., Andhra Pradesh.
4	M/s The Seksaria Biswan Sugar Factory Ltd., Biswan, Distt – Sitapur, U.P.
5	M/s Dhampur Sugar Mills Ltd., Asmoli, (Distillery division).
6	M/s Parle Biscuits Pvt. Ltd., Parsendi, Distt – Bahraich, U.P.
7	M/s Kisan Sahakari Chini Mills Ltd., Sathion, Distt – Azamgarh, U.P.

8	M/s Gobind Sugar Mills Ltd., Aira, Distt – Kheri, U.P.
9	M/s The Amaravathi Co-operative Sugar Mills Ltd., Krishnapuram, Distt - Tirupur, Tamilnadu.
10	M/s The Salem Co-operative Sugar Mills Ltd., Mohanur, Distt- Namakkal,– Tamilnadu.
11	M/s Ugar Sugars Works Ltd., Distt - Belagavi, Karnataka
12	M/s Daurala Sugar Works Daurala, Distt – Meerut, U.P.
13	M/s K M Sugar Mills Pvt. Ltd., Masodha, Distt - Faizabad, U.P.
14	M/s Perambalur Sugar Mills Ltd., Eraiyur, Distt – Perambalur, Tamil Nadu.
15	M/s Danteshwari Maiya Sahakari Shakkar Karkhana Maryadit, Distt – Balod, Chhattisgarh.
16	M/s Shri Bake Bihari Food Production Pvt. Ltd., Distt – Hardoi, U.P.

xxxxx

OUR OTHER ACTIVITIES:

1. Amid lockdown, since the classroom teaching was not possible, classes on virtual platform were conducted during the period so as to maintain the continuity. To facilitate the students further, a You Tube channel has been created where many videos/lectures of the study material have been uploaded. In addition to it, study material has also been uploaded on the institute website from where it can be retrieved by the students.



2. Earth Day-2020 was celebrated by the institute on 22nd April, 2020. On the occasion Director emphasized upon conservation of natural resources and minimizing pollution in any form. In support of campaign for environmental protection, tree plantation was organized in the institute campus.

3. Intercropping of sugar beet and sweet sorghum with sugarcane has been taken up at institute farm to assess the productivity and potential of ethanol production along-with sugar during the period.

Harvesting of three varieties of sugar beet was taken up at the institute farm during 2019-20 session and it was observed that the weight of beet roots was in the range of 4 to 5 kg. The average ethanol yield was also estimated up to 90 to 100 liter per ton of beet roots.

4. To combat Covid-19, various precautionary measures as per the guidelines issued in the matter were taken. Foot Operated Hand Washing System was constructed and installed at Experimental Sugar Factory (ESF) by the institute on 29th April, 2020, which facilitates washing of hands without touching tap and soap dispenser. In addition to it, foot mounted sanitizer dispensing system was also developed and installed.Thermal scanning, personal and general sanitization of the institute campus was ensured during the period.



PPE kits, sanitizer and masks were provided to the district administration and also to the front line corona warriors at police stations and district hospital.



Under the auspices of 'Council of Students' Activities of the Institute, bags of 10 kg food material to the needy families were distributed for direct benefit to the weaker sections of the society on 18th May, 2020.



5. Patent application for Production of Vitamin-A Fortified Sugar by Co-Crystallization Technique was filed through National Research Development Council. Laboratory scale trials were carried out by overcoming drawbacks of existing technique of preparing premix and adding to bulk of sugar. Co-crystallization technique resulted in uniform distribution of Vitamin A (15.5-19.5 microgram per gram) and higher shelf life.


6. "World Environment Day" was celebrated at the institute on 5th June 2020 on the theme **"Bio-economy of the Sugar Industry".** Tree plantation was carried out on this occasion and a poster carrying message for "Environmental Sustainability" of the sugar industry was released.



7. 6th World Yoga Day was celebrated on 21st June, 2020, the theme of this year was Yoga at home and Yoga with family, reflecting the need to maintain physical fitness which is more important keeping in view the current pandemic.


8. सरकारी कामकाज में राजभाषा के रुप में हिन्दी के प्रति जागरुकता लाने तथा उसके उत्तरोत्तर विकास हेतु संस्थान में 24 जून, 2020 को ऑनलाइन हिन्दी कार्यशाला का आयोजन किया गया।

HAPPENING IN THE SUGAR INDUSTRY:

UP's sugar crushing ends, cane dues swell to nearly Rs 15,000 crore.
Even as the Uttar Pradesh government is basking in the 'historic' glow of Rs 1 lakh crore cane payments made to farmers by the end of crushing season 2019-20, the state's mills still have whopping arrears of around Rs 14,800 crore piled against the cane purchased from farmers.

Yogi government to promote sugarcane farming to help rural women to earn more.
To increase the participation of women in sugarcane farming and promote self-employment in the rural areas, the Yogi Adityanath government has decided to train women in preparing cane seedlings through single bud and bud chip method. The women can make additional earning by selling these seedlings to the sugarcane farmers.

Sanjivani 'closure' stuns sugarcane farmers; Government denies move.
Hours after the sugarcane farmers at Sanjivani Sugar Factory, Dharbandora threatened to protest the announcement to close operations, the government said there was no decision on closure of the sugar factory. In a press release through the Department of Information and Publicity.

UP State sugar administration begins issuing share certificates to farmers; first ever move in state.
Principal secretary of UP cane and sugar industry, Sanjay R Bhoosreddy, is promoting a system of issuing share certificates to all sugarcane growers who are registered with the cooperative sugarcane societies for their supply of cane to sugar mills, as well as those who have contributed share capital to sugar mills.

Maharashtra: Distilleries get FDA nod to keep making sanitisers till December.
Around 108 distilleries in the state that had got a special nod to manufacture hand sanitizers at the start of the pandemic in March have been allowed to continue till December. Foreseeing rise in demand for sanitizers after the lockdown is relaxed, the state FDA last week extended licences till December 31.

Avadh Sugar & Energy standalone net profit declines 29.01% in the March 2020 quarter.
Sales rise 45.30% to Rs 773.14 crore Net profit of Avadh Sugar & Energy declined 29.01% to Rs 60.50 crore in the quarter ended March 2020 as against Rs 85.22 crore during the previous quarter ended March 2019. Sales rose 45.30% to Rs 773.14 crore in the quarter ended March 2020.

Maharashtra co-operative sugar mills seek hike in sugar MSP.
Cooperative sugar mills from Maharashtra are seeking a grade-wise rise in the minimum support price (MSP) of sugar and a government guarantee for mills that have reported a negative NDR (net disposable resource) and therefore are being turned away by banks for working capital loans for the new season, top officials of the Maharashtra.

Sugar sector eyes relief package from Centre amid Covid-19 headwinds.
Amid the Covid-19 headwinds, the domestic sugar sector is expecting some relief from the Centre in the form of a package to deal with the multipronged challenges of muted demand, cash flow bottlenecks and the minimum selling price (MSP) cap of Rs 31/kg. The sugar industry has estimated consumption to fall by 0.5 million.

Haryana: Revive Bhuna sugar mill, we are ready to leave paddy: Farmers tell Haryana govt.
At a time when the Haryana government is vociferously promoting crop diversification, the farmers of Fatehabad district have assured the authorities that they will plant sugarcane in place of paddy if the government is ready to revive the dysfunctional sugar mill of Bhuna town. "Sugarcane is the best answer to check the depleting.

Food ministry chalks out plan to liquidate sugar mills stocks worth Rs 30,000 crore.
Food ministry has chalked out four-month plan to liquidate stocks worth Rs 30,000 crore with sugar mills to help them improve cash flow and pay cane arrears to farmers, officials said. "Apart from that, we would be releasing assistance of Rs 1,100 crore on account of export and buffer subsidy.

Maharashtra: 37 cooperative sugar mills in state face problems in raising finance.
Ahead of the 2020-21 sugarcane crushing season, as many as 37 cooperative sugar mills in Maharashtra not be able to raise capital from banks to start their operations. Jaiprakash Dandegaonkar, chairman of the Maharashtra State Cooperative Sugar Factories Federation, has urged NABARD to allow such mills to raise finance from the banks.

Food min for sugar buffer subsidy for 1 more year.
The food ministry has requested the Prime Minister's Office to extend the buffer stock subsidy scheme for sugar by a year to 2020-21 (Aug-Jul), a senior government official said today. Last year, the Union Cabinet had approved the creation of a 4-mln-tn sugar buffer stock for 2019-20.

Sugar & Ethanol Production, Payment of Arrears are Main Focus: Ram Bilas Paswan.
Several issues were discussed in the meeting like reimbursing Rs.1674 crore towards the maintenance of buffer stocks of 40 lakh metric tonnes and to provide an additional Rs. 6268 crore to meet the expenses of exporting 60 lakh metric tonnes of sugar.

Govt source says may allow sugar mills to sell Apr quota till May 31.
The government is likely to extend the deadline for mills to sell sugar under the April quota to May 31 as mills have huge unsold stocks due to the ongoing lockdown, two senior government officials said. The government had fixed April sugar sales quota for mills at 1.8 mln tn.

Uttar Pradesh: Stocks piling up, mills and sugarcane growers hit hard by lockdown.
The woes of sugarcane growing farmers don't seem to end any soon as mills, where they sell their produce, are struggling to sell sugar in the market due to lockdown. According to UP Sugar Mills Association (UPSMA), 119 mills of the state owe Rs 12,078 crore to cane growers.

Sugar federation seeks time till May 15 for mills to sell Apr quota.
The sugar federation has sought time till May 15 from the government for mills to exhaust their April sales quota due to lack of demand from industrial buyers and consumers amid the outbreak of COVID-19 pandemic, industry officials told Cogencis.

Immediately pay Rs 934 crore arrears due to cane farmers, Bihar sugar mill owners told.
In a move to ensure financial assistance amid the lockdown, Bihar Deputy Chief Minister Sushil Kumar Modi on Wednesday asked the owners of state's 11 private sector sugar mills to make an immediate payment of arrears of Rs 934.34 crore to cane farmers.

Sugar mills sweat over Rs 16,000 crore cane arrears.
Sugar mills are struggling to pay cane arrears of about Rs 16,000 crore as sales have halved and global prices have fallen. The maximum dues are in Uttar Pradesh, followed by Karnataka. The mills in Maharashtra have paid 90% of their arrears.

No conflict if state cane prices higher than minimum fixed by Centre: Supreme Court.
Since 2009-10, the SMP has been replaced with fair and remunerative price. Ruling out any conflict between the statutory minimum price (SMP) of sugarcane fixed by the Centre and the advisory price by the state government if the latter is higher.

Sugarcane department sanitizes cane growing region in UP.
With coronavirus positive cases crossing the 300-mark in Agra, questions are being raised about the Agra Model of Covid-19 management. Earlier this month, officials had said the local administration's proactive approach in identifying cases, a door-to-door survey, the number of samples sent for testing.

UP distillers ask OMCs to look for newer depots for off loading.
Sugar mills in UP are still crushing sugarcane, producing molasses and increasing ethanol production continuously, and will continue to do so for the next month or more. With ethanol storage capacities brimming and liquidity nearing zero, sugar mills in Uttar Pradesh, especially those with distilleries, have been forced to look for new ways.

India allows additional 745 tonne raw sugar exports to US.
Sugar production in Maharashtra — the country's largest sugar producing state — fell to 5.58 million tonnes till March 15, as against 10.08 million tonnes in the same period last year. The government on Friday permitted export of additional 745 tonne raw sugar under its tariff-rate quota (TRQ).

Pune: Sugar mills clear 90 per cent FRP dues.
SUGAR MILLS in Maharashtra have been able to clear around 90 per cent of their dues to farmers. With just 10 mills in operation, the state's cane arrears as of April 15 were Rs 1,254.08 crore as against Rs 4,324.4 crore last year.

Sugar production dips 20% to 24.7 million tonnes.

Sugar production in the country has registered a decline of 20 per cent at 24.7 million tonnes as of April 15, as the season that started on a bleak note last October, nears its end. In November, sugar production was lower in the country by over 64 per cent as unseasonal rain and floods.

Sugar industry in UP contributes to over 45% in hand sanitizer production.

Pilibhit: Sugar mills in UP are producing over 45% of the total sanitiser being manufactured in the state. It is a key disinfectant being used to keep hands clean in the battle against coronavirus. "Although the hand sanitiser is not a sugar mil product, we have started its production on the state government's.

UP's Kisan Sahkari Sugar Mill installs Disinfectant Tunnel.

Cooperative sector ahead in innovating to keep safe from coronavirus. One of the cooperative sugar mills of Uttar Pradesh namely the Kisan Sahkari Sugar Mill, Hasanpur in Amroha district has installed a Disinfectant Tunnel in the wake of the coronavirus outbreak.

COVID-19 to put pressure on sugar industry as domestic consumption, exports to take a hit.

The export of sugar is also likely to get affected due to fall in international prices and also on account of supply chain disruptions at various ports. The ongoing COVID-19 pandemic is expected to put pressure on the sugar consumption patterns as there are curbs on social gatherings and outings.

India – Sugar mills seek to cash in from exporting molasses.

Sugar mills are looking to tap export of molasses to improve cash flow and provide additional stability to their business amidst volatility in the sugar market, according to the local press reports.

Cameroon – Sosucam to expand sugar factory capacity by 20,000 tonnes.

The subsidiary of the French group Somdiaa, Sosucam, plans to increase its annual sugar production to 150,000 tonnes from 130,000 tonnes, according to an agreement with the Promotion Agency investments (API) on 15th May.

Cristal Union posts €89 million loss in 2019/20.

For the second consecutive year, the French sugar cooperative Cristal Union posted a loss reflecting low sugar prices and exceptional costs.

USA – 2020-21 likely to see sugar beet sector rebounding, says CoBank .

Sugar beet growers and cooperatives in the US are expected to have a stronger financial year ahead, with improved production and high prices for the 2020-2021 crop ushering in a recovery from the stressful growing season last year, according to a report from CoBank.

Sri Lanka – With injection of US$2 million, Kantale Sugar Factory to reopen in August

The Kantale Sugar Factory which was closed for 30 years is set to open in August, according to local press reports.

South Africa – Covid-19 pandemic stalls plan to revive the sugar industry

The Covid-19 pandemic has scuppered plans to revitalize South Africa's ailing sugar industry for the time being, reported Bloomberg.

iCell – Single cell protein producer profitizes sugar refinery wastewater

The Hong Kong-based company iCell which uses a patented process to convert nutrient-rich wastewater into an alternative to fishmeal, is looking to raise US$50 million to extend into joint ventures and water treatment facilities outside of Asia-Pacific.

Tereos returns to profit

The sugar group Tereos has managed to navigate through the choppy waters of the market place and returned to profit in 2019/2020. The impact of the Covid-19 pandemic felt in the latter part of the financial year will doubtless be greater next year.

Uganda – Kakira Sugar commences production of pharmaceutical grade sugar

Kakira Sugar Works has started manufacturing pharmaceutical-grade sugar, according to local press reports.

Pakistan – Shortage of molasses impacts ethanol producers

The reduction in the cane acreage in Pakistan has invariably affected sugar production, and with it the availability of molasses for ethanol production, according to press reports.

China – Sugar imports tariff to drop to 50% from 85%

The Chinese government has decided not to renew a safeguard on sugar imports in place since 2017, reported Reuters.

Costa Rica – Cane industry asks government for support and raise import tariffs

The Federation of Cane Producer Chambers (Fedecaña) and the sugar producer members of the National Chamber of the Social Solidarity Economy have sought support from the government as they continue to be under financial stress due to low sugar prices and high production costs. Also, high economic uncertainty caused by the COVID-19 may delay or limit expansion plans.

China – Guangxi sugar industry embarks on driving competitiveness

The regional government launched a three-pronged, three-year action plan on 8th May to improve the efficiency of the Guangxi sugar industry, according to local press reports.

Brazil – Revenues from ethanol sales down 50% in April

Fuel consumption declined sharply in Brazil in April, amid the impact of isolation measures taken to stem the spread of coronavirus, with demand for ethanol plummeting 49% year-on-year, said the minister of Mines and Energy, Bento Albuquerque, reported Reuters.

USA – Over 70 ethanol plants idled and 70 more reducing their operations

Over "70 ethanol facilities with an annual production capacity of 6.1 billion gallons have been fully idled, and approximately 70 more plants have reduced their operating rates by a combined amount of 1.9 billion gallons annualized" according to 24 senators in a letter to President Trump on 7th May to support the sector as the Covid-19 pandemic has resulted in steep decline in both gasoline and fuel ethanol demand

USA increases sugar imports by 500,000 tonnes

The Office of the U.S. Trade Representative announced on 3rd April country-specific and first-come, first-served in-quota additional allocations under the tariff-rate quotas (TRQs) on imported raw cane sugar for Fiscal Year (FY) 2020 (October 1, 2019, through September 30, 2020). The total additional allocation is 317,515 tonnes raw value.

USA agrees to maintain trade terms for sugar with Mexico

Mexico's government on 2nd May said the U.S. Commerce Department had published a notification of its intention to keep an agreement regulating Mexican sugar exports into the United States active for another five years, reported Reuters.

WTO's ruling on India's sugar subsidy case delayed until Q2 2021

The dispute settlement panel of the World Trade Organisation is unlikely to come out with its report on a case against India's support measures for the sugar sector before the second quarter of 2021 on account of "complex procedural and factual nature of the disputes", the WTO said in a press release on 29th April.

Brazil – 2020/21 sugar output expected to be 41 million tonnes say Job Economia

Brazil is likely to produce 41 million tonnes of sugar in the 2020/21 campaign, according to the consultancy Job Economia, reported Reuters.

Amyris' low calorie sweetener Purecane™ approved in Brazil and Canada

The biotech start-up Amyris announced on 20th April that it has received approval from both Brazilian and Canadian regulators to expand its distribution of its biobased Reb M, branded as Purecane™ zero-calorie sweetener in the US to both of these countries.

Kenya – Alteo to invest US$45 million for a new cogen unit at Kilgoris factory

The Mauritian sugar producer Alteo plans to build a new 25 MW bagasse-based cogen plant at its Kilgoris sugar factory managed by its subsidiary Transmara Sugar Company. The investment for the project is expected to be KES4.7 billion (US$45 million), according to local press reports.

Philippines – 2020/21 sugar imports expected to rise to 450,000 tonnes says USDA

The Philippines is likely to import 450,000 tonnes of sugar during the current 2020/21 as the production is forecast to drop to 2 million tonnes while consumption is expected to rise to 2.35 million tonnes. The country will maintain its preferential access to the US market by exporting 140,000 tonnes sugar.

Philippines – Cane growers to receive government support amid Covid-19 crisis

The Philippine government has moved to include sugar in COVID-19 relief packs to help cane growers weather the coronavirus crisis.

Brazil – Millers have hedged 17 million tonnes of 2020/21 sugar output

As of March 31, Brazilian mills had hedged 17 million tonnes of sugar using ICE futures contracts on the New York Stock Exchange, a large increase over the same period last year, according to Archer Consulting reported Reuters.

Philippines – Coronavirus shuts down two sugar mills in Bukidnon

Due to coronavirus-containment measures, two sugar mills have been ordered to shut down. This could lead to a domestic shortage and trigger price spikes, the country's farm minister said on 15th April.

Indonesia – Permits issued to import 150,000 tonnes white sugar

Indonesia has issued import permits for 150,000 tonnes of white sugar, Musdhalifah Machmud, a deputy minister at the Coordinating Ministry of Economic Affairs told Reuters on 8th April.

Nigeria – Dangote Sugar, Savannah Sugar merger gets regulatory approval

The Nigerian Stock Exchange (NSE) has approved the merger of Dangote Sugar Refinery (DSR) Plc and Savannah Sugar Company Limited, according to local press reports.

Bangladesh – Meghna Sugar Refinery inaugurated

Meghna Group of Industries (MGI), a leading Bangladeshi business group, recently inaugurated Meghna Sugar Refinery at the Narayanganj district, Dhaka of Bangladesh, along with eight other new enterprises from cement to biscuit making, according to local press reports.

Australia – Rabobank forecasts 2020 sugar output at 4.2 million tonnes

Widespread rain across key cane- growing regions – up to 800mm recorded in parts of north-east Australia – has strengthened yield prospects for the incoming 2020 crush, says Rabobank in its Q1 report. Though the risk of cyclones and floods cannot be discounted.

xxxx

➢ **RESEARCH ARTICLE:**

"Techno-economic Process for Producing Superior Quality White & Other Specialty Sugars"

by

Narendra Mohan & Prem Shanker Katiyar
National Sugar Institute
Kanpur, India

ABSTRACT:

To meet the market requirement when even the common consumer is more quality conscious, many sugar factories are modifying their process for improving the sugar quality soas to cater to the need of such buyers, international sugar market, beverage industry, pharmaceutical industry and other bulk consumers. Lessons learnt due to pandemic Covid-19 also call for better quality controls during production and packing of sugar. The authors have discussed a process by which superior quality white sugar required for the purpose can be produced in existing plants without having the necessity of modifying the whole process thus reducing the capital investment to a great extent.

Key words: techno-economic, beverage, quality

INTRODUCTION:

India has emerged as No.1 leaving Brazil behind after achieving the ever highest sugar production of more than 33.2 million tonnes during sugar season 2018-19, but due to limitations of process technique Indian sugar factories find it to be difficult so far as acceptability of Indian sugar quality in overseas world market and in beverage & pharmaceutical industry is concerned. Further, there is growing demand of superior quality white sugar packed under hygienic conditions in consumer packs in the shopping malls which is likely to gain momentum as a result of learnings made due to pandemic Covid-19.

Most of the Indian sugar factories adopt Double Sulphitation process of clarification. Owing to limitations of the sulphitation process of clarification, the sugar quality of Indian sugar factories in terms of colour (ICUMSA), SO_2, Ash content and turbidity, the main parameters in ascertaining sugar quality remains wanting. Sometimes they also fail in the floc test which is of paramount importance to the beverage industry.

Many sugar factories took up steps to upgrade their process so as to produce sugar conforming to the international standards and/ or of standards as laid down by the beverage and pharmaceutical industry or as per the market requirement. In the process besides, carrying out

modifications at various other stages, systems for syrup clarification and vacuum filtrate clarifications were installed, but even after incorporating these modifications the sugar factories could not consistently produce the superior quality sugar. Further, modification of the process in such a way causes increase in the cost of production due to which profitability of the unit may be adversely affected if the unit fails to earn price premium over the produce. Thus, instead of modifying the while process and making appreciable capital investment and unnecessary taxing the common citizen, the factories may develop a system to cater to the specific requirements of superior quality white sugar or other specialty sugars.

Keeping this in view, the authors worked out a process by which superior quality white sugar required for the above mentioned purposes can be produced without having the necessity of modifying the whole process. Side by side, this may facilitate producing other special sugar viz. candy sugar, sachet sugar and brown sugar etc. without much extra efforts.

ABOUT INDIAN, INTERNATIONAL & BEVERAGE INDUSTRY STANDARDS:

The details with regard to quality characteristic of sugars as specified by various organizations and desired by the industry are presented in table no.1.The table no. 2 gives a comparison between the plantation white sugar produced in India and white sugar required in the international market.

Table No.1 : Comparison of Indian Standards with other standards

S.No.	Parameter	Nestle	Pepsico	Codex	NSDA	IS 5982 : 2003
1.	Pol% Min.	99.85	99.80	99.70	NS	99.50
2.	Reducing sugar % Max.	0.04	NS	0.04	NS	0.10
3.	Moisture % w/w (loss on drying) Max.	0.05	0.04	0.1	NS	0.10
4.	Sulphur di-oxide SO_2 content Max.	2 ppm	6.0 ppm	NS	NS	50 ppm
5.	Sulphated Ash%	0.03	NS	NS	NS	NS
6.	Colour Max.	NS	45 IU	60	35 IU	150 IU

7.	Conductivity Ash% Max.	NS	0.02	0.04	0.015	0.1
8.	Turbidity Max.	NS	25 RBU	NS	20 RBU	NS
9.	Beverage Floc	NS	Passes the test	NS	NS	NS

N.S.D.A. - National Soft Drink Association,
N.S. - Not Specified.
R.B.U - Reference basis unit I.U. – ICUMSA unit
M.R. - Modulated reflectance.

Table No.2 : Comparison between plantation white sugar produced in India & white sugar available in world market.

S.No.	Particulars	Indian plantation white sugar	White sugar available in world market
1.	Pol %	99.50-99.85	99-80-99.90
2.	Reducing Sugar %	0.05-0.08	0.03-0.04
3.	Colour in ICUMSA Unit	70-120	20-40
4.	SO_2 content (ppm)	25-40	Less than 10
5.	Conductivity ash%	0.04-0.07	0.01-0.03

A perusal of the data containedin these tables indicates that the most significant difference between Indian plantation white and white sugars available in the world marketis in the terms of colour, invert sugar, ash, sulphur di-oxide content etc. As discussed in the earlier paras this is primarily due to the limitation of clarification technique being followed in our country.

Due to limitation of process technique, it is difficult to match with sugars conforming to international or beverage industry standards. Further, in the Double Sulphitation process the liquors are processed in acidic medium, as such, the Indian plantation sugars do contain higher amount of invert sugars. Moreover, as the inorganic ash constituents, particularly, sesquioxides are not completely removed the ash% remains much higher, 0.50-0.60%. To have a lower colour value, sugar factories carry out syrup sulphitation to a pH around 5.0-5.1 which causes higher SO_2 content of sugars, generally, in the range of 25-40 ppm.

The process discussed in the following paras has been developed so as to produce superior quality white sugar acceptable to beverage industry, other bulk consumers, quality conscious consumers and in international market. The process is so designed (flow diagram at fig.1) that it does not effect the normal juice processing of the unit and the improved superior quality white sugar is produced by reprocessing rori sugar, dust sugar, off colour sugar, moist sugar etc. (in general, quantity around 2.0-2.5% of sugar produced). Instead of melting these sugars and adding the melt in raw/ clear juice thus to produce plantation white sugar, the sugars are required to be processed separately in the following manner for production superior quality white and other specialty sugars.

PROCESS:

The process is based on the principle that "recrystallization leads to elimination of impurities". Based on the principle successful trials of Defco Melt Crystallization Process were carried out in 1960's. The sugar so produced was superior in quality to the plantation white sugar being produced in the country at that time. However, looking to the quality of sugar required for the specific purpose, the process has further been modified. From table no.3, it can be observed that purities of rori/dust/ off-colour sugars are quite high indicating relatively small percentage of non sugars to be removed, as such, it is envisaged that removal of suspended / turbid material and de-colourization of mother liquor will be sufficient to produce sugar required for the purpose.

In the process, the mixture of rori, moist, off and dust sugar is to be melted in a melter to 60-65º brix at a temperature of 75-80ºC with hot water. After melting, the melt is to be pumped through on line filter fitted with 80/100 mesh screen (optional) so as to remove the suspended impurities and undissolved sugar crystals, if any. Thereafter the primary screened melt is passed through multi bed/deep bed filter for finer screening. The filtered melt is collected in a tank from where it is pumped to Ion Exchange resin column containing styrene resin for de-colourisation of the liquor. The de-colourized liquor is collected in a tank from where it is pumped to pan floor for production of respective quality of sugar.

Experimental:

Trials were conducted at the institute and in one of the commercial sugar factory so as to ascertain the efficiency of the proposed process in terms of quality improvement.

Initially during the laboratory scale trials, the off-colour, rori and dust sugars (analytical details as given in Table No.3) as available were utilized for preparation of melt of around 60ºbrix.The melt was filtered through polypropylene filter cloth to remove the suspended impurities thus to prevent choking of resin column. For de-colourisation, the filtered melt was passed through a column containing commercially available styrene resin having a bed height of 70 cms, the service flow rate maintained being approx. 2 bed volume/ hour. The de-colourized melt obtained was filtered through Whatman filter paper no. 1 so as to remove any carry overs.

The details with regard to rise in purity,colour reduction and reduction in ash % during the processing are as given in table no.4.

Table No.3 : Analysis of sugars (laboratory trials)

S.No.	Particulars	Pol%	Moisture %(w/w)	SO_2 Content in ppm	Colour value (I.U.)
1.	**Dust Sugar**				
	1.	97.14	0.051	24.03	246
	2.	98.98	0.032	21.90	368
2.	**Rori Sugar**				
	1.	99.23	0.033	22.43	359
	2.	99.45	0.048	26.18	327
3.	**Off Coloured sugar**				
	1.	98.06	0.050	28.84	546
	2.	98.32	0.064	21.36	652

Table No.4 : Analysis of untreated & treated melt (laboratory trials)

S. No.	Particulars	Sample 1	Sample 2	Sample 3	Sample 4
1.	**Untreated melt**				
	1. Brix	58.96	60.64	60.48	58.64
	2. Purity	98.62	99.01	98.54	98.03
	3. Colour (I.U.)	396	457	449	374
	4. SO_2 content (ppm)	22.40	23.36	23.04	24.00
	5. Ash %	0.0580	0.062	0.055	0.068
2.	**Treated melt**				
	1. Brix	58.16	60.24	59.84	57.28
	2. Purity	98.96	99.31	98.95	98.52
	3. Colour (I.U.)	254	276	268	250
	4. SO_2 content (ppm)	18.56	19.52	17.60	18.24
	5. Ash %	0.044	0.052	0.047	0.045

During the experiments conducted in a commercial sugar factory, process as shown in fig.1 was adopted. The resultant fine liquor was utilized for producing sachet sugar and candy sugar. For

boiling candy sugar, a rotary vacuum crystallizer was installed where slow boiling was conducted for building candy crystals of desired sizes. Whereas, sugar to be packed as sachet sugar was boiled in the available conventional pans. However, screening of sugar was carried out in a double decker vibro screen to have required crystal size. The run off as a result of centrifugation of sachet or candy sugar was re-circulated to the extent that it did not affect the sugar colour and then it was sent for boiling Amassecuite. The details of analysis with respect to sugar quality, treated and untreated melt are shown in table no.5 & 6 and those with respect to quality of sachet sugar and candy sugar in table no. 7 & 8 respectively.

Table No.5 : Analysis of Sugars (Factory trials)

S.No.	Particulars	Pol%	Moisture % (w/w)	SO_2 Content in ppm	Colour value (I.U.)
1	**Dust Sugar**	98.02	0.08	22.8	310
2	**Rori Sugar**	99.02	0.05	18.6	294
3	**Off coloured sugar**	98.14	0.06	20.2	470

Table No.6 : Analysis of untreated & treated melt (Factory trials)

S. No.	Particulars	Sample 1	Sample 2
Untreated melt			
1.	1. Brix	62.02	59.68
	2. Purity	98.16	98.42
	3. Colour (I.U.)	330	357
	4. SO_2 content (ppm)	19.2	20.2
	5. Ash %	0.048	0.052
Treated melt			
2.			
	1. Brix	61.84	59.20
	2. Purity	98.44	99.01
	3. Colour (I.U.)	170	145
	4. SO_2 content (ppm)	18.6	19.7
	5. Ash %	0.036	0.040

Table no. 7 : Quality of sachet sugar

S.No.	Parameter	Observed value
1.	Pol%	99.88
2.	Reducing sugar%	0.07
3.	Moisture % w/w	0.03
4.	Sulphurdi-oxide SO_2content	12 ppm
6.	Colour	58 IU
7.	Conductivity Ash%	0.04

Table no. 8 : Quality of candy sugar

S.No.	Parameter	Observed value
1.	Pol%	99.79
2.	Reducing sugar%	0.08
3.	Moisture % w/w	0.08
4.	Crystal size	90% above 3 mm
6.	Colour	124 IU
7.	Conductivity Ash%	0.06

Sachet and Candy Sugar

Results and Discussions:

From the analytical observations recorded in table no.3 & 4 and 5 & 6 following inferences may be drawn:

1. From the data recorded in these tables it can be inferred that apparent purity rise ranges between 0.3-0.6 units.

2. Another important parameter which reflects the efficiency of the system is the reduction in colour value from original melt to the treated melt. In the presentcaseunder study it is observed that percentage colour removal isfairly consistentand it is in the range of 35-40%.
3. The ash % treated melt is between 0.048 to 0.052 having its average around 0.047%, whereas, in the untreated melt, it was around 0.036 to 0.068.
4. The colour value of the treated melt was in between 145-170 I.U. only during the commercial trials. The efficiency although was observed lower in case of laboratory trials which may be due to the batch type operation for limited time.
5. The quality of white sugar as reflected from the table was observed to much improved and comparable with the refined sugar.
6. The sachet sugar and candy sugar could be produced with having the necessity of installing the melt clarification system.
7. The cost of production is estimated to be lower than the conventional process of refined sugar production.

Conclusion:

The process discussed is a low cost solution for the sugar factories aspiring to produce value added sugars that too by converting the off colour, moist and rori sugars etc. which in any case are to be reprocessed. It is envisaged that by processing rori/ dust/ sweeping/ off colour sugars in such a manner thus having a melt of such a high purity and low colour value (around 250 I.U only), it is possible to produce white sugar of superior quality and also to produce other value added specialty sugars. The process may be modified to some extent keeping in view the quality of raw material produced and end quality of the product envisaged. Further, sugars so produced may be converted into brown sugars by coating process.

Reference:

1. Nath S, Jain S.K. & Mohan N – Studies on Defco Melt Crystallization Process, “Sharkara”, Jan-Dec 89, Page 14-16.

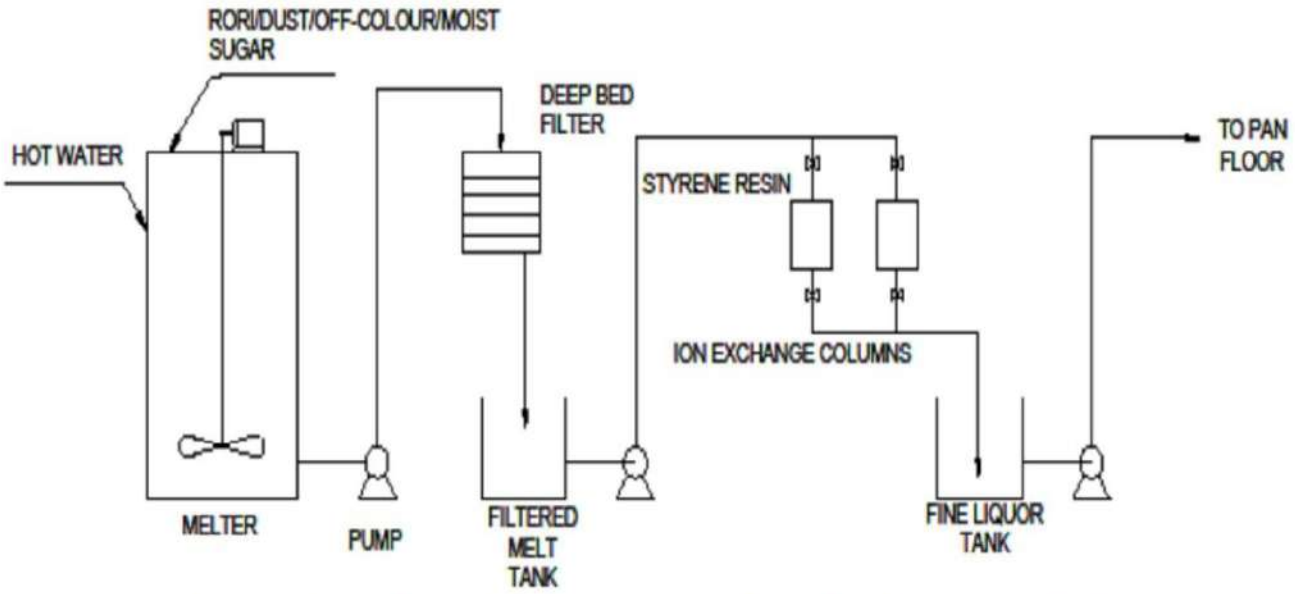


FIG.1- PROCESS OF MANUFACTURE OF SUPERIOR QUALITY WHITE SUGAR

ABSTRACTS:

Evaluation of a reduced extraction time to improve the efficiency of routine analysis of resin extractable phosphorus and sulphur by LW Titshall, DE Elephant & N Magagula published in International Sugar Journal, in April, 2020.

Phosphorus (P) and sulphur (S) are essential plant nutrients that are routinely measured for plant available levels in soil samples for fertiliser advisory purposes. The resin extraction method is an excellent estimator of plant available P and S because it simulates the root environment better than other chemical extractions. However, the method requires a 16-hour extraction time which limits sample turnover for routine analysis. This study tested a 2-hour extraction time against the standard 16 h extraction time in 134 soil samples from various sugarcane growing soils in South Africa.

Cane sugar refineries: towards a 'green' process solution for fine liquor de-colorization by Anne Gonin, Dominique Paillat & Marc Andre Theoleyre published in International Sugar Journal, in April, 2020.

The most common way to remove sugar color in cane refineries is by using strong anionic resins, regenerated with brine (NaCl) solution. This process generates significant volumes of salty and highly COD-loaded wastewaters. Due to increasing environmental pressures, companies have developed different process solutions aiming at limiting this wastewater production, optimizing water and chemical consumption and maximizing recycling. Those solutions are based on nanofiltration membrane technologies, the key process operation to separate salts from color bodies. A single nanofiltration process was developed in the early 2000s to recover and recycle up to 75% of the brine.

Review of current practices in evaporator cleaning by DW Rackemann, B Phakam, L Moghaddam & WOS Doherty published in International Sugar Journal, in April, 2020.

Chemical cleaning still provides the most cost-effective method of cleaning the evaporators and heat exchangers in a sugar mill. However, operating procedures can have a profound impact on scaling propensity as well as cleaning effectiveness and efficiency. There has been little research into the characteristics of scale formation over the last 10 years, but recent developments in remediation, scale analysis and advancements in other chemical industries may allow new cleaning strategies for sugar mill evaporators to be developed and thereby improve cleaning performance. Some best practices used by sugar factories in the use of preventative and post-operation cleaning chemicals.

Application of permanganate to reduce microbial contamination and sugar loss in raw-sugar production in Louisiana, USA by Stephanie Boone, Sam Ihli, Dan Hartsough, Luis Hernandez, John Sanders, K. Thomas Klasson & Isabel M. Lima published in International Sugar Journal, in April, 2020.

During the 2016-2018 harvest seasons, some sugarcane factories in Louisiana applied permanganate to mill tandems and other factory locations. Brix, purity, sugar content,

microbial growth and mannitol were evaluated, as well as manganese distribution in the raw sugar process. Sample collection included crusher juice, mixed juice, clarified juice, syrup and final molasses. In concurrent studies, samples were collected and brought back to the laboratory for studies under controlled conditions. Both laboratory and factory samples treated with permanganate indicated a reduction in microbial contamination. Leuconostoc contamination was reduced by 94% in laboratory tests and microbial load in factory mixed juice.

An evaporator station model for estimating exhaust steam conversion and consumption by KM Foxon published in International Sugar Journal, in May, 2020.

The two largest categories of energy consumption in a sugar factory, after the boilers, are concentration of clear juice to syrup and process heating duties serviced using evaporator vapour bleeds. These cannot be measured directly, since both are supplied by the same exhaust steam fed to the evaporator station. In this study, an algorithm was developed to separate the evaporator exhaust steam demand into the amount required to concentrate clear juice to syrup and the amount that is required for raising vapours for downstream process heating duties. The algorithm was generalised for different evaporator station configurations.

Assessing the efficiency of sucrose recovery from final molasses by R Broadfoot published in International Sugar Journal, in May, 2020.

The sucrose loss in final molasses is the largest loss in raw sugar manufacture and consequently requires consistent close monitoring in order to maximise raw-sugar production. The main parameter used by the industry to assess the efficiency of recovery of sucrose in final molasses is the approach of the true purity of the final molasses to the Target Purity value, as defined in terms of the reducing sugars/ash ratio of the final molasses. Another efficiency assessment can be obtained by comparing the actual sucrose loss in final molasses to that predicted based on the quantity of soluble impurities.

Why are yields of sugarcane not increasing as much as sugar beet (or other crops)? by Phillip Jackson published in International Sugar Journal, in May, 2020.

Average worldwide farm-realised yield of sugar beet has increased by approximately 250% since 1961, while that for sugarcane has increased less than 50% over the same period. The yield increase of sugar beet is within the range observed in other major crops, while that of sugarcane is much less. Genetic improvement through breeding has made a major contribution to gains observed in the major crops since the 1960s. In sugarcane it has been suggested that factors associated with sugarcane monoculture may be at least partly responsible for slow yield increases.

Shredder windage investigation by AP Mann, F Plaza & GA Kent published in International Sugar Journal, in June, 2020.

Air flow through a shredder is complex. There are many examples where relatively small design changes to the shredder and surrounding conveyors can cause quite large changes to air flow. Windage is the term used

to describe undesirable air flow. Windage that is counter current to the flow of cane into the shredder is particularly undesirable because it can cause feeding problems. Windage can limit the transfer of energy from the shredder hammers to the cane billets by reducing the relative velocity at impact which can reduce preparation.

Mexican COMPASS: An aid to improving farm performance in the sugar industry by David J Nixon, Sergio Salgado Garcia, Neil M Crout & Saravana Gurusamy published in International Sugar Journal, in June, 2020.

The Mexican Crop Observation, Management and Production Analysis Services System (COMPASS) aims to help sugarcane (and wheat) farmers in Mexico improve crop management, increase yields and enhance profitability. A phone app has been developed which combines remote sensing data with management information captured by farmers. A key goal is to help smallholders identify factors causing the gap between potential and actual yields, thereby assisting growers to improve their technical and financial performance. The COMPASS app is available to local farmers within rural communities in Mexico. The project has included experimental work carried out in sugarcane farmers' fields in Veracruz.

IIoT for batch centrifugals – initial results by Andreas Lehnberger published in International Sugar Journal, in June, 2020.

Nowadays, the use of digital products has become an integral part of the private and business environment, be it in the form of ubiquitous smartphones or the convenience and safety functions found in the office, the home or vehicles. In manufacturing, these developments have been slower, but also taking different forms. While automation has become widely established at local production sites or at group level, digitalisation projects involving the use of cloud services are not very common in process industries. As part of the implementation of a development project for the sugar industry.

Review of fundamental milling measurements and modelling, and a way forward by F Plaza published in International Sugar Journal, in June, 2020**.**

The literature continues to increase on the number of proposed improvements to the performance of milling units, with the aim of achieving high throughput, high pol extraction, and low moisture final bagasse, with equipment that is reliable, low capital cost and minimizes energy use. Invariably, the reported testing has been conducted on equipment installed on large operating milling trains. This has the advantage of obtaining performance measurements in a real-world situation. However, there are also some disadvantages, such as the data being affected by other operating factors, and the need to be conservative in order to not interrupt.

Sugar Quality: Effects of polysaccharides starch and dextran and their management in the factory by M.Saska, S. Zossi and M. Ruiz published in Indian Sugar Journal, in April, 2020.

In raw, white or refined sugar there are three major groups of non-sucrose classes of compounds: ash (organic and inorganic),

reducing sugars and polysaccharides, present at roughly similar levels of 100 to 200 ppm each in refined sugar and 400 to 800 ppm each in plantation white sugars. Short of ion exchange resin-based techniques, ash levels in sugar can mostly be affected by improved crystallization and sugar washing techniques. Polysaccharides on the other hand are amenable to hydrolysis to oligoor mono-saccharides with well-chosen industrial enzyme systems. Reducing sugars, that is glucose and fructose do not have major negative effects on sucrose recovery but rather add to the value of final molasses when used as animal feed or fermentation feedstock. On the contrary, and regardless of their origin or chemistry, at even low levels polysaccharides raise the cost of production, reduce sugar yield and negatively affect commercial quality of the final product.

A New Business Vertical for Sugar Industry – Manufacturing of Hand Sanitizer by CA K. Marimuthu & M.Murugesan published in Indian Sugar Journal, in June, 2020.

The Corona Virus outbreak came to light on December 31, 2019 when China informed the World Health Organization (WHO) of a cluster of cases of pneumonia of an unknown cause in Wuhan City in Hubei Province. Subsequently the disease spread to more provinces in China, and to the rest of the world. The WHO has now declared it a "Pandemic". The virus has been named SARS-CoV-2 and the disease is now called COVID-19. The war against germs, bacteria and virus especially COVID- 19 is a contingent one, all the Governments are looking for ways to stop the spread of COVID-19. Center of Disease Control and prevention (CDC) recommends washing hands with soap and water whenever possible because hand washing eliminates all types of germs & virus on hands in the normal course. But, it is not always viable option often to anymore in the present scenario. In fact the CDC of US recommended using an alcohol based hand sanitizer with a final concentration of 75-80% Ethanol inactivates viruses that are genetically related to with similar physical properties of COVID-19.

Editor

Dr. Ashutosh Bajpai
Professor Sugar Technology
For & on behalf of:
NATIONAL SUGAR INSTITUTE
Ministry of Consumer Affairs,
Food & Public Distribution
Department of Food
& Public Distribution
Kalyanpur,
Kanpur – 208017
Uttar Pradesh (India)

Visit us at http//:nsi.gov.in
Contact:
nsikanpur@nic.in, director.nsi@gov.in
Telephone
+91-512-2570730 Fax: +91-512-2570247