SHARKARA

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VOLUME - 54, No .04

OCTOBER-DECEMBER 2022

It contains……..

From Director's Desk…

Indian Sugar Industry created many milestones in the sugar season 2021-22 as the country became the largest producer and second largest exporter of sugar. In addition to it, highest ever ethanol blending also became possible with supplies of about 4000 million liters of ethanol. The growth of ethanol as a biofuel sector has become possible due to proactive policies of Government of India.

During the current sugar season 2022-23, till November 2022, the sugar production is higher by around 1.5% compared with the same period a year ago. Sugar production during the period after accounting for ethanol diversion was 4.79 million MT as against 4.72 million MT last year. With the expected sugarcane production during the current, exports and diversion of sugar for producing ethanol are going to be crucial to facilitate demand-supply scenario.

The importance of diversification, particularly, by-product utilization for green energy supported by some government incentives & schemes, particularly for ethanol capacity building and through differential pricing policy proved to be game changer for the Indian Sugar Industry. This not only helped in maintaining the demand-supply scenario of sugar and thus stable domestic sugar prices but also resulted in value addition and lowering of dependency on revenues from sugar only. Now the potential of revenue generation through utilization of various by-products viz. bagasse, filter cake and molasses is being taken up in an innovative manner for producing bio-food, bio-energy, bio-chemicals and other value added products. The Indian Sugar Industry has also successfully developed technologies for converting "wastes", including utilization of effluents and spent wash from sugar factories and integrated distilleries respectively for developing many value added products.

Institute while working on development of newer techniques of juice clarification so as to evolve cleaner & greener process in place of existing Double Sulphitation process, remained active carrying out R&D for developing value added products. We look forward for your active participation during the International Conference being organized jointly with Assiut University, Egypt at Luxor, Egypt from 11-14th February 2023.

Wishing you a very happy & prosperous new year 2023.

(Narendra Mohan)
Director

OUR PROVISIONS

FOUNDATION DAY CELEBRATED:

National Sugar Institute, Kanpur celebrated **“87th Foundation Day”** and felicitated **"Progressive Sugarcane Farmers"** and **"Ex- Institute Officials"** on 4th October 2022. Prof. Vinay Pathak, Vice Chancellor, CSJM University and Dr. Sushil Solomon, Ex. Vice Chancellor, CSA University of Agriculture and Technology graced the occasion. Director, NSI lauded the role of sugarcane farmers in sugarcane productivity enhancement in the subtropical region during the last five years.



DELEGATION FROM FIJI VISITS INSTITUTE:

Four member delegation from Fiji headed by Ms. Reshmi Kumari, Director, Planning, Policy & Research, Ministry of Sugar Industry visited National Sugar Institute on 19th October 2022. The delegation which also included Chief Executive Officer, Fiji Sugar Corporation and Chairman, Sugar Research Institute of Fiji visited institute to explore possibilities of seeking National Sugar Institute assistance in modernization and development of the sugar industry in Fiji.

Director NSI, Prof. Narendra Mohan while welcoming the delegates, presented the activities of the institute and briefed the delegates from Fiji about recent developments in Indian Sugar Industry for making it financially sustainable.



TWO DAY ONLINE TRAINING PROGRAMME ORGANIZED:

Two days Online training programme on **"Effluent Treatment Plant Operation & Analysis of Effluent"** was organized on 11th & 12th October 2022. The training programme was meant for the benefit of sugar and alcohol industry and the delegates were apprised about the targets which had been envisaged for reducing fresh water consumption and subsequently controlling the effluent discharge as per Central Pollution Control Board guidelines. More than 80 delegates from states of U.P., Bihar, Himanchal Pradesh, Tamil Nadu, Karnataka and Maharashtra participated in the programme.

STUDENT'S EDUCATIONAL TOUR:

National Sugar Institute, Kanpur organized educational tours for the students of Post Graduate Diploma Course of Associateship of National Sugar Institute in Sugar Engineering (ANSI-SE), Post Graduate Diploma Course in Industrial Fermentation and Alcohol Technology (DIFAT), Post Graduate Diploma Course in Sugarcane Productivity & Maturity Management (DSPMM) and Post Graduate Diploma Course in Instrumentation & Process Control in various sugar factories, distilleries & allied industries situated in different states to learn about sugarcane management, process techniques, ethanol manufacturing process, raw & refined sugar manufacturing process and engineering techniques, etc.

WORKSHOP ON MEDITATION ORGANIZED:

A "Meditation Workshop" was organized at National Sugar Institute, Kanpur by **"Heartfulness"** organization on 29th November 2022, for the staff and students. On this occasion, a book **"The Wisdom Bridge"** written by Mr. Kamlesh D. Patel "Daaji" of Heartfulness organization was released by the Director, NSI, Kanpur containing nine principles which are considered important references for parents, parents-to-be, grandparents and caregivers to create fulfilling and happy lives. Director NSI, also said as intelligence and creativily gradually improved anxiety simultaneously diminished and mediating regular helped students to improve their creativity & grasping power. Office bearers of the organization also interacted with the staff and students and appealed to them for greater participation in such programmes for understanding the philosophy of life in a better manner and for stress relieving.

MEETING OF ACADEMIC COUNCIL:

Meeting of Academic Council of the institute was held on 29th December 2022, under the Chairmanship of Director NSI to discuss about revision of syllabus of various courses and various issues related to entrance examination viz. revision of prospectus with respect to entrance qualifications and fee structure for various course conducted by the institute for the academic session 2023-24. The Council also discussed the probable names of experts/faculties who can undertake the work regarding revision of syllabus for entrance examination.

MoA/MoU SIGNED:

National Sugar Institute, Kanpur on 1st November 2022, signed a Memorandum of Understanding (MoU) with **M/s Ion Exchange (India) Ltd., Mumbai** to conduct laboratory and pilot plant trials jointly at the site of some sugar factories on concentration of sugarcane juice using **"Reverse Osmosis Technology".**



RESEARCH WORK:

1. **Studies on Sweet Sorghum bagasse value addition:**Re-analysis of Sweet Sorghum bagasse composition and related fractionated components (Cellulose, Hemi-cellulose and lignin) was carried out. The experiment related to fractionation of individual component of new variety i.e. ICSSH28 was carried out during the period. The different fractions shall be subjected to different treatments for obtaining value added products viz. Vanillin from Lignin.

2. **Comparative study of five varieties of sweet sorghum for production of ethanol yield:** Five varieties of sweet sorghum crop grown at the demonstration plots and at NSI farm were harvested. The juices obtained for different varieties were analyzed for Brix, Pol, Purity, TRS, RS, TDS & pH. The Juice were then fermented and distilled for ethanol in lab and in pilot plant. Compilation of report is ongoing and based on the results identification of the potential variety for alcohol production shall be identified.

3. **Cane juice syrup study for shelf-life and production of alcohol:** Two Syrup samples were collected, one from Jawaharpur unit of M/s Dalmia Bharat Sugar Mills Ltd. and other from Experimental Sugar factory. The samples were preserved in Biochemistry division at room temperature. Preserved Syrup showed no appreciable detoriation, while ^{0}Brix showed no changes in both the samples, the TRS content of sample from plantation white sugar factory showed no detoriation, but purity drop of around 2-unit was seen in raw sugar factory sample after about 10 months. New samples are being collected from different factories to validate the results.

4. **Waste water purification using water hyacinth**: Institute is conducting experiments on ascertain efficiency of water purification based on Phytoremediation principle using water hyacinth. Samples of surplus condensates and effluent have been collected from various sugar factories of different states and treatment using water hyacinths in combination with tertiary treatment units has been tried. Encouraging results have been obtained with respect to removal of BOD, COD, nitrogen, heavy metals and pesticides from common condensates. Futher, trials with water hyacinth shall be taken up for purification of sugar factory effulents.



5. **Production of Invert Syrup directly from sugarcane juice:** The study taken up at Sugar Technology division is aimed producing medium invert sugar syrup directly from sugarcane juice. At present, such invert syrup is produced using sugar as raw material. The process involves in situ purification of sugarcane juice without addition of any clarifying agents. Different techniques of high level filtration and inversion are being tried. Samples of such invert syrup shall be analyzed for quality parameters and shelf life periodically. The study shall be extended on different sugarcane varities with use of natural clarificants to improve quality.



6. **Study of Sugar beet varieties for ethanol production:**. Five sugar beet germplasm lines viz. IISR Comp 1, LS 6, LKC HB, LKC 2020, LKC LB and LKC 2006 were sown at the demonstration plot. Out of which LS 6, IISR Comp 1 and LKC 2020 showed good phyical apperance while LKC

HB, LKC LB and LKC 2006 failed to germinate. Irrigation and wedding practies are under process to evaluate the productivity and ethanol potential of three sugarbeet varieties viz. LS-6, IISR Comp 1 and LKC 2020.

7. **Comparative study on polarization by using lead and non-lead based clarificants and employing NIR polarimetry:** Comparative study was carried out by polarising samples of B-Heavy molasses at wavelength of 589 nm & 880 nm and by applying different doses of Carrez reagent i.e. 0.1 ml, 0.2 ml & 0.5 ml. In both the cases i.e. at 589 nm & 880 nm the polarization of B heavy molasses was not possible due to darker sample. Further studies are being carried out on juices, syrups and other low coloured process intermediates. Efforts shall also be made to optimize the level of dilution so as to make polarization possible. The results shall be compared with those obtained by conventional lead clarification.

8. **Use of Guljag Crystasulf for sugar cane juice clarification:** Trials of liquid SMBS based clarificant were conducted during the period on various doses of MOL 1.0 %, 1.2 %, 1.4 %, & 1.6 % V/V on raw juice after heating up to 70 deg. C and then neutralizing the limed juice by applying liquid SMBS (Sodium meta bi-sulphite) based clarificant. Remaining procedure was kept same as carried out in earlier experiments using powder SMBS based clarificant Results obtained by using liquid SMBS were observed better in terms of transmittance, colour, turbidity & mud removal as compared to the results obtained by using powder SMBS. The trial shall be further conducted during the forthcoming crushing session of The Experimental Sugar Factory of the institute.

9. **Mechanical clarification of sugarcane juice:** Few sets of experiments were conducted using diffent sugar cane varieties (CO-0118 & UP- 05125). The study was made using different filtration techniques i.e. pressure filtration using ceramic membranes and laboratory centrifugals. The trials were conducted at different temperature using verried quantities of flocculants and filteration aids. Different parameters in raw juice & filtered raw juice were analysed to ascertion efficiencies. Further trials shall be carried out for reaching to conclusion.

10. **Studies on use of B Heavy molasses as edible molasses/ high taste molasses:** Samples of B heavy molasses collected from different factories produring raw sugar were analysed for Magnesium, Potassium, Calcium, Manganese & Iron content besides analysis for sucrose, reducing sugar etc. For clarification of B heavy molasses(for use as edible molasses) centrifugation techniques was adopted, however, the the same was observed to be difficult due to higher brix and viscosity. Other techniques for physical clarification of molasses shall also be taken up with more trials using A – Light and A – Heavy molasses.

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RESEARCH PAPER:

1. A research paper entitled **"Bagasse based value-added products: Looking beyond boundaries"** by Narendra Mohan published in Indian Sugar Journal, October – 2022.

2. A research paper entitled **"Sugar Industry-Harnessing the Unexploited Potential"** by Narendra Mohan sent for publication in 10th International Conference on Sugar and Integrated Industries to be held in Luxor, Egypt, 11-16 February 2023.

3. A research paper entitled **"Conservation of Energy in Sugar Industry"** by Prof. D Swain sent for publication in 10th International Conference on Sugar and Integrated Industries to be held in Luxor, Egypt, 11-16 February 2023.

4. A research paper entitled **"Healthier Sugar: Possibilities and Future Prospects"** by Narendra Mohan, published in International Journal of Engineering research & Technology (IJERT), ISSN:2278-0181, Vol.11 Issue 11, November-2022.

5. A research paper entitled **"Exploiting Sugarcane Value Chain – Indian Experience"** by Narendra Mohan sent for publication in 95th SASTA Congress to be held at Durban, South Africa from 15th – 17th August 2023.

6. A research paper entitled **"Classification of Indian Sugars – Then & Now"** by Narendra Mohan sent for publication in Indian Sugar.

7. A research paper entitled **"Sugar Beet: A Potential Crop for Production of Biofuel and other Value-Added Products"** by Sharad Babu, Lokesh Babar, Ashok Kumar & Narendra Mohan published in "**SHARKARA – October -December 2022"**.

SALE OF SUGAR STANDARDS:

Sale of sugar standard grades commenced from 1st October 2022 for the sugar season 2022-23. Standard grades can be procured online also. Institute has sold 956 samples to the 206 sugar factories up to December 2022. The details are available on our website *http://www.nsi.gov.in*

OUR ADVISORY:

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

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 through technical contribution in policy formulation and control of Sugar Industry.
4. To render assistance to various government organizations in implementation of policies, validations and on associated matters.
5. To extend human resource management services to various government and private organizations.

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CONSULTANCY:

Request for availing consultancy services of the institute were received and also provided to various sugar factories ethanol & other allied units on various technical matters relating to diversion of B Heavy molasses/syrup, validation of ETP's, preparation of DPR's, validation of no increase in pollution loads in ethanol units upon enhancement in capacity etc.

1	M/s Triveni Engineering & Ind. Ltd., Unit – Milak Narayanpur, Rampur, U.P.
2	M/s Bajaj Hindusthan Sugar Ltd., Distillery Unit – Gangnauli, Saharanpur, U.P.
3	M/s Uttam Sugar Mills Ltd., Sugar Unit – Khaikheri, Muzaffarnagar, U.P.
4	M/s Daya Sugar (A Unit of B.K. Investment Services Pvt. Ltd.), Gopalhari, Saharanpur, UP
5	M/s Rajasthan State Ganganagar Sugar Mills Ltd., Rajasthan
6	M/s Uttam Sugar Mills Ltd., Unit-Barkatpur, Bijnor, UP
7	M/s Uttam Sugar Mills Ltd., Unit-Sheramau, U.P.
8	M/s Triveni Engineering & Ind. Ltd., Unit – Chandanpur, Amroha, U.P
9	M/s Bajaj Hindustan Sugars Ltd., Unit-Golagokarnath, Kheri, U.P.
10	M/s Bajaj Hindustan Sugars Ltd., Unit-Palia Kalan, Kheri, U.P.
11	M/s Bajaj Hindustan Sugars Ltd., Unit-Khambharkhera, Lakhimpur Kheri, U.P.
12	M/s Triveni Engineering & Industries Ltd., Unit-Deoband, Saharanpur, U.P.
13	M/s Magadh Sugar & Energy Ltd., Unit-Hasanpur Sugar Mills ltd., Samastipur, Bihar
14	M/s Bajaj Hindustan Sugars Ltd., Unit-Maqsoodapur, Shahjahanpur, U.P.
15	M/s Bajaj Hindustan Sugars Ltd., Unit-Thana Bhawan, Shamli, U.P.
16	M/s DCM Shriram Limited, Sugar Unit – Ajbapur, Lakhimpur Kheri, U.P.
17	M/s Dalmia Bharat Sugar & Industries Limited, Unit-Nigohi, Shahjahanpur, U.P.
18	M/s Balrampur Chini Mills Ltd., Unit-Tulsipur, Balrampur, U.P.

19	M/s Bajaj Hindusthan Sugar Ltd., Unit – Kinauni, Meerut, U.P.
20	M/s Bajaj Hindusthan Sugar Ltd., Unit – Gangnauli, Saharanpur, U.P.
21	M/s Bajaj Hindusthan Sugar Ltd., Unit – Kundarkhi, Gonda, U.P.
22	M/s Bajaj Hindusthan Sugar Ltd., Unit – Pratapur, Deoria, U.P.
23	M/s Bajaj Hindusthan Sugar Ltd., Unit – Rudauli, Basti, U.P.
24	M/s Avadh Sugar & Energy Ltd., Sugar Unit – Hargaon, Sitapur, U.P.
25	M/s Avadh Sugar & Energy Ltd., Distillery Unit – Hargaon, Sitapur, U.P.
26	M/s UP State Sugar Corporation Ltd., Gomtinagar, Lucknow, U.P.
27	M/s Avadh Sugar & Energy Ltd., Sugar Unit – Seohara, Bijnor, U.P.
28	M/s Dalmia Bharat Sugar & Industries Ltd., Unit – Ramgarh, Sitapur, U.P.
29	M/s Dwarikesh Sugar Ind. Ltd., Unit – Dwarikesh Nagar, Bijnor, U.P.
30	M/s Triveni Engineering & Ind. Ltd., Unit – Sabitgarh, Bulandshahr, U.P.
31	M/s Naglamal Sugar Complex, Unit – Naglamal, (A Unit of Mawana Sugar Ltd.), Meerut, U.P.
32	M/s Wave Industries Pvt. Ltd., Unit – Dhanaura, Amroha, U.P.
33	M/s DCM Shriram Ltd., Sugar Unit – Loni, Hardoi, U.P.
34	M/s Uttarakhand Pollution Control Board, Dehradoon, U.K.
35	M/s Triveni Engineering & Ind. Ltd., Unit – Khatauli, Muzaffarnagar, U.P.
36	M/s Saraswati Sugar Mills Ltd., Yamunanagar, Haryana
37	M/s Harinagar Sugar Mills Ltd., Unit – Harinagar, West Champaran, Bihar
38	M/s LH Sugar Factories Ltd., Pilibhit, U.P.
39	M/s Balrampur Chini Mills Ltd., Unit – Gularia, Lakhimpur, U.P.
40	M/s Uttam Sugar Mills Ltd., Unit – Libberheri, Haridwar, U.K.

41	M/s Balrampur Chini Mills Ltd., Unit – Akbarpur, Ambedkar Nagar, U.P.
42	M/s Balrampur Chini Mills Ltd., Unit – Kumbhi, Lakhimpur Kheri, U.P.
43	M/s DCM Shriram Ltd., Unit – Rupapur, Hardoi, U.P.
44	M/s The Haryana Co-operative Sugar Mills Ltd., Rohtak, Haryana
45	M/s Wave Industries Pvt. Ltd., Unit – Bijnor, Bijnor, U.P.
46	M/s Bajaj Hindusthan Sugar Ltd., Distillery Unit – Khambharkhera, Lakhimpur Kheri, U.P.
47	M/s Dalmia Bharat Sugar & Industries Ltd., Unit – Jawaharpur, Sitapur, U.P.
48	M/s Magadh Sugar & Energy Ltd., Unit – New Swadeshi Sugar Mills Ltd., Bihar
49	M/s UP Co-operative Sugar Factories Federation Ltd., Distillery Unit – Nanauta, U.P.
50	M/s Balrampur Chini Mills Ltd., Unit – Babhnan, Gonda, U.P.
51	M/s Seksaria Biswan Sugar Factories Ltd., Sitapur, U.P.
52	M/s Gobind Sugar Mills (A Division of Zuari Ind. Ltd.), Lakhimpur Kheri, U.P.
53	M/s DCM Shriram Ltd., Unit – Hariawan, Hardoi, U.P.
54	M/s Triveni Engineering & Ind. Ltd., Unit – Raninangal, Moradabad, U.P.

ANALYTICAL SERVICES:

Besides analysis of sugar & sugar house products, ethanol and effluents etc., Institute offers testing of Ethyl Alcohol based Sanitizer in its sophisticated, most modern NABL accredited analytical laboratory and other laboratories of the institute. Testing of bagasse for determination of GCV and lime for various constituents also taken up during the period. Analytical services were rendered to following:

1	M/s Uttam Sugar Mills Ltd., Sugar Unit – Khaikheri, Muzaffarnagar, U.P.
2	M/s Kisan Sahkari Chini Mills Ltd., Sultanpur, U.P.
3	M/s Kisan Sahkari Chini Mills Ltd., Unit – Ghosi, Mau, U.P.
4	M/s Ramala Cooperative Sugar Mills Ltd., Ramala Bagpat, UP.

5	M/s The Ganga Kisan Sahkari Chini Mills Ltd., Unit -Morna, Muzaffarnagar, U.P.
6	M/s Kisan Sahkari Chini Mills Ltd., Unit – Sultanpur, U.P.
7	M/s Uttam Sugar Mills Ltd., Sugar Unit - Barkatpur, Bijnor, U.P.
8	M/s Magadh Sugar and Energy Ltd., (Unit - Bharat sugar Mills), Gopalganj, Bihar
9	M/s Balrampur Chini Mills Ltd., Unit – Akbarpur, Ambedkar Nagar, U.P.
10	M/s Dhampur Bio Organics Ltd., Unit – Asmoli, Sambhal, U.P.
11	M/s Dhampur Bio Organics Ltd., Unit – Meerganj, Bareilly, U.P.
12	M/s Dhampur Bio Organics Ltd., Unit –Mansoorpur, Muzaffarnagar, U.P.
13	M/s Bajaj Hindusthan Ltd., Unit – Kinauni, Meerut, U.P.
14	M/s Avadh Sugar & Energy Ltd., Sugar Unit – Seohara, Bijnor, U.P.
15	M/s Triveni Engineering & Ind. Ltd., Unit – Khatauli, Muzaffarnagar, U.P.
16	M/s Bajaj Hindusthan Sugar Ltd., Unit – Kundarkhi, Gonda, U.P
17	M/s Triveni Engineering & Ind. Ltd., Unit –Sabitgarh, Bulandshahr, U.P.
18	M/s Ugar Sugar Works Ltd., Ugar, Karnataka
19	M/s Magadh Sugar & Energy Ltd., Unit – New Swadeshi Sugar Mills Ltd., Bihar

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OUR OTHER ACTIVITIES:

1. राष्ट्रीय शर्करा संस्थान**,** कानपुर द्वारा गत वर्षो की भाँति इस वर्ष भी वार्षिक खेलकूद संस्थान में आयोजित किये गये। इस अवसर पर सुमित शर्मा (एल्कोहल टेक्नोल़ॉजी, अंतिम वर्ष) और आशीष दूबे (शुगर टेक्नोल़ॉजी, अंतिम वर्ष) ने बैडमिंटन तथा अरविंद कुमार (शुगर टेक्नोल़ॉजी, प्रथम वर्ष) और ऋषभ भंडारी (शुगर इंजिनियरिंग, अंतिम वर्ष) ने टेबल टेनिस फाइलन में जगह बनाई। इसके अतिरिक्त क्रिकेट, वॉलीवाल, शतरंज इत्यादि खेलो के विजेतओं को दिनांक 02 अक्टूबर 2022 को आयोजित पुरस्कार वितरण समारोह में निदेशक, राष्ट्रीय शर्करा संस्थान**,** कानपुर के द्वारा पुरस्कार से सम्मानित किया गया।



2. Director National Sugar Institute, Kanpur, addressed technical officers of M/s Balrampur Chini Mills Ltd. on the topic **"Business Model for Sugar-Ethanol Balance"** during Training Program organized at Lucknow on 10th October 2022. Interactions was also made by institute experts on **"Use of MVR's for reducing steam consumption", "Causes of sugar dust formation and prevention of explosion"** and on "Automation Trends & Future Requirements".



3. Director, National Sugar Institute, Kanpur inaugurated the newly constructed library for girl students on 14th October 2022 at Girl's Hostel of the Institute. The library has computers with wi-fi facility to access books and journals online. Such facilities were available in the Boy' Hostel but necessity of having such facility in Girl's Hostel was being felt due to more no. of girls now seeking admissions in various courses and students also joining the institute for project work.



4. Director National Sugar Institute, Kanpur was conferred with **"Excellence Award"** for exemplary contribution in development of sugar and ethanol production technology during the International Conference, SUGARCON 2022, organized by International Association of Professionals in Sugar and Associated Technologies at Indian Institute of Sugarcane Research, Lucknow during 16th - 19th October 2022. He also address the delegates on the topic "Sugar Consumption – Myth and Realities".


5. Renovated Dining Hall of Hostel No. 2 of the National Sugar Institute, Kanpur was inaugurated by Ms. Margaret Gangte, Director (Sugar Administration), Department of Food & Public Distribution, Ministry of Consumer Affairs, Food & Public Distribution on 18th October 2022.



6. A "**Millet's Corner"** has been created in the departmental canteen of National Sugar Institute, Kanpur, where millets (jowar, bajra and ragi) based products viz. cookies, puffs and multi-grain flour have been provided for sale to the staff and students on 20th October 2022.



7. स्वछता जागरूकता के सन्दर्भ मे चलाये जा रहे विशेष अभियान " स्वल्छता पखवाड़ा २०२२" (स्पेशल कैंपेन २.०) के अंतर्गत राष्ट्रीय शर्करा संस्थान, कानपुर के अधिकारीयों, कर्मचारियों एवं छात्रों द्वारा श्री अशोक गर्ग, नोडल अधिकारी के नेतृत्व मे स्वछता के विभिन्न कार्यक्रम अक्टूबर माह में चलाये गये। इसी क्रम में निदेशक महोदय द्वारा प्लास्टिक के प्रयोग को रोकने हेतु कपडे से बने हुए थैलों का वितरण किया गया ।



8. To commemorate the 147th birth anniversary of Sardar Vallabhbhai Patel on **"Rashtriya Ekta Diwas", "Run for Unity"** was organized by National Sugar Institute, Kanpur. Floral tributes were paid to the **"Iron Man"** of the country and **"Rashtriya Ekta Diwas Pledge"** was administered to the staff and students.



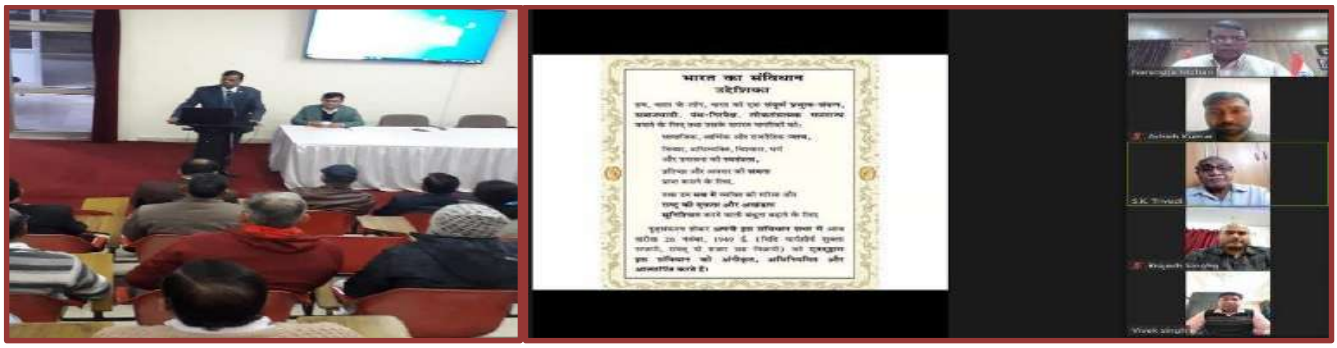
9. राष्ट्रीय शर्करा संस्थान कानपुर की ओर से दिनांक 1 नवंबर 2022 को परिसर में निशुल्क स्वास्थ शिवर का आयोजन, अपोलो स्पेक्ट्रा हॉस्पिटल कानपुर के द्वारा कराया गया। शिविर का छात्र - छात्राओं , शिक्षकों, कर्मचारियों , के अलावा आसपास के लोगों ने भी लाभ उठाया।

10. Autumn planting of sugarcane at farm of National Sugar Institute, Kanpur was carried out during the month. Young and enthusiastic students of Sugarcane Productivity & Maturity Management were observed planting of sugarcane seeds of Co 15023, CoLk 14201 and CoS 13235 with their own hands to learn details of various methods of planting and seed treatment.



11. Director National Sugar Institute, Kanpur distributed **"IDBI Bank Golden Jubilee Scholarships (2022-23)"** on 10th November 2022 to the meritorious and deserving students at Ram Krishna Mission School, Kanpur.


12. राष्ट्रीय शर्करा संस्थान मे हिंदी (राजभाषा) कार्यशाला का आयोजन दिनाँक 30 दिसम्बर 2022 को किया गया जिसमे संस्थान विभिन्न अधिकारियों एवं कर्मचारियों को अधिक से अधिक कार्य हिंदी मे करने हेतु निदेशक द्वारा प्रेरित किया गया।



13. **"Indian Constitution Day"** is celebrated in National Sugar Institute, Kanpur. On this occasion, oath to the constitution was taken by reading Preamble to the Indian Constitution by all officers, staffs and students of the institute.

14. राष्ट्रीय आविष्कार अभियान 2022-23 के अन्तर्गत बेसिक शिक्षा विभाग कानपुर नगर द्वारा विकास खण्ड बिल्हौर स्थित विभिन्न विद्यालयों के छात्र-छात्राओं ने राष्ट्रीय शर्करा संस्थान में विज्ञान-शैक्षिक भ्रमण किया।

15. Students of M.Sc. (Chemistry) of Brahmanand College, Students of M.Sc. and B.Sc. courses from BND College, Kanpur, Students of B. Pharm, II-year, Krishna Institute of Pharmacy and Sciences visited National Sugar Institute, Kanpur and also attended an interactive session addressed by Director, NSI and other faculty of the institute.

HAPPENING IN THE SUGAR INDUSTRY:

Crop diversification, improved irrigation, technology transformed Odisha's farm sector: CM Patnaik:

Highlighting the efforts of the state government towards the development and empowerment of farmers, Chief Minister Naveen Patnaik on Saturday said that crop diversification, improved water provision and the use of technology have made a transformative impact in the agriculture sector in Odisha.

Punjab hikes sugarcane price to Rs 380 per quintal:

In order to provide assistance to sugarcane farmers, Punjab Chief Minister Bhagwant Mann on Monday announced a Rs 20 per quintal hike in the purchase price of sugarcane in the state from the existing Rs 360 to Rs 380 per quintal, said a statement from the chief minister's office.

India becomes world's top sugar producer, also 2nd largest exporter of sugar:

In Sugar Season (Oct-Sep) 2021-22, a record of more than 5000 Lakh Metric Tons (LMT) sugarcane was produced in the country out of which about 3574 LMT of sugarcane was crushed by sugar mills to produce about 394 LMT of sugar (Sucrose). Out of this, 35 LMT sugar was diverted to ethanol production and 359 LMT sugar was produced by sugar mills. With this, India has emerged as the world's largest producer and consumer of sugar as well as the world's 2nd largest exporter of sugar.

Ethanol subsidy scheme extended till March 2023:

The ethanol blending programme interest subsidy scheme under which the centre disburses loans has been extended till March 2023. Food Ministry issued a notification on October 6 stating the applicants who have submitted their applications to DFPD after the date of notification of the scheme but within the cut-off date prescribed in the notification dated 19.07.2018 and in case of whom, loans were disbursed to them prior to the in-principle approval of DFPD, will also be eligible for interest subvention under the scheme.

केंद्र सरकार ने **61** एथेनॉल उत्पादन परियोजनाओं को मंजूरी दी**:**

नई दिल्ली: केंद्र सरकार ने 2025 तक पेट्रोल के साथ 20 प्रतिशत एथेनॉल मिश्रण के लक्ष्य को प्राप्त करने के लिए 61 एथेनॉल उत्पादन परियोजनाओं को सैद्धांतिक रूप से मंजूरी दे दी है। खाद्य और सार्वजनिक वितरण विभाग ने कहा है कि, इन परियोजनाओं से देश की एथेनॉल उत्पादन क्षमता में 257 करोड़ लीटर का इजाफा होगा।

Hindustan Green Energy to set up an ethanol plant in Madhya Pradesh:

Hindustan Green Energy will set up an ethanol manufacturing plant at Khairlanji tehsil in Balaghat district of Madhya Pradesh. The ProjectToday has reported that the project spread over 34.65 acres of land will have a capacity of 400 KLPD and will be developed in two phases.

Ministry granted 190 Environment Clearances so far for Grain based Ethanol production projects: Bhupender Yadav

New Delhi [India], October 14 (ANI): Emphasizing that the Central Government has taken various steps to tackle the issue of stubble burning, Union Minister of Environment, Forest and Climate Change Bhupender Yadav on Thursday presided over a workshop to kick start an initiative to tackle stubble burning. The Central Government has taken various steps to tackle the issue of stubble burning and a large quantity of paddy straw is now being managed through in-situ and ex-situ management options.

पाकिस्तान सरकार ने चीनी निर्यात को दी मंजूरी: मीडिया रिपोर्ट:

इस्लामाबाद : पाकिस्तान सरकार ने सोमवार को पिछले कई महीनों से की जा रही मिलर्स की प्रमुख मांग को स्वीकार करते हुए लगभग 100,000-150,000 टन चीनी के निर्यात की अनुमति देने का फैसला किया है। पाकिस्तानी मीडिया रिपोर्ट्स के मुताबिक, यह फैसला वित्त मंत्रालय में आयोजित एक बैठक के दौरान किया गया, जिसमें राष्ट्रीय खाद्य सुरक्षा और अनुसंधान मंत्रालय के अधिकारियों ने भी भाग लिया।

PM releases 12th instalment of funds worth Rs 16K crore for farmers:

Prime Minister Narendra Modi inaugurated the two-day PM Kisan Samman Sammelan 2022 on Monday and said that the 12th instalment of funds worth Rs 16,000 crore has been sent to farmers across the country. "Under PM Kisan the 12th instalment worth of funds Rs 16,000 crore has been sent to farmers across India. Under 'One nation, one fertilizer', farmers will be provided with cheaper & good quality fertilizer," said PM Modi.

Uttar Pradesh will again become highest sugarcane producing state in country: Minister:

Sugar mills in Uttar Pradesh are focusing to produce export quality sugar, said minister for sugar mills and sugarcane development Laxmi Narain Chaudhary. He said, "Uttar Pradesh will again become the highest sugarcane producing state in the country. Due to untimely rains, the state has slipped to second position."

Ethanol economy in Uttar Pradesh soaring, crosses Rs 12,000 crore mark:

ttar Pradesh has crossed the mark of Rs 12,000 crore in the ethanol economy with annual capacity pegged at 2 billion litres per annum, reports Business-Standard. Sanjay Bhoosreddy, additional chief secretary (sugar industry and sugarcane development) said, "In the next couple of years the state's ethanol capacity is expected to touch 2.25 billion litres."

ISMA seeks higher pricing for ethanol from sugarcane juice/syrup:

The Cabinet approved a hike in rates of ethanol derived from different sugarcane based raw materials under the Ethanol Blending Programme (EBP) for Ethanol Supply Year 2022-23. (i) The price of ethanol from C heavy molasses was increased from Rs.46.66 per litre to Rs.49.41 per litre, (ii) The

price of ethanol from B heavy molasses route was increased from Rs.59.08 per litre to Rs.60.73 per litre, (iii) The price of ethanol from sugarcane juice/sugar/sugar syrup route was increased from Rs.63.45 per litre to Rs.65.61 per litre, (iv) Additionally, GST and transportation charges will also be payable.

मोहिउद्दीनपुर चीनी मिल में लगी आग की होगी जांच:

मेरठ : मोहिउद्दीनपुर चीनी मिल लगी आग की जांच करने का फैसला राज्य सरकार ने किये है। इस हादसे की जांच अपर मुख्य सचिव के निर्देशन में प्रदेश स्तरीय तकनीकी समिति करेगी। गन्ना विकास मंत्री लक्ष्मीनारायण चौधरी ने जांच का आदेश दिया है। मिल में लगी आग से हडकंप मच गया है। आपको बता दे की, इस हादसे में मुख्य अभियंता की मृत्यु हुई है। मिल का पेराई सत्र नौ नवंबर से शुरू हुआ था। दो दिन बाद ही 10 हजार किलो वाट की मोटर फुंक गई थी। जिससे मिल पांच दिन बंद रही थी। अब टरबाइन गर्म होकर जल गई और उसकी वजह से मिल में आग लग गई थी। राष्ट्रीय लोकदल व किसान नेता रोहित जाखड़ ने मिल की फारेंसिक आडिट की मांग की है।

ISMA optimistic on announcement of additional 30 LMT for sugar exports in season 2022-23:

GOI announced a policy for sugar exports in the sugar season 2022-23. The Government has allowed a quantity of 60 LMT to sugars mills across the country. The step comes as another measure to strike a balance between the price stability of sugar in the country and the financial positions of sugar mills in the country.

Sugar export guidelines for 2022-23 season:

In development to the statement that sugar export was allowed for 6 million tonne for 2022-23, Commerce Minister Piyush Goyal on Sunday tweeted the guidelines released by the government for the sector during the season. These guidelines informed the chief executive officers and managing directors of the mills via a statement that the government decided to allow export of sugar up to reasonable limit till October 31, 2023. In this regard, the government has decided to allocate sugar mill-wise export quota of 6 million tonne for the export of 2022-23.

भारत में एथेनॉल उत्पादन क्षमता प्रति वर्ष **947** करोड़ लीटर बढी:

नई दिल्ली : 2025 तक 20 प्रतिशत एथेनॉल सम्मिश्रण लक्ष्य प्राप्त करने के लिए सरकार जैव ईंधन उत्पादन बढ़ाने के लिए विभिन्न कदम उठा रही है। इसी दिशा में आगे बढ़ते हुए 30 नवंबर 2022 तक देश में एथेनॉल उत्पादन क्षमता को बढ़ाकर 947 करोड़ लीटर प्रति वर्ष कर दिया गया है। इनमें से मोलासेस आधारित डिस्टलरी की क्षमता 619 करोड़ लीटर है, जबकि अनाज आधारित डिस्टलरी की क्षमता 328 करोड़ लीटर है।

India records sugar production of 19.9 LMT till Nov, 15, 2022 : ISMA

According to the latest reports by Indian Sugar Mills Association (ISMA), sugar production till 15th November, 2022 in the current 2022-23 SS is 19.9 lac tons, against 20.8 lac tons produced last year on 15th November 2021. Several sugar mills in West, started their operations late this season, because of which the sugar production till 15th November, this year is slightly lower.

श्रीलंका**:** चीनी मिल कर्मियों की हड़ताल जारी**:**

कोलंबो: सेवनगला और पेलवट्टा चीनी मिल के मजदूरों द्वारा शुरू की गई हड़ताल अब भी जारी है। जनक निमलचंद्र, जो दोनों मिलों के अध्यक्ष थे, उनको बदलने और कार्यवाहक अध्यक्ष नियुक्त करने के निर्णय के खिलाफ श्रमिकों ने शुक्रवार (2) को हड़ताल शुरू की। प्रगतिशील कर्मचारी संघ के सचिव शिशिरा कुमारा का कहना है कि, जब तक लिखित में समाधान नहीं होगा तब तक हड़ताल जारी रहेगी। हड़ताल के चलते फैक्ट्रियों में मेंटेनेंस का काम भी ठप हो गया।

Sugarcane farmers expect Chief Minister to announce revival of closed sugar mill in Jagtial:

Sugarcane farmers are expecting Chief Minister K Chandrasekhar Rao would speak about the revival of the closed Nizam Sugar mill in Muthyampet during his visit to Jagtial, reports The New Indian Express. CM will be inaugurating a series of development works in the region.

India targets to divert 60 LMT of excess sugar to ethanol by 2025:

The Union Minister of State for Consumer Affairs, Food and Public Distribution, Ms. Sadhvi Niranjan Jyoti in a written reply to a question in Lok Sabha today shared that in a normal sugar season, production of sugar is around 320-360 Lakh Metric Tonne (LMT) as against the domestic consumption of 260 LMT which used to result in huge carry over stock of sugar with mills.

Jaggery makers in Erode worry over no takers for quality jaggery:

Coimbatore: Jaggery makers in the Erode district are worried as the demand for quality jaggery remains low despite a month left for the Pongal festival, reports The Hindu. Around 100 jaggery production units are operating in Mullamparappu, Arachalur, Kavundapadi and Ammapettai areas in the district.

ब्राजील में नवंबर के अंत में चीनी उत्पादन बढ़ा**: Unica:**

साओ पाउलो: उद्योग समूह Unica ने कहा, ब्राजील के केंद्र-दक्षिण में नवंबर की दूसरी छमाही में गन्ने की कुल पेराई 16.23 मिलियन टन हुई, जो एक साल से 318.75% अधिक है। इस अवधि में चीनी का उत्पादन 532.3% की वृद्धि के साथ 1.03 मिलियन टन तक पहुंच गया, जबकि एथेनॉल का उत्पादन 148% बढ़कर 887.26 मिलियन लीटर हो गया। Unica के एथेनॉल डेटा में मकई से बना ईंधन भी शामिल है।

45 lakh litres of ethanol produced by 34 sugar mills: Minister:

Belgavi: This season 45 lakh litres of ethanol has been produced by the 34 sugar mills in the state and the government is taking steps to share the profits earned by millers from the sale of ethanol with the sugarcane farmers, said Shankar Patil Munenkoppa, Minister for Sugar and Textile, in the Council, reports The New Indian Express.

Tamil Nadu: Farmers want govt to provide sugarcane through ration shops during Pongal:

Chennai: Government should procure sugarcane directly from farmers and distribute it through ration shops during Pongal, said farmers in the state, reports Business Standard. During last year the

government had distributed sugarcane through ration shops and if it distributes this year also then it would be beneficial to farmers, they said.

Karnataka: Directorate of Sugarcane Development to be shifted to Belgavi:

The Directorate of Sugarcane Development would be soon shifted to Belgavi after the conclusion of the current legislative session, stated the Minister for Sugar, Handloom and Textiles Shankar B. Patil Munenakoppa on Tuesday in the Legislative Council, reports The Hindu.

Govt. fixes 22 LMT monthly sugar quota for domestic sale in January 2023:

n a notification issued on 30th day of December 2022, the food ministry has allocated 22 LMT monthly sugar quota for January 2023 to 558 mills which is 0.5 LMT lesser than the quantity allocated sugar quota in January 2022 (21.5 LMT). In the last month i.e. in December 2022 the allocated sugar quota for domestic sale was 22 LMT. Department of Food and Public Distribution also informed on Twitter that the Monthly Sugar Quota for January 2023 is 22 LMT.

मिस्र के सामने चीनी आपूर्ति का संकट**:**

कैरो : मिस्र के घरेलू बाजार में सफेद चीनी की कीमतों में अभूतपूर्व उछाल देखा जा रहा है। पिछले कुछ दिनों में 1 टन सफेद चीनी की कीमत 16,750 मिस्र पाउंड (682 अमेरिकन डॉलर) तक पहुंच गई है। खुदरा दुकानों में, लोकप्रिय अल-डोहा चीनी के एक पैक (1.1-1.6 पाउंड) की कीमत बढ़कर 23 मिस्र पाउंड ($ 0.94) हो गई, जबकि कम गुणवत्ता वाले ब्रांडों की कीमत 18 पाउंड और 21 पाउंड हुई है। मिस्र में नहर चीनी कंपनी ने बीट की पेराई शुरू की है, और यह मिल 900,000 टन से अधिक चीनी के अपेक्षित वार्षिक उत्पादन के साथ दुनिया की सबसे बड़ी मिल है। लेकिन फिर भी देश के घरेलू बाजारों में चीनी की किल्लत हुई है। मिस्र के बाजार में उत्पादन और खपत की मात्रा के बीच लगभग 600,000 टन चीनी का अंतर बना हुआ है, क्योंकि मिस्र में सफेद चीनी का उत्पादन लगभग 2.6 मिलियन टन होता है, जबकि सालाना खपत लगभग 3.2 मिलियन टन है।

TruAlt Bioenergy एशिया की सबसे बड़ी एथेनॉल निर्माण कंपनी होगी**:**

नई दिल्ली: जैसे-जैसे दुनिया पारंपरिक ईंधन से एथेनॉल जैसे नवीकरणीय और टिकाऊ ईंधन के उपयोग की ओर बढ़ रही है, एथेनॉल उत्पादन में काम करने वाली TruAlt Bioenergy एशिया की सबसे बड़ी एथेनॉल निर्माण कंपनी बनने को तैयार है, जिसकी उत्पादन क्षमता प्रति दिन लगभग 2,000 किलो लीटर (KLPD) है।

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RESEARCH ARTICLE:

Sugar Beet: A Potential Crop for Production of Biofuel and other Value Added Products

by
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ABSTRACT:

Sugar beet may be considered as a crop for production of biofuel as it has a high potential for ethanol production in less growth span. The life cycle of this crop is of five to six months with a root yield of 60–80 t ha-1 and sugar content of 15–17%. Although, Sugar beet is known as a temperate crop of short duration grown during the month of September to October and harvested in April and May, but efforts are being made in establishing this crop for Indian agro-climatic conditions. India stands to gain from capitalizing on the potential of sugar beet for sugar, ethanol, fodder and host of other value added products. The present paper discusses brief history of Sugar beet cultivation & utilization in India along with details of trials conducted to assess the potential of this crop under Indian conditions with a view to harness its potential for production of ethanol in particular to make ethanol blending programme in India a success.

Key words: Biofuel, value added products, agro-technological.

INTRODUCTION:

A total of 8.1 million ha of sugar beet is grown in 41 different nations among which the top 10 nations are China, Egypt, France, Russian Federation, Germany, Poland, Turkey, Ukraine, the United Kingdom, and United States of America (Mall et al. 2021). As per USDA (2008) sugar beet contributes to 40% of world sugar trade. However, Zicari *et. al.* (2019) revealed the contribution of beet in the world's sugar production accounts for nearly 30%. Domestication of beet as a leafy vegetable and root crop is known from prehistoric era, but its production as a crop is new to many countries like India (Panella and Kaffka 2011). It was the European sugar industry which extracted sugar from this crop and in the nineteenth century, the spread of this industry was boosted up due to the increased demand of sugar caused by British blockade of continental Europe (Francis 2006). This crop owns a wider consistency with resistance to water stress (Mall *et. al*. 2018a), salt stress (Misra *et. al.* 2020) and frost (Webster *et. al.* 2016).

Sugar beet, a sucrose rich crop, is known for its multifarious uses in the industrial field (Misra *et. al.* 2018). It competes well with sugarcane crop in European countries for production of sugar and

ethanol. Sugar beet is mainly cultivated in Europe and in very lesser amount in Asia and North America (Pathak *et. al.* 2014). This crop holds promise in Indian agro-climates with increasing demands and needs of bio-ethanol and sugar (Pathak *et. al.* 2017). In India, the production of sugar and ethanol is solely dependent on sugarcane crop which makes the crop over burdened with the high demands and needs of the population (Mall *et. al.* 2018b). Sugar beet crop can augment sugarcane to fulfil such future requirements of India (Mall *et. al.* 2018c). Sugar beet was originated as a fodder beet having low amount of sugar content but the continuous selection and improvement has given rise to the present diploid hybrid sugar beet varieties which possess high sugar content (16–19 % on an average). This implies that sugar beet cultivation in India may help in enhancing the sugar recovery (reaching as close to 13-15%) at mills and more on boosting ethanol production. However, the matter needs in-depth study looking to past experiences and present day challenges particularly with respect to climatic conditions and varieties suiting to same.

Historical Perspective of Sugar beet in India:

Sugar beet was introduced in India in 1950s when exploratory trials for the root and seed crop were carried out by ICAR Indian Institute of Sugarcane Research (IISR), Lucknow, at certain identified suitable sites in India. The first phase of trial was conducted in India during 1959–1969 on exotic varieties of sugar beet with systematic multi-location testing with the suitable package and practices. This concept was established by All India Coordinated Research Project on Sugar beet by the Indian Council of Agricultural Research (ICAR) in 1970 which had three main centers at Pantnagar, Kanpur, and IISR Lucknow (Nodal Center). ICAR established five sub-centers at Jalandhar, Hissar, Sriganganagar, Phaltan (Maharashtra) and Vegetable Research Station, Kalpa, and a new center at BCKV, Kalyani (WB) was added in the 7th five-year plan.

The sugar beet cultivation practices in salt affected soils were developed at Sundarbans (West Bengal) for the sub-tropical region of India (Anonymous 2008), and it was found that some varieties, viz., Pant S 1, Pant S 10, IISR Comp-1, IISR 2, and Magnapoly were suitable to grow in alkaline soil conditions. The utilization of sugar beet for alcohol production was also worked at Sundarbans. During1976, All India Coordinated Research Project on sugar beet was transferred to G.B.P.U.A.&T, Pantnagar, but during VIII five-year plan, AICRP on Sugar beet was continued as Network Research Project with its headquarters at IISR, Lucknow, and five centers at Lucknow, Mukteshwar, Sriganganagar, Sundarbans (under the Kalyani Centre) and Kalpa. Then from 1970, cultivation of sugar beet on commercial scale was taken up at Sriganganagar in Rajasthan. A cane then beet sugar factory was established at Sriganganagar (Rajasthan) for commercial exploitation of sugar beet.

Development of diploid/polyploid varieties/hybrid was a major objective in sugar beet research at IISR, Lucknow and during 80's IISR developed two hybrids (LK HY-1 and LK HY-2), one composite (IISR Comp-1) and one synthetic (LKS-10). Multi-location testing of these hybrids was also conducted by the IISR, Lucknow. During this era, breeder seed production of amelite variety LS-6 was done at

Sugar beet Breeding Outpost, Mukteshwar. An open-pollinated diploid Russian variety seed namely Ramonskaya-06 (R- 06) was found suitable to grow in India. Several exotic germplasms were evaluated against the best available check Ramonskaya (R-06). National Seeds Corporation (Sriganganagar) undertook the seed production of R-06 and after that Himachal Pradesh took over the production authority. Network Research Project on sugar beet was merged with AICRP (Sugarcane)during December, 1994. During a joint meeting of AICRP (S) and Network Research Project on Sugar beet held in 1998, it was decided to phase out the sugar beet project because this crop could not be popularized as expected.

In view of several benefits of sugar beet, IISR, Lucknow is still continuing the sugar beet research and seed production at its Outpost in Mukteshwar in Kumaon hills. Development of tropicalized sugar beet varieties and seed production was taken up by multinational sugar beet seed companies under the direction of Syngenta Company in 2004. At the same time, ICAR also launched a Network Research Project to assess the feasibility of new sugar beet varieties under tropical conditions. Sporadic establishment of sugar beet processing units during 2008–2012 made the prospects of sugar beet look better up and consequently a commercial sugar factory was established in Punjab.

THE RECENT TRIALS WITH SUGAR BEET VARIETIES:

The possibility of having more than one crop a year is also not ruled out under tropical agro-climates. The package of practices along with the suitable varieties was developed. The potential for root was observed to be 60-80 t/ha with a sugar content in the roots of 13-15 % or even more. The following table No. 1 gives the performance of sugar beet varieties with respect to yield and sucrose content reported from diverse seed sources:

Table No. 1: Results of trials (different locations) of various Sugar Beet varieties (1980-2020)

S.N.	Varieties	Sucrose Content (%)		Root Yield (t/ha)		Gross sugar 180 DAS* (t/ha)
		150 DAS*	180 DAS*	150 DAS*	180 DAS*	
1.	LK-27	13.05	14.93	78.22	67.92	10.868
2.	LKC-95	12.71	14.98	76.00	65.05	11.058
3.	SYT-06-07	14.26	16.40	84.79	70.99	10.807
4.	SYT-06-13	14.50	16.67	75.37	69.24	10.890
5.	IN-06	14.13	16.06	90.77	69.33	9.566
6.	IN-07	14.28	15.76	65.27	61.32	10.248
7.	PAC-60002	14.88	17.14	81.49	70.62	11.444

8.	PAC-60006	13.56	16.18	72.20	66.97	11.097
9.	FELICITA	13.07	15.19	84.63	80.82	11.728
10.	RASOUL	13.38	14.88	64.86	55.56	9.044
11.	LS-6	13.14	16.22	82.77	70.42	11.484
12.	SHUBHRA	13.78	17.67	93.59	77.77	13.253
	Mean	13.73	16.01	79.16	68.83	10.957

Table No. 2 : Effect of treatment on Root Fresh Weight and Root dry weight
(on the basis of two years mean data 2018-2019 and 2019-2020)

Treatments	**Root Fresh Weight (gm)**			**Root dry weight (gm)**		
	Subhra	**LKC-2000**	**LS-6**	**Subhra**	**LKC-2000**	**LS-6**
T_1-$N_{120}P_{60}K_{60}$ (Control)	390.0	410.8	364.2	50.7	53.10	46.25
T_2- $N_{150}P_{60}K_{60}$ (FP)	370.0	398.0	342.0	45.15	48.78	41.10
T_3- $N_{140}P_{72}K_{40}$(100 % STR)	392.8	414.8	365.0	50.28	53.92	46.72
T_4 - $N_{175}P_{90}K_{50}$(125 % STR)	398.0	417.2	367.2	50.55	54.48	46.03
T_5 - $N_{150}P_{60}K_{60}$ (FP)+ 5 t FYM	375.2	405.0	350.8	46.55	51.03	42.90
T_6 - $N_{150}P_{60}K_{60}$ (FP)+ 1 t Vermi (FP)	378.5	407.2	353.7	47.69	51.71	43.86
T_7- $N_{140}P_{72}K_{40}$(100 % STR)+ 5 t FYM	397.4	415.0	364.8	51.36	54.88	47.05
T_8- $N_{140}P_{72}K_{40}$(100 % STR)+ 1 t Vermi	399.8	418.2	368.5	52.38	55.90	47.91
T_9- $N_{175}P_{90}K_{50}$(125 % STR) + 5 t FYM	405.0	422.8	372.8	53.46	56.80	45.48
T_{10}- $N_{175}P_{90}K_{50}$(125 % STR) +1 t Vermi	406.2	425.0	374.2	55.02	57.10	46.78
S.E. (diff)	18.20	21.50	17.10	1.38	2.05	1.70
CD at 5%	37.49	44.29	35.22	2.84	4.22	3.50

Such trials were carried out at National Sugar Institute, Kanpur on three sugar beet verities, namely LS-6, SZ-35 and PAC-60008 during the period November to March, 2017-18 and three sugar beet verities, namely Subhra, LKC-2000, and LS-6 during November to March, 2018-19 and 2019-20. The observations made on cultivation of these sugar beet varieties over these years have been presented in table no. 3.

Table No. 3 : Effect of treatment on Root yield (t/ha) and Brix (TSS %)
(on the basis of two years mean data 2018-2019 and 2019-2020)

Treatments	Root yield (t/ha)			Brix (TSS %)		
	Subhra	LKC-2000	LS-6	Subhra	LKC-2000	LS-6
T_1-$N_{120}P_{60}K_{60}$ (Control)	55.7	58.9	50.10	15.98	16.20	15.70
T_2- $N_{150}P_{60}K_{60}$ (FP)	50.8	53.7	48.50	15.80	16.00	15.50
T_3- $N_{140}P_{72}K_{40}$(100 % STR)	60.50	64.8	56.820	16.12	16.28	15.72
T_4 - $N_{175}P_{90}K_{50}$(125 % STR)	68.20	73.10	65.30	16.15	16.28	15.72
T_5 - $N_{150}P_{60}K_{60}$ (FP)+ 5 t FYM	54.80	59.20	52.00	15.90	16.08	15.54
T_6 - $N_{150}P_{60}K_{60}$ (FP)+ 1 t Vermi (FP)	56.90	62.10	53.10	15.94	16.10	15.60
T_7- $N_{140}P_{72}K_{40}$(100 % STR)+ 5 t FYM	65.70	71.20	61.80	16.20	16.40	15.88
T_8- $N_{140}P_{72}K_{40}$(100 % STR)+ 1 t Vermi	70.00	76.80	65.10	16.24	16.42	15.90
T_9- $N_{175}P_{90}K_{50}$(125 % STR) + 5 t FYM	78.20	85.10	70.50	16.30	16.70	16.00
T_{10}- $N_{175}P_{90}K_{50}$(125 % STR) +1 t Vermi	82.10	90.20	75.20	16.32	16.70	16.02
S.E. (diff)	0.62	0.84	0.92	0.18	0.26	0.30
CD at 5%	1.27	1.73	1.89	0.37	0.53	0.62

The yield was estimated to be about 80 tonnes per hectare although the same was varying to certain extent from one variety to another. The beet juice was used to assess the ethanol production potential and the same was observed to be about 90-100 liters per ton of sugar beet on laboratory scale (Mohan, N 2019).

Constrains in Sugar Beet Production and Cultivation:

Sugar beet crop though having multiple uses is not being picked up much by farmers for cultivation for commercial purposes due to multiple issues including indigenous seed, beet varieties, climatic challenges, harvesting issues and lack of assured market. Being an industrial crop, at present, there are no incentives or seed money sanctioned to the industries for installing the additional machinery required for beet processing by the government. Also, there is no laid down governmental policy been involved in establishing this crop for commercial purposes. There is a need for involvement of government for developing this crop considering its rich by products and ethanol production potential which may help to contribute in full filling the future needs of the country. Thus, the government may consider coming forth with grants/easy loans, tax holidays, seed subsidies, etc. for the cultivation of this crop. Until and unless this is done, this crop will not get the desired stimulus regardless of how much well it can perform under Indian agro-climatic conditions. There is a need for the creation of a business model in combination with contract farming where several

stakeholders commit themselves to their specific role in the entire venture. Earlier such ventures were initiated at Sri Ganganagar among farmers, factory and seed companies but later it could not be facilitated much.

The history of sugar beet development in Europe, USA and also at Sriganganagar (Rajasthan) in India shows that unless there were incentives given by the Government, sugar beet could not be a success due to various reasons. As regards India, the major constraints identified as a result of operation of a commercial sugar plant had been the following:

1. Sugar beet's molasses rich in Vitamin B12 was in high demand and was sold in premium forming a significant part of revenue in pharma industry lost favour subsequently as it was available from other sources at cheaper rat.

2. Sugar beet was not accepted from fuel generation prospective.

3. Unlike sugarcane it does not have fuel of its own & then additional expenditure on fuel.

4. In Indian conditions; after April month, deterioration in keeping quality of sugar beet created severe post-harvest losses.

In Sriganganagar, it was the extra canal water provided for every acre sugar beet which was a big attraction, and the assured purchase of Sugar Beet by the sugar factory. Similarly, farmers need to be attracted to the crop through other such incentives. Being an industrial crop, at the first instance government may provide incentives for seed development and establishment of sugar beet processing units particularly for producing ethanol. Further, support for fertilizers and pesticides along with technical guidance in raising the crop has to be provided. The central and state agricultural extension and development machinery has to make an all-out effort to be equal partners with the farmers and factory to lend the necessary support with their active presence and post-harvest management of the produce.

As we go along and gain experience of growing it in specific locations, innovative refinements in crop and produce management shall be introduced. In fact, working models are provided by the successful cultivation of sugar beet in countries like Egypt, Morocco, Iran, Pakistan, EU and North America, which have a wide range of agro-climatic conditions and from largely manual to totally mechanized making precision farming.

Sugar Beet & Sugar or Ethanol Production:

As regards utilization of Sugar Beet for sugar production is concerned there are certain issues which are worth consideration:

1. Since the sugar beet doesn't have fuel of its own (as bagasse in case of sugarcane), fuel from outside shall be required to meet steam generation requirements at the boiler.

2. Clarification of beet juice is carried out by carbonation process, where lime requirement is almost 10 times than that required in sulphitation process for cane juices.

3. Capital cost of such sugar processing plant is more due to more no. of unit operations.

4. India is already surplus in sugar production and finding it difficult to dispose of the sugar in global market and thus only better option may be producing ethanol out of it.

Prospects and Future Thrust:

Sugar beet has the prospects of becoming an important and feasible crop of our country. The majority of the segments are now worked out and can be coordinated in a mission mode with the suitable government strategies combined with business approach and agricultural department. To encourage the farmers to bring more area under sugar beet crop, IISR, Lucknow has taken initiative in introducing sugar beet in Bihar also. Further to promote the research and diverse utilization of this crop, IISR, Lucknow has organized national consultations, summer school for researchers, and an IISR-Industry interface with researchers, industries of sugar, bio-ethanol, and seed for scientific footing and popularization of this crop in India. The saline and alkaline tolerance capability of this crop are one of the characteristic features of this crop that will help in reclaiming and ploughing saline soils, covering an area of 6.7 million hectares. The integration of sugar beet with other crops has also flourished well as sugar beet turns out to be a profitable crop while intercropping with other crops, not affecting the current cropping pattern. This crop is known to increase the sugar production when intercropped with sugarcane that will definitely help in fulfilling the required increasing demand for sugar and ethanol. It will also help in lowering the burden imposed on a single sugarcane crop for the production of sugar and ethanol. With the increasing demands of sugar beet seed, there will be higher possibilities of shifting multinationals seed companies to shift in India for its seed production and easy availability.

Conclusion:

- Sugar beet has the potential to be a feedstock for the purpose of sugar and ethanol production.
- There shall be need for developing indigenous sugar beet varieties.
- Adoption of sugar beet cultivation holds promise but shall require greater extension work and assurance to farmers requiring policy interventions.
- It shall also require robust harvesting and transport mechanism.
- Considering requirement of ethanol for EBP 20, it is not possible to cope-up only through molasses route and other feed stocks are to be explored. Sugar beet appears to have the potential to be a feedstock for the purpose.
- The sugar beet and bio-ethanol made from it shall require some price fixation mechanism.

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ABSTRACTS

CLASSIFICATION OF INDIAN SUGARS- THEN & NOW, by Narendra Mohan, Director, National Sugar Institute, Kanpur, December-2022, Indian Sugar

Due to advent of process technology and availability of efficient plant & machinery, the quality of Indian Sugars has seen a easurable change over the last two decades. Traditionally, as a common consumer in the country measures sugar quality on the basis of its appearance in terms of colour i.e. whiteness & luster and also the crystal size, the Indian Sugar Standards are based on these two parameters only for the purpose of trade of sugar in domestic market. Considering various applications requiring sugar as an essential ingredient and for the sake of consumer protection, there was not only a need to develop different grades of sugar but also to provide a reference in determining the price in accordance with the grade.

Climate Change Scenario and Adaptation Strategies for Sugarcane Crop, by TK Srivastava, RRVerma, Anam, Pushpa Singh ICAR-Indian Institute of Sugarcane Research, Lucknow, December-2022, Indian Sugar

Rainfall and temperature variability analysis of six decades in upper Gangetic Plains of UP clearly brought forth the changes in climate of sub-tropical India. Over the years, there has been a decline in rainfall by 205.3 mm during 1986-2015 against 1956-1985. Mean annual Tmax decreased by 0.4oC while an increase in mean annual Tmin by 0.21oC was recorded for the corresponding period. A fare degree of variation has also been recorded in the weekly rainfall and temperature conditions of the zone. Maximum rainfall deficit of 21.25% in monsoon rains was recorded between July-September which coincided with the most critical growth stage of sugarcane.

Cane farm size in major sugarcane producing countries: Implications for Indian sugar production competitiveness, by Dr. A.K. Sharma, Pr. Scientist (Ag. Econ.), ICAR-Indian Institute of Sugarcane Research, Lucknow (India)-226 002, December-2022, Indian Sugar

The relationship of farm size with the productivity levels has been the topic of debate amongst researchers. During 1960s and 1970s, large number of studies established the inverse relationship between farm size and per hectare agricultural productivity, and highlighted that the small farms have high productivity.

Automization of Milk of Lime by Weight method by Vikas Thakur, Virendra Kumar and Narendra Mohan, November-2022, Indian Sugar

Clarification section is an important section of the sugar industry and good clarification is important for making better quality of sugar. pH is one of the vital control parameter that is required to be controlled for production of good quality of clear juice and subsequently good quality of sugar.In the process of doing so,quantity of milk of lime is addedin the mixed juice in a predetermined ratio by most of the sugar factories but desired results are not achieved many a times. Since pH mainly depends on the interaction of prepared milk of lime and mixed juice therefore, quality of milk of lime i.e. apart from available Cao etc. density should also be considered. This paper discusses the efforts made in controlling the desired milk of lime density by making various arrangements in process and use of Instrumentation.

Future Sources of Sugarcane Growth in India and need for reoriented District-level Development Strategies, by AK Sharma, LS Gangwar, Rajesh Kumar and AD Pathak, November-2022, Indian Sugar

The sugarcane production growth in India was observed to be around 1.8 per cent per year during the last one decade from 2009-10 to 2018-19. Region-wise analysis revealed that the growth was negative in tropical region as well as in its major sugarcane growing states during this period for sugarcane area coverage as well as in respect of productivity levels.

Bagasse based value-added products: Looking beyond boundaries, by Narendra Mohan, Director, National Sugar Institute, Kanpur, October-2022, Indian Sugar

Indian sugar industry while on one hand is in pursuit of developing additional revenue streams is focussing on by-product utilization in an innovative manner, society on the other hand is also inclined to use products which are safe, hygienic and environment friendly. Large number of products can be developed from the by-products of the sugar industry, out of which one 100% compostable crockery from bagasse is now greatly talked about because of its multiple advantages. Due to pandemic and otherwise also there is greater thrust on safe food, safe packaging and use of bio-degradable packing materials as well and hence bagasse based tableware can be an excellent choice for the purpose.

Diversification in the nexus of sugar production, environmental stewardship, and sustainable agriculture, by Minori Uchimiya, INTERNATIONAL SUGAR JOURNAL, OCTOBER 2022

Sugar industry has the potential to lead a circular economy within the nexus of sustainable nutrient cycles, environmental protection, and soil health in the coming decades. Sustainable production and consumer safety are the key captioning messages to the emerging health-conscious consumers rapidly expanding by proactive approaches to health after COVID-19. Organic byproducts from sugar processing, e.g., mill mud, meet all criteria for consumer acceptance to replace fossil-based soil amendments. The organic waste-to-biofertilizer concept of mill muds will offer a real-world message, beyond the UN's Sustainable Development Goals, to diversified, sustainability-aware and health-conscious consumers.

Sugar beet weevil (Asproparthenis punctiventris) – a pest of sugar beet in Pannonian arid regions, by Herbert Eigner, Martina Mayrhofer, Stefan Geyer, INTERNATIONAL SUGAR JOURNAL, OCTOBER 2022

Increasingly dry and hot weather conditions have frequently fostered pest damage to agricultural crops. Infestation by the sugar beet weevil (Asproparthenis punctiventris) was observed in Pannonian growing areas from 2017 to 2020. To estimate whether and to what extent larvae and young weevils could establish in a sugar beet field, eight soil samples up to 40 cm depth were taken by a motorized auger (Ø 20 cm) at selected sites. From 2018 to 2020, collected data showed a significant decrease in the number of infested locations and the number of weevils per site (number/m^2).

Brazilian corn ethanol producer enters world's Top 10, By FO Licht GmbH, INTERNATIONAL SUGAR JOURNAL, OCTOBER 2022

Post-Covid 19 pandemic, with the return to some semblance of normality, ethanol production has bounced back on the back of a resurgence in demand. The USA continues to be the leading global producer, followed by Brazil. The US companies Poet, Valero and ADM are the top three leading ethanol producers, followed by the Brazilian Raizen. Over the past few years, investment in corn-based ethanol in Brazil has been significant. In 2021, FS Bioenergia, a corn ethanol producer, entered the Top 10 for the first time.

Modernising sugarcane diagnostics, by Chuong Ngo, Lihan Zhao, Nicole Thompson, Reynard Poels, INTERNATIONAL SUGAR JOURNAL, NOVEMBER 2022

Sugarcane disease diagnostics play an instrumental role in biosecurity and disease management. There has been considerable investment in improving disease diagnostic tests for some exotic and established sugarcane pathogens in recent years. However, for some important pathogens, the diagnostic test development had not been upgraded for many years. This paper describes the progress in upgrading diagnostic tests for nine of these pathogens/diseases.

Optimization of the production of sugarcane one-eye cane setts in organic cropping systems in French Polynesia, By Christophe Poser, Francois-Regis Goebel, Ines Shili-Touzi, Marotea Vitrac, Taivini Teai, INTERNATIONAL SUGAR JOURNAL, NOVEMBER 2022

To increase the efficiency of the vegetative reproduction and growing conditions of young plants under organic agriculture, sugarcane one-eye cane setts were produced following new methods used in Reunion Island. While they are produced using standard cane tops, our study was conducted on cane parts to be used regarding the capacity to develop buds and leaves and on the optimization of the density for both Saccharum officinarum and spp. cultivars.

Implementing predictive dynamic process simulation technology to optimize sugar refinery vacuum pan operation, by Eleanor McFeaters , INTERNATIONAL SUGAR JOURNAL, DECEMBER 2022

One of the remaining horizons in optimizing the sugar refining process is the automation of the crystallization sequence. High concentration sucrose solutions behave non-linearly which makes performing engineering calculations on the sequence complicated. New developments in process simulation software make developing and optimizing the crystallization step more attainable, with engineers able to incorporate process knowledge and data into a simulated model. The future of modelling software could also include a direct communication from the modelling software straight to a refinery's DCS.

Optimising bagasse diffuser performance using percolation velocities, by D Stockham, J Wallace, K Nel, L Brouckaert, INTERNATIONAL SUGAR JOURNAL, DECEMBER 2022

Invicta Mill at Giru, north Queensland, is a dual-train sugar mill that crushes about 3 Mt of cane each season. The factory has a

traditional milling train on the A-side, and a bagasse diffuser on the B-side installed in 1995. During the 2019 crushing season, Invicta Mill had several reliability issues with the bagasse diffuser. The root cause of these issues was difficult to identify and prompted an investigation to better understand how this unit operated.

Managing the impacts of the Maillard reaction on the C massecuite pan and crystalliser stations, by R Broadfoot, INTERNATIONAL SUGAR JOURNAL, DECEMBER 2022

The Maillard reaction is known to occur in each stage of pan stage operations and during the storage of massecuites such as in receivers and crystallisers. The rate of reaction is faster in C massecuite processing than for the higher purity massecuites owing to the higher concentration of impurities, higher brix and generally higher boiling temperatures. The reaction is known to occur predominantly between glucose and amino compounds and produces organic acids, heat and carbon dioxide. Hydrolysis of sucrose is also known to occur.

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