

A collage of images showing various types of wood and bamboo, including cross-sections and whole pieces, arranged in a diamond shape. The images are set against a background of green and yellow geometric shapes. The wood pieces are arranged in a diamond pattern, with some showing cross-sections and others showing the full length of the logs. The colors of the wood range from light brown to dark brown, and some show signs of weathering or decay. The bamboo pieces are also arranged in a diamond pattern, with some showing cross-sections and others showing the full length of the stalks. The bamboo pieces are light green and show signs of weathering or decay. The overall composition is a collage of natural materials, emphasizing the diversity and availability of wood and bamboo in the region.



MITHAS 2023-24





U.P. COUNCIL OF SUGARCANE RESEARCH

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Director Message

Sugarcane is the backbone of state economy and more than 46 lakhs sugarcane farmers are directly and indirectly dependent on cane farming. U.P. Council of Sugarcane Research, Shahjahanpur aimed at developing scientific innovations for farmers and millers to achieve twin benefits of improved productivity and higher sugar recovery. These achievements could be possible by faster multiplication of latest released varieties, creating awareness among farmers for control of major insect-pest and diseases and suggesting various diversification options to double the farmers' income in Uttar Pradesh.

The institute is constantly making efforts for developing new sugarcane varieties and making seed cane available to the farmers. A total of 237 varieties have been developed by the Institute till now, CoS 97264 and many prominent varieties like CoS 767, CoS 8436, CoS 8432, CoS 88230, CoS 95255, CoSe 98231, CoSe 92423 ruled over the several decades. Sugarcane varieties have also been developed for various adverse climatic conditions like drought tolerance, water logging tolerance etc to improve the farmers' income in adverse situations also. Recently new sugarcane varieties like CoS 13235, CoS17231, CoS 18231 (Early), CoS 14233, CoS 16233, CoS 15233 (mid late) have been developed by the Institute for normal situations and a variety i.e., UP 14234 has also been developed for salinity conditions. These prominent varieties are becoming popular among the farmers and millers.


Apart from the development of varieties, research work is also going on continuously on improved planting methods, wide row spacing for newly released varieties, integrated nutrient management, crop diversification options with high value crops, occurrence of new pest and disease management, balanced fertilizer use, improved varieties for jaggery and various value added jaggery products to address multiple needs of society. Implementation of new technologies can also reduce the cost of sugarcane production, maintain ecological balance and increase farm benefits.

For rapid multiplication of sugarcane seed cane, tissue culture, single bud, bud chip, S.T.P methods are being employed. Awareness is created among farmers to adopt the recommended package of practices to avoid red rot disease in sugarcane and other pests. Farmers are being trained and advisories on critical issues have been widely published and circulated. Wide coverage on developmental issues has been emphasized through social and print media. Biofertilisers and biopesticide have been made available to farmers by the Institute to sustain the soil fertility and reduce the cost of chemical fertilizers and pesticides at farm level. Trichocard is also being produced by the Institute for biological control of borer insect-pests.

In order to quickly provide the latest information on sugarcane production to the farmers, a Facebook Live program on current topics is being organized every Tuesday at 4-5 pm, which helped in creating understanding the pertinent issues related to sugarcane growing in Uttar Pradesh and other areas as well. Face book live program beneficiaries have also been noticed in other states and countries.

Annual Report of 2023-24 is a report of all the experiments conducted by the Council during the year. Our priority is to conduct farmer centric research based on scientific principles having sound back ground. I am thankful to the Editorial Board, Head of Divisions/Centres, Section in-charges and other scientific/ non scientific staff of the council who made contributions in preparing the Annual Report.

Jai Hind


(V.K. Shukla)

About UPCR

U.P. Council of Sugarcane Research was established as a research centre in 1912 by George Clark, the then Agricultural Chemist and later Director of Agriculture. With the enforcement of Sugar Tariff Act in 1931, the sugar industry developed at a rapid pace and sugarcane became a major cash crop of the State in early thirties. Realizing the importance of this crop in the State, Government appointed an Economic Botanist (Sugarcane) in the same year at Shahjahanpur with the number of research schemes on different aspects of sugarcane. Thus it became possible to intensify sugarcane research activities in the State under this intensive programme. Some new disciplines like Agronomy Mycology, Soil Science and Statistics were added during the period of 1931 to 1941. Two sub stations i.e. Muzaffarnagar (1934) and Gorakhpur (1939) also came into existence. In 1944, the State Govt. posted the first Director Sugarcane Research, U.P. at Shahjahanpur under the administrative control of Director of Agriculture, UP, Lucknow. Until December, 1972, the U.P. Sugarcane Research Organization was under the administrative control of Director of Agriculture, U.P., Lucknow and Director, U.P. Institute of Agriculture Sciences, Kanpur but in the same month it was transferred under the administrative control of Cane Commissioner, U.P., Lucknow with a view to integrate Sugarcane Research with Cane Development to enhance the productivity. In order to intensify sugarcane research in U.P., a committee headed by the Chairman, Indian Sugarcane Development Council along with members gave number of recommendations emphasizing on the need of suitable sugarcane varieties for different tracts of Uttar Pradesh based on studies made from August 07 to 14, 1974. The Chairman, Indian Sugarcane Development Council in a committee consisting of four members visited Deoria from June 03 to 06, 1975 & gave its recommendations in a "Supplementary report" on Sugarcane Development and the need of Sugarcane Breeding in East U.P. The sub-committee gave 07 recommendations on the different aspects of development/ evolution of sugarcane varieties. The first and most important recommendation was "The Sugarcane Breeding Station" should be located at Seorahi. Based on above recommendation, the U.P.

Govt. sanctioned a scheme for the establishment of Sugarcane Breeding Station at Seorahi, Deoria in 1976 with the objective of breeding high yielding, high sugared and disease resistant sugarcane varieties suitable for different agro climatic zones of Uttar Pradesh.

In December 1976, Mahamahim Rajyapal, U.P. sanctioned the establishment of U.P. Council of Sugarcane Research at Shahjahanpur to speed up the research work by way of attracting highly qualified experienced scientists and avoiding the administrative restriction on financial help.

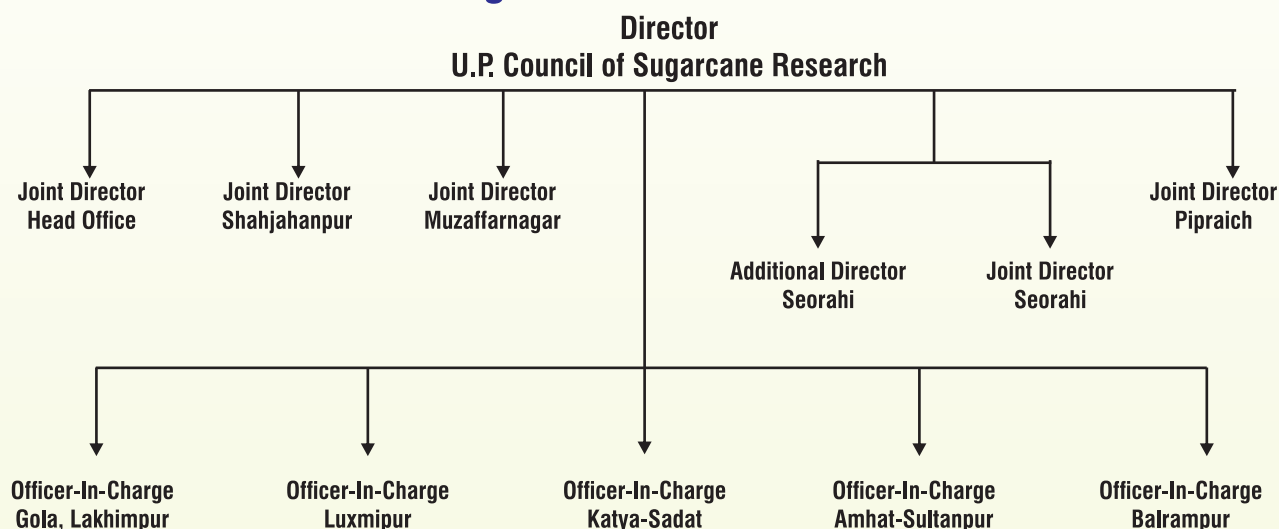
The objectives of U.P. Council of Sugarcane Research are to :

- Conduct research on various aspects of sugarcane in relation to breeding and productivity.
- Evolve varieties for different agro climatic zones of the State.
- Produce and multiply nucleus seed of improved varieties to raise the foundation nurseries at growers field.
- Disseminate the research findings through various communication media.
- Impart training to the farmers and cane development staff.

With the establishment of U.P. Council of Sugarcane Research concerted efforts have been made for varietal evolution suitable for different agro climatic regions of the State and technologies to boost up the sugar and sugarcane production. The State has its own hybridization garden which is supporting the varietal evolution programme with the help of National Hybridization Garden at Sugarcane Breeding Institute, Coimbatore. With the result 231 varieties have been developed and released for general cultivation in the state, so far. Some of the varieties viz. CoS 767, CoS 8436, CoS 92423, CoS 08272, CoS 08279, and CoS 88230 have crossed the State boundary due to their performance over wide range of agro climate.

Recently elite sugarcane varieties viz. CoS 13235, CoS 17231, UP 14234 and CoS 10239 and CoS 18231 were released for general cultivation in different tracts of U.P.

Organizational Structure



Research & Other Disciplines under UPCR (Shahjahanpur)

1	Genetics & Cytogenetics	11	Biotechnology
2	Tissue Culture	12	Central Lab
3	Breeding	13	Plant Pathology
4	Agronomy	14	Entomology
5	Sugar Chemistry	15	Biological Control
6	Soil Chemistry	16	Soil Microbiology
7	Gur and Khandsari	17	Seed Production
8	Biochemistry	18	Extension
9	Pesticide Chemistry	19	Economics
10	Plant Physiology	20	Statistics

Affiliated Research Institute and Seed Multiplication Centres

S.No.	Stations	Year of Establishment	Total Area (ha)	Cultivated Area (ha)
1.	Sugarcane Research Institute, Shahjahanpur	1912	101.35	78.83
2.	Sugarcane Research Station, Muzaffarnagar	1934	40.20	32.42
3.	Sugarcane Research Station, Gola	1961	104.74	89.20
4.	Sugarcane Seed Multiplication Centre, Gola	1974		
5.	Genda Singh Sugarcane Breeding & Research Institute, Kushinagar	1975	114.58	89.12
6.	Sugarcane Seed Multiplication Center, Luxmipur, Kushinagar	1968	30.10	22.31
7.	Sugarcane Seed Multiplication Center, Amhat, Sultanpur	1987	14.17	13.23
8.	Sugarcane Seed Multiplication Center, Sirsa, Bareilly	2018	39.58	24.32
9.	Sugarcane Research Station, Katya-Sadat, Gazipur	1987	16.58	5.99
10.	Sugarcane Seed Multiplication Center, Balrampur	2002	7.68	5.99
11.	Sugarcane Research Station, Pipraich Gorakhpur	2020	16.57	15.00
12.	Sugarcane Seed Multiplication Center, Mahola, Kheri	2022	13.82	11.35
Total			498.87	396.35

Salient Achievements (2023-24)

- A total of 526 accessions of germplasm including *Saccharum officinarum*, *S. sinense*, *S. barberi*, *S. robustum* and *S. spontaneum*, along with Indian and foreign commercial hybrids were maintained.
- Ninety four sugarcane accessions were characterized morphologically using 27 DUS (Distinctness, Uniformity and Stability).
- Under molecular characterization, DNA isolation of 129 sugarcane accessions were done and DNA amplification profiles of nineteen accessions were generated with the help of 10 ISSR markers. Out of ten markers, two markers ISSR UBC 810 and ISSR UBC 815 were found as polymorphic in genetic diversity experiment.
- In 2023-24 total 40,000 micro propagated plantlets of new elite sugarcane varieties CoS 13235, CoLk 14201, CoS 17231, CoS 18231 and CoS 19231 in green house of aforesaid varieties were transplanted in 1.10 hectare at Institute's farms for raising breeder seed nurseries.
- In the year 2022-23, a total 0.91 ha area was planted under tissue culture raised seedlings of varieties CoLk 14201, CoS 13235 and Co 15023. Total 779 quintal seed of varieties CoLk 14201 CoS 13235 and Co 15023 was obtained from tissue culture raised seedlings, planted in the year 2021-22.
- One elite sugarcane variety CoS 18231(early) was released by 'State Varietal Release Committee' in 2023-24 for general cultivation in various tracts of UP.
- A total of seven genotypes were accepted for Inclusion in IVT of North West Zone of AICRP(S). Two early genotypes viz., CoS 23231(S.5/19)-(CoSe 01434 x CoS 510), CoS 23232 (S.151/19)-(CoS 8119 x Co 775) and Five mid-late genotypes viz., CoS 23333 (S.77/18)-(CoS 8436 x CoS 96260), CoS 23334 (S.124/18)-(Co 8353 x BO 130), CoS 23335 (S.245/18)-(LG 07482 GC), CoS 23336 (S.04/18)-(Co 09022 x Co 62198), CoS 23337 (S.246/18)-(LG 07482 GC)
- All above 7 (2+5) entries were proposed in the State Varietal Trial for multi location testing at various Research Institutes/Stations of UPCSAR and nine sugar factory farms across the eastern central and western Uttar Pradesh.
- A total of 2741.5 g (2376.5 + 365.0 local) fluff of 88 crosses from different crossing sites viz; Coimbatore, Agali and Shahjahanpur was sown which resulted in 18660 seedlings. A total of 16522 (11259 at Shahjahanpur+ 3006 at Muzaffarnagar + 2257 at Gola) seedlings were transplanted and rationed for further studies and evolution of elite sugarcane varieties in future.
- Transplanting of three seedlings per running meter raised in tray with coco-pit gave significantly higher no. of shoots (186420/ha), no of millable canes (128600/ha) and cane yield (122.90t/ha)
- Variety CoS 17231 and promising genotype CoS 18231 gave significantly better yield with 100% recommended dose of NPK +25% N through organic manure + bio-fertilizers (Azotobacter + P.S.B) @ 10 kg/ha each and with 67:134 cm in deep furrow paired row planting as compare to the 100% recommended dose of NPK and 30:120 cm in trench, respectively. Recommended doses of NPK through in organics as basal are essential for the optimum cane yield.
- Basal application of 100% P_2O_5 and K_2O through in organics (without basal N) + spraying of nano urea @ 5 ml/lit water of 60 and 90 DAP decreased the cane yield 15.59% (on the basis of highest cane yield 72.10 t/ha).
- Among all the treatments where recommended dose of N, P_2O_5 and K_2O were not applied as basal treatments T_5 -ie, sett treatment with nano DAP @ 5 ml/lit of water+ spraying of nano DAP and nano urea @ 5 ml/lit of water at 60 DAP + spraying of nano DAP and nano urea @ 5 ml/lit of water and sagarika @ 5 ml/lit of water at 90 and 120 DAP gave better cane yield (73.20 t/ha) with decreasing in cane yield 9.70% (highest 87.40 t/ha obtained with 100% recommended dose of NPK + sagarika 25 kg/ha as basal).
- Sett treatments with nano DAP @ 5ml/lit of water or spraying can not fulfill the basal need of P and Spraying of nano urea @ 5ml/lit of water at 60,90 and 120 DAP can not fulfill the 2/3 need of nitrogen required as top dressing upto June month.
- Significantly higher cane yield (98.20.60 t/ha) was recorded with Potash Derived Molasses @ 400kg/ha i.e., 60kg potash, 200kg at sowing time & 200kg at earthen up time (followed by Potash Derived Molasses @ 500kg/ha i.e., 75kg potash as basal with cane yield of 97.20 t/ha) as compare to control treatment where potash is not applied as basal.
- In the scarcity or unavailability of MOP fertilizer PDM can fulfill the basal need of potash without decreasing cane yield and proved better alternative of MOP.
- A total 3362 soil samples were analyzed in Soil survey, Testing and Fertilizer recommendations of



different sugar factory zones in U. P. Results showed that almost all the soils of these zones were deficient in organic carbon and more than 71.0% samples falls in phosphorus responsive category while status of potash found medium. About 59.8%, 28.1%, 42.6% and 27.8% samples are rated responsive to Zn, Fe, Mn and Cu application, respectively.

- Fertilizer recommendation were also prepared on the basis of soil test results and given to cane growers.
- With the objective- to evaluate the appropriate quantity of nitrogen through different modes of urea application in relation to yield of sugarcane, an experiment entitled "Studies on different mode of nitrogen utilization efficiency in sugarcane" was conducted three years in spring planting season. Results revealed that by the application of 66% RDN as two top dressing at 60 and 120 DAP along with single foliar application of 1% of Nitrogen at 45 DAP gave highest cane yield and sucrose% in comparison to recommended dose and methods of Nitrogen.
- An experiment entitled "Effect of micronutrients application on sugarcane" results indicate that seed germination increased 6.8 to 10.3% in sugarcane by the application of Zn, Mn and Cu along with recommended dose of NPK.
- The higher HR Brix and Sucrose % in juice were increased up to 3.9% and cane yield is also enhanced up to 5% by the application of Zn, Mn and Cu along with recommended dose of NPK.
- Highest net return (Rs 404380/ha) and benefit : cost ratio (1.17) was recorded by cropping system "sugarcane + potato- onion transplanting in 01st January" over cane+ potato (Rs 290325 and 1.03) and alone cane (Rs 167477 and 0.73)
- Maximum cane yield of 91.38 t/ha, CCS yield (11.88t/ha) and net profit (Rs 156556/ha) was recorded by CoS 17231 variety when its planting at 30:120 cm spacing in trenches with 100% RDF + 25 kg N/ha through organics + Bio. Fertilizers (Azoto.&PSB)@10 kg/ha each.
- Significantly highest cane yield (96.34t/ha), CCS yield (13.04 t/ha), net profit (Rs 145576/ha) and benefit ratio (1: 0.63) were obtained by treatment T8- 100% recommended dose of NPK through inorganics (conventional) + Sagarika @ 25 kg/ha.
- As regards to gur % in cane, the sugarcane variety Co 15023 produced higher (11.72), followed by CoS 13235 (11.500), Co 0238 (11.38), CoS 17231 (11.33), CoLk 14201 (10.83). In respect of gur yield ton per hectare, highest was obtained in CoS 13235 (9.22) followed by Co 0238 (9.22), CoS 17231 (8.92), Co

15023 (8.60), CoLk 14201 (8.27) over standard CoS 767 (5.65).

- The recommended dose of NPK + 25%N through organic manure + biofertilizers practice was performed well for both genotypes (CoSe 17451 and CoS 17231). The trench planting method (30:120 cm plant geometry) was suitable for obtaining the higher cane productivity (91.75 t/ha)
- The effect of sett treatment with nano-DAP and spraying of nano urea on sugarcane productivity was significantly lower in comparison with conventional RDF of NPK (81.40 t/ha). Application of RDF + Sagarika @ 25 kg/ha (87.35 t/ha) could not produce the desired significant results in comparison with the RDF of the NPK application.
- Nineteen sugar factories were surveyed for disease assessment during pre and post-monsoon. Severe incidence of red rot observed up to 100 per cent on Co 0238 in western part of UP.
- Nineteen new isolates and 8 designated pathotypes of *C. falcatum* were cultured and maintained in laboratory for further study.
- The 204 genotypes/varieties were tested against CF 08, and CF 13 pathotypes. Of these, 118 showed resistant/moderately resistant to all above pathotypes.
- The 204 genotypes/varieties were tested against smut, and 163 showed resistant/moderately resistant to smut disease.
- Thirty six entries in AICRP were evaluated against red rot, smut, wilt, YLD and PBD and 28 were recorded R/MR to red rot.
- The five varieties such as Co 0118, Co 98014, CoS 08272 and CoS 08279 and Co 0238 were found susceptible by soil inoculum that cause crop damaging through primary infection of red rot at farmer field.
- Drenching of Thiophanate Methyl at planting and at 45 and 90 DAP and mechanized sett treatment with Thiophanate Methyl were recorded good to prevent primary incidence of red rot and also enhance the germination, and all other quantitative parameters.
- Soaking of bud either 1 h or 24 hrs with bacterial strain *S. maltophilia* B2132 recorded good to prevent primary incidence of red rot and also enhance the germination, and all other quantitative parameters.
- Soaking of bud and red rot infected bagasse with carbendazime, TPM and STD exhibited better result to reduce red rot and also enhance the germination, and settling vigour.
- The early and highest germination (65.33%) was recorded with *Pseudomonas studzerry* B 3133



under poly tray condition.

- DNA Fingerprinting of 12 varieties were prepared with SSR and RAPD markers.
- The bacterial strains (*S. maltophilia* B2132 and *P. studzerry* B2133) exhibited PGP activities in both pot and tray experiment under green house conditions.
- Biochemical study of macronutrients utilization in 16 promising sugarcane varieties showed that, highest average 'N' content was observed 1.30% in Co 0238 while lowest value (1.08%) was observed in CoS 10239. The Phosphorus content was recorded maximum 0.32% in Co 0238 while lowest 0.21% in CoS 08279. Maximum Potassium (K) content was observed in CoLk 14201 (3.74%) whereas minimum in CoS 16232 (2.61%).
- Micronutrients utilization studies showed that, Zinc content was increased from leaf to whole plant. Zinc content was varied from 2.7 to 38.5 ppm in all the parts of sugarcane. However, average content was found maximum (21.1 mg/kg) in CoS 16233 while minimum in CoSe 13452 (11.3 ppm). The Iron content was found maximum in CoS 08272 (460.0 mg/kg) whereas minimum in Co 05011 (204.1 ppm). The average plant content of Copper (Cu) was detected maximum in CoS 0238 (13.57 ppm) while in leaf it was maximum in CoS 16233 (20.3 ppm) whereas minimum in UP 05125 (7.31 ppm). The highest Manganese content was observed in CoS 14231 (34.37 ppm) and lowest in Co 05011 variety (19.43 ppm).
- The maximum NRA activity was recorded in variety CoS 08272 (2.68 $\mu\text{m/gm/hr}$) followed by CoS 17231 and CoLk 14201 varieties while it was lowest in CoS 16232 (1.49 $\mu\text{m/gm/hr}$).
- With the objective, to find out the effect of micronutrients Zn, Mn and Cu on qualitative and quantitative parameters of sugarcane; an experiment was conducted with four treatments and four newly released early sugarcane varieties.
- The results indicate that seed germination increased 6.8 to 10.3% in sugarcane by the application of ZnSO_4 , MnSO_4 and CuSO_4 along with recommended dose of NPK. The higher HR Brix and Sucrose % in juice were increased up to 3.9% and cane yield is also enhanced up to 5% by the application of Zn, Mn and Cu along with recommended dose of NPK.
- These results showed that by the application of ZnSO_4 , CuSO_4 and MnSO_4 as micronutrient fertilizers along with the recommended dose of N, P, K the qualitative and quantitative traits of sugarcane could be enhanced.
- In Physiology division experiments, varieties CoLk 14201, CoS 16233 and CoS 18231 gave higher yield

under water stress condition along with minimum yield reduction present which indicated their water stress tolerant.

- Varieties CoLk 14201, CoS 16233, CoS 10239 and CoS 18231 gave higher yield under saline soil condition. These varieties are found relatively more tolerant to saline soil condition.
- Varieties CoS 08279, CoSe 96436, CoS 13231 and CoSe 11453 showed better response than other tested varieties under water logging condition.
- A total of 5747 samples of cane juice were analyzed for Brix, sucrose and purity coefficient, and 1179 cane samples were analyzed for pol % and fibre % in cane.
- The sucrose content in juice for early varieties ranged from 14.29% (CoS 16233) to 16.55% (Co 15023) in October, with a gradual increase up to March, peaking between 19.33% (CoS 16233) and 19.68% (Co 0238).
- Mid-late varieties showcased lower sucrose content, starting from 11.49% (CoS 10239) to 15.54% (CoS 08279) in October, rising to 17.78% (CoS 10239) to 19.13% (CoS 08279) in March.
- Six sugar mills viz; (1). Avadh Sugar & Energy Ltd., Unit-Roza, (Shahjahanpur) (2). Parle Biscuits Pvt. Ltd., Unit- Paresendi (Bahraich), (3). The Kisan Sahkari Chini Mills Ltd, Puranpur, (Pilibhit), (4). Avadh Sugar & Energy Ltd., Unit-Seohara, (Bijnor), (5). Shrivasti Kisan Sahkari Chini Mill Ltd, Unit-Nanpara (Bahraich), and (6) L H Sugar Mill Pilibhit were evaluated for sugar recovery.
- During the year 2023-24 a total 48572 kg of Ankush, 1405 kg of Azotobacter, 5060 kg of PSB, 1885 kg of Organo decomposer and 407 Kg of Beauveria bassiana & Metarrhizium anisopliae (total 57329 kg) were supplied to the various farmers/ sugar mills and earned an amount of Rs. 32,17,218.00 (Rs. Thirty two lakhs seventeen thousands two hundred eighteen) only and Rs. 3,50,350.00 from seeliry of Trieho cards.
- During the year Statistics division of Shahjahanpur institute received about 920 data of research experiments including 200 data of AICRP mainly from Shahjahanpur institute and Gola centre and some data from Muzaffarnagar station. The data were analyzed and summary results sent to the respective disciplines.
- During 2023-24 from the breeder seed cane nurseries planted 2022-23, total 1,07,45,113 Single buds of CoS 17231 and CoLk 15466. Total 151189.63 qt. of other varieties of breeder seed cane was produced UPCSRE Shahjahanpur. During 2023-24 breeder seed cane nurseries were planted in 277.30 ha area at research and sugar mills farms, under UPCSRE Shahjahanpur.

01. GENETICS AND CYTOGENETICS

Shahjahanpur

Collection, maintenance and evaluation of germplasm

A total of 526 accessions of germplasm including *Saccharum officinarum*, *S. sinense*, *S. barberi*, *S. robustum* and *S. spontaneum*, along with Indian and foreign commercial hybrids were maintained in pure condition in an augmented block design at the research farm of Sugarcane Research Institute, Shahjahanpur which is an important centre for germplasm collection and maintenance in North India (Table 1).

Table 1. Germplasm, maintained at Shahjahanpur

SN	Species/hybrids	No. of accessions
1	<i>Saccharum officinarum</i>	03
2	<i>Saccharum sinense</i>	06
3	<i>Saccharum barberi</i>	08
4	<i>Saccharum spontaneum</i>	02
5	Inter specific hybrids	14
6	Indian commercial hybrids	445
7	Foreign commercial hybrids and others	48
Total		526

Assessment of genetic diversity in sugarcane germplasm

With the aim of value addition to germplasm collection and to prepare a data base with description of each and every genotype, a programme "Assessment of genetic diversity in the sugarcane germplasm" was initiated in the year 2022- 23 in collaboration with breeding and biotechnology division with the objectives of characterizing sugarcane germplasm for agro morphological traits and assessment of genetic diversity with the help of molecular markers.

Ninty four sugarcane accessions were characterized morphologically using 27 DUS (Distinctiveness, Uniformity, and Stability) till now.

Under molecular characterization, DNA isolation of 129 sugarcane accessions was done and DNA amplification profiles of nineteen accessions were generated with the help of 10 ISSR markers. Out of ten markers, two markers ISSR UBC 810 and ISSR UBC 815 were found as polymorphic at a primary stage of genetic diversity experiment.

Evaluation and utilization of sugarcane germplasm for red rot resistance

Screening of sugarcane varieties/ genotypes available

in the germplasm against multiple races of red rot is utmost important because red rot is a major disease of sugarcane, so that on getting desired outcome, information could be exchanged with SBI, Coimbatore for the inclusion of respective genotype/s in National Hybridization Garden as a source of red rot resistance to be utilized in the varietal development programme.

During the year 2023-24, a total 120 genotypes/ varieties including 60 of last year were tested with CF 08 and CF 13 with standard inoculation methods. Out of 120 genotypes/varieties, 94 were rated as R/MR, and rest were S/HS against CF 08 with plug method and 99 were R/MR and rest were as S/HS against CF 08 with NCS method of inoculation.

With CF 13, 90 genotypes / varieties were rated as R/MR, rest were as S/HS with plug method and 92 were rated as R/MR and rest were as S/HS with NCS method.

Seorahi

Maintenance and evaluation of sugarcane germplasm

Genda Singh Sugarcane Breeding and Research Institute, Seorahi- Kushinagar has been designated as the main center for maintenance collection and evaluation of sugarcane germplasm for North Central Zone of India with the aim of improvement in sugarcane crop. This Institute is situated at 27.2 N latitude and 84.2 E longitude in eastern region of Uttar Pradesh. Germplasm includes Indian and interspecific hybrids. During 2023-24 a total of 183 accessions including *Saccharum* species, Indian commercial hybrid and inter-specific hybrids were successfully maintained in germplasm in pure (Table-2) condition for their utilization in breeding programme.

Table 2 : Details of the sugarcane germplasm maintained at Seorahi

Species/ commercial hybrids	Number of accessions
<i>Saccharum spontaneum</i>	03
Indian Commercial Hybrid	175
Foreign commercial hybrid	04
Inter Specific Hybrid (ISH)	01
Total	183

These accessions were planted in augmented design in two rows of six meters length with 90 cm. distance and evaluated for some quantitative and quality traits. No. of shoots/ha and No. of millable canes/ha in the available collection were ranged from 79,826 to 189302 and 101,318 to 1,66,208 respectively, whereas, HR brix was ranged from 12.6 to 23.8 percent.

02. TISSUE CULTURE

Shahjahanpur

Micro propagation of sugarcane varieties

Fresh cultures of new elite sugarcane varieties CoS 13235, CoLk 14201, CoS 17231, CoS 18231 and CoS 19231 were established and micro propagated through shoot tip culture during the year 2023-2024. For establishment of shoot cultures, healthy tops of the sugarcane varieties were collected from trials of Breeding Division. For 2023-24 total 40,000 micro propagated plantlets in green house of aforesaid varieties were transplanted in 1.27 hectare at Institute's

farms for raising breeder seed nurseries. The nurseries were monitored by Seed Certification Committee and found pure and disease and pest free.

In the year 2022-23, a total 0.91 ha area was planted under tissue culture raised seedlings of varieties CoLk 14201, CoS 13235 and Co 15023. Total 762 quintal seed of varieties CoLk 14201, CoS 13235 and Co 15023 was obtained from tissue culture raised seedlings planted in the year 2021-22, from which total 9.10 ha area was planted under breeder seed production programme in the year 2022-23.

Table.1 Performance of tissue culture plantlets *In-vivo* and *In-vitro*.

Observations	Varieties					
	CoS 13235	CoLk 14201	Co 15023	CoS 17231	CoS 18231	CoS 19231
Culture establishment (%)	72	80	60	40	85	70
Shoot Initiation (%)	80	82	72	65	90	75
No. of Shoots / Culture	12	12	10	4	10	08
Rooting (%) / Culture	82	90	69	70	-	-
Survival Green House (%)	75	76	75	70	-	-
Survival in Field (%)	92	94	90	81	-	-

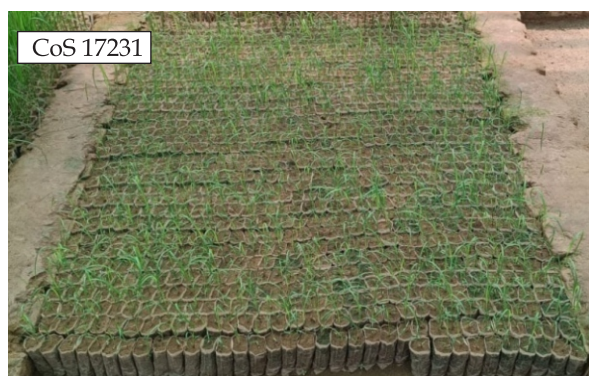


Fig. 1



Fig. 2



Fig. 3



Fig. 4

Fig: 1,2,3,4 Tissue culture raised plantlets in green house



Fig. 5. Variety CoLk 14201



Fig. 6. Variety CoS 13235



Fig. 7. CoS 17231 on field



Fig. 8. CoLK 14201 on field

03. BREEDING

Shahjahanpur

Newly released variety

Variety CoS 18231(early) was released by 'State Varietal Release Committee' on dated 20.02.2024 for general cultivation in various tracts of UP. The salient features of these are as under:

CoS 18231 (Early) (LG 95053 X BO 91)

An early maturing variety CoS 18231 is characterized by tall with zig-zag alignment, medium thick ,blackish white solid stalks, dark green foliage, erect habit easily

detrashing, reddish spot on leaf sheath with long inner and outer auricle, very good ratooner, moderately resistant to red rot with low incidence of top borer, stem borer and shoot borer. During the study CoS 17231 recorded 90.16 t/ha average yield which is 11.36 percent higher than Co 0238. Regarding sucrose percent in November, January and March it was recorded 16.11,17.70 and 19.16 respectively where as it was 16.38,17.66 and 18.98 in Co 0238. CCS t/ha were recorded 11.89 which are 13.94 per cent higher than Co 0238.



Fig. 1 Solidness of CoS 18231



Fig. 2 Jaggery prepared from CoS 18231 and Co 0238



Fig. 3 Internode and Auricle of CoS 18231



Fig. 4 Field view of CoS 18231

Hybridization

With the objective to improve the cane juice quality, yield and disease resistance hybridization work was performed at Shahjahanpur as well as Coimbatore (Tamil Nadu). A hybridization garden was maintained at Sugarcane Research Institute, Shahjahanpur, U.P. to study the floral biology and to affect the crosses. Out of 54 genotypes planted 36 flowered. The pollen fertility ranged from 4.30 percent (S.5083/11) to 72.37 percent (S.301/87). A total of 14 crosses were affected.

Hybridization was also performed at National

Hybridization Garden, ICAR- Sugarcane Breeding Institute, Coimbatore as well as Agali. Where 30 Bi-Parental Crosses 05 PC, 29 GC and 07 Agali cross were affected.

Raising of seedlings

A total of 2520.18 g. (2140.18 + 380.0 local) fluff of 92 crosses from different crossing sites viz; Coimbatore, Agali and Shahjahanpur was sown which resulted in 17369 seedlings. A total of 15763 (15428 + 335 local) seedlings were transplanted for further studies and evolution of elite sugarcane varieties in future.

Details of seedlings

S N	Crosses	Weight of fluff (gm.)	No. of seedlings obtained	No. of seedlings transplanted
A-	Coimbatore crosses			
01	Bi-parental(39)Co31+Agali8	1144.37	10776	9868
02	Poly crosses (02)	17.60	54	47
03	General Crosses (35)	978.21	6162	5513
	Total (76)	2140.18	16992	15428
-				
B-	Shahjahanpur crosses (16)	380.0	377	335
	Grand Total (92)	2520.18	17369	15763

Ratooning of seedlings

In order to select superior clones with good ratooning ability along with other desirable attributes, a total of 16522 seedlings (16428 Coimbatore including 94 local seedlings) were transplanted out of which 1087 survived. These seedlings clones were ratooned during February 2023 for further evaluation. Out of these 288 (281+7 Local) superior clones were selected on the basis of qualitative, quantitative and visual performance. These were for the studied in C1 generation. Cross combinations CoV 89101 X CoPant 97222, Co 86032 X CoPant 97222, Co 0238 X CoSe 92423, Co 8371X CoSe 92423 gave good selections.

First clonal generation (C1)

At Shahjahanpur from 756 ratooned seedling, on the basis of overall good performance a total of 80 clones were promoted for the study in C₁ generation. Some good crosses viz. Co 0238xCoPant 97222, CoS 08279xCo 62198, CoS8119xCo62198 gave more number of genotypes with desirable attributes. On the basis of HR brix and other desirable attributes and overall good performance 44 genotypes were promoted for further evaluation in C₂ generation.

Second clonal generation (C2)

In this experiment 68 genotypes selected from C₁ generation and 56 multiplication were evaluated against four standards viz. Co 0238, CoJ 64, CoS 767 and CoPant 97222. On the basis of quality and other desirable characters a total of 41 genotypes were selected for Preliminary Varietal Trial (PVT) and planted in RBD in two replications comprising of 6 m row length with six rows each.

Preliminary varietal trial

A total of 52 genotypes viz. S.5/19, S.151/19, S.434/19, S.160/19, S.202/19, S.301/19, S.113/19, S.403/19, S.328/19, S.114/19, S.372/19, S.146/19, S.159/19, S.23/19, S.149/19, S.217/19, S.475/19, S.163/19, S.105/19, S.511/19, S.371/19, S.234/19, S.307/19, S.80/19, S.121/19, S.346/19, S.304/19, S.340/19, S.389/19, S.330/19, S.404/19, S.269/19, S.440/19, S.418/19, S.494/19, S.430/19, S.222/19, S.481/19, S.437/19, S.468/19, SL..04/19, S.483/19, S.402/19, S.456/19, S.488/19, S.493/19, S.311/19, S.78/19, S.459/19, S.413/19, S.216/19, S.277/19 were tested with four standards Co 0238, CoJ 64, CoS 767 and CoPant 97222 in RBD with two replications. Highest Cane Yield (t/ ha) was recorded in S 5/19 (98.38)



followed by S.151/19 (96.53) and S. 160/19 (92.12). In the month of November the highest pol % in cane was recorded in Co0238 (12.19) followed by CoS767 (11.80) and S5/19 (11.65). In the month of January the highest pol % in cane was recorded in S 151/19 (13.69) followed by Co 0238 (13.40) and S.23/19 (13.23). In the month of March the highest pol % in cane was recorded in S 151/19 (14.63) followed by S. 391/19(14.51) and S. 402/19(14.47). Out of 52 genotypes studied, 19 were found moderately resistant to Cf08 and Cf 13 (new race) of red rot.

State varietal trial (I Plant)

The performance of a uniform set of thirteen genotypes viz. CoS 20231 (S.38/16), CoS 20232 (S.43/16), CoS 21231 (S.50/16), CoS 21232 (S.391/16), CoS 21233 (S.188/16), S.27/17, CoSe 21451 (Seo.1231/15), UP 21452 (SeoL.261/17), S.310/16 along with standards CoJ 64, Co 0238, CoS767 and CoPant 97222 were studied in RBD with two replication Shahjahanpur, Seorahi, Muzaffarnagar, Gola & Katya Sadat.

At Shahjahanpur the highest cane yield (t/ha) was recorded in CoS 20231 (95.36) followed by CoS 20232 (93.74) and S.27/17 (92.12). The highest Pol per cent in Cane was recorded in CoJ 64 (11.06), followed by Co 0238 (10.94) and CoS 767(10.70) in November. In January Co 0238 (13.63) followed by CoS 21232(12.93) and CoS 20231(12.89). In March CoS 20231 (14.00) followed by S. 27/17(13.80) and Co 0238 (13.63). The highest CCS t/ha was recorded in CoS 20231 (12.77) followed by S. 27/17 (12.10) and CoS 21231(11.68)

State varietal trial (II Plant)

The performance of a uniform set of Seventeen genotypes viz CoS 19231 (S.181/15), CoS 19233 (S.12/15), CoS 19234 (S.234/15), CoS 20234 (S.142/15), S.188/15, Seo 685/15, Seo 565/16, Seo 1581/16, Seo.1019/16, CoLk 18201, CoLk 18202, CoLk 18203, CoLk 18204 along with standards CoJ 64, Co 0238, CoS 767 and CoPant 97222 were studied in RBD with two replications at Shahjahanpur, Seorahi, Muzaffarnagar, Gola & Katya Sadat.

At Shahjahanpur the highest cane yield (t/ha) was recorded in CoS 19231 (96.76) followed by CoS 19234 (95.83) and S. 188/15(89.81). The highest Pol per cent in cane was recorded in CoS 19231 (12.96) followed by CoLk 18204 (12.00) and S.188/15 (11.62) in November. In January Co 0238 (13.40) followed by CoS 19231 (13.38) and CoLk 18202 (13.14). In March S. 188/15 (13.67) followed by CoS 19231(13.66) and Co 0238 (13.58). The highest CCS t/ha was recorded in CoS

19231 (12.56) followed by S. 188/15 (12.26) and CoS 19234(11.61).

State varietal trial -ratoon

The ratoon ability of a uniform set of Seventeen genotypes viz CoS 19231 (S.181/15), CoS 19233 (S.12/15), CoS 19234 (S.234/15), CoS 20234 (S.142/15), S.188/15, Seo 685/15, Seo 565/16, Seo 1581/16, Seo 1019/16, CoLk 18201, CoLk 18202, CoLk 18203, CoLk 18204 along with standards CoJ 64, Co 0238, CoS 767 and CoPant 97222 were studied in RBD with two replications at Shahjahanpur, Seorahi, Muzaffarnagar, Gola & Katya Sadat.

At Shahjahanpur on the basis of cane yield (t/ha) CoS 19231(84.49) was highest followed by CoS 19234 (83.33), and Co 0238 (80.56). The highest Pol per cent in cane was recorded in S.188/15(12.95) followed by Co 0238 (12.37) and CoS 19231 (12.34) in October. In November S.188/15 (13.56) followed by Co 0238 (13.09) and CoS 19231 (12.74). In December S.188/15 (14.01) followed by CoS 19231 (13.68) and Co 0238 (13.55). The highest CCS t/ha was recorded in CoS 19231 (10.87) followed by S. 188/15 (10.60) and Co 0238 (10.32).

Muzaffarnagar

Ratooning of seedling

In order to select superior clones with good ratooning ability along with other desirable attributes, a total of 3006 seedlings of 04 Biparental crosses and 4 GCs were collected in June 2022 from Sugarcane Research Institute, Shahjahanpur and transplanted in field, out of which 920 were survived. These seedlings clones were ratooned in February 2023 for further evaluation. On the basis of qualitative and quantitative attributes 38 clones were selected for further studies in C1 generation.

Preliminary varietal trial (PVT)

A total of 33 genotypes were tested with three standards viz. CoJ 64, Co 0238 and CoS 767 in RBD with two replications. On the basis of red rot reaction by plug method 17 genotypes showed moderately resistant reaction (MR) against CF13 races. Highest cane yield and CCS t/ha was recorded S.201/19 (106.27, 14.22) followed by S.426/19 (105.18, 14.02) and S.261/19 (102.23, 13.84). In the month of November highest sucrose % in juice was recorded by standard CoJ64 (17.44) followed by S.48/19 (17.30) and CoS 767 (16.70). In January S.232/19 (18.10) was highest followed by S.426/19 (17.95) and S.201/19 (17.75) whereas in March standard variety CoJ 64 (20.08) was

highest followed by S426/19 (19.99) and S.261/19 (19.56). On the basis of qualitative and morphological attributes 08 genotypes were selected for multiplication.

Standard varietal trial 1st plant

Thirteen entries including four standards (CoS 767, CoPant 97222, Co 0238, and CoJ 64) were studied in randomized block design with two replications. Seven entries viz. CoS 20231, CoS 21231, CoS 21232, CoS 21233, CoSe 21451, UP 21452 and S.27/17 in cane yield and five entries viz. CoS 20231, CoS 21233, CoSe 21451, UP 21452 and S.27/17 in CCS t/ha were found significantly superior over the best standard Co 0238 (80.56, 11.24). In November highest pol % in cane recorded in CoJ 64 (11.09) followed by CoS 21231 (10.82) and CoS 20232 (10.58). In the month of January highest pol % in cane in CoS 20231 (12.76) followed by Co 0238 (12.52) and CoS 21233 (12.51), while in March CoS 20231 (14.09) was highest followed by CoS 20232 (14.02) and Co 0238 (14.01).

Standard varietal trail 2nd plant

Seventeen entries including four standards viz. CoS 767, CoPant 97222, Co 0238 and CoJ 64 were evaluated in randomized block design with two replications. Six entries viz. CoS 19231, CoS 19233, CoS 19234, Seo 565/16, Seo 1019/16, and Seo1581/16 in cane yield and 05 entries viz. CoS 19231, CoS 19233, CoS 19234, Seo565/16 and Seo1581/16 in CCS t/ha were significantly higher over the best standard Co 0238 (84.62, 11.90). As regards pol % in cane in November standard CoJ 64 (10.46), CoS 19231 (10.40) and CoS 19233 (10.23) stood first, second and third respectively. In January Co 0238 (12.65) was highest followed by CoS 20234 (12.60) and CoLk 18204 (12.31). While in the month of March CoS 19231 (14.12), Co 0238 (14.06) and CoLk 18204 (13.95) exhibited 1st, 2nd and 3rd respectively.

Standard varietal trail, ratoon

The ratooning ability of preceding SVT 1st plant 17 entries including 4 standards viz. CoS 767, CoPant 97222, Co 0238 and CoJ 64 were studied in randomized block design with two replications. Three entries CoS 19233, CoS 19234 and Seo1581/16 recorded significantly higher cane yield and CCS t/ha over the best standard CoPant 97222 (70.60, 8.82). In pol % in cane in October CoJ 64 (11.09) was highest followed by CoS 19231 (10.65) and Co 0238 (10.61). In November the standard variety CoJ 64 (12.36) recorded highest

pol % in cane followed by CoS 19231 (12.09) and CoS 20234 (11.91), while in December CoS 19231 (13.11) was highest followed by CoLk 18204 (12.87) and CoS 19233 (12.64).

All India Coordinated Research Project on Sugarcane (North West Zone) 2023-24

Seorahi

Hybridization

To improve cane yield, juice quality and disease resistance, crossing programme was carried out at Sugarcane Breeding institute Coimbatore and Genda Singh Sugarcane Breeding and Research Institute Seorahi (Kushinagar). A hybridization garden was maintained with 34 genotypes/ varieties at G.S. Sugarcane Breeding and Research Institute Seorahi (Kushinagar) to study the pollen fertility. The pollen fertility was recorded which ranged from 10.8 to 72.6 %. A total 27 biparental crosses at Coimbatore and 6 biparental crosses at Agali (Keral) were affected. At Genda Singh Sugarcane Breeding and Research Institute Seorahi, 16 biparental crosses were affected.

Raising of seedling fluff received from Coimbatore and produced locally

In the month of November/December, 2023 total 27 biparental, 15 GC and 3 PC were affected at National Hybridization Garden Coimbatore (Tamilnadu) and 6 biparental crosses were affected at Regional Research Center, Agali (Keral). Sixteen Biparental Crosses were also affected at Local Hybridization Garden, Seorahi. Total 2.029 kg fluff was received from the crosses affected at Coimbatore and fluff was sown for raising seedling using UP method of seedling management.

Seedling ratoon

After ratooning total 5885 seedlings were survived and studied during 2023-24. On the basis of desirable attributes total 452 seedlings were sown in augmented design in C1 generation for further study.

Multiplication of seedling clones for disposition of their real character in order to select the desirable types

C2-Generation: - Total 162 genotypes along with 2 standards (CoS 767 and Co 0238) were studied during 2023-24 in augmented design to select desirable types. On the basis of desirable attributes 15 genotypes were selected for Preliminary Varietal Trial.



To test the suitability of new genotypes selected from multiplication stages

Preliminary varietal trial

In this experiment total 24 genotypes including six standards (CoSe 95422, CoJ 64, CoLk 94184, CoS 767, BO 91 and CoP 06436) were studied in a randomized block design with two replications. On the basis of cane yield t/ha, genotype Seo L 433/21 (91.89 t/ha) was found superior followed by SeoL 427/21 (91.44 t/ha) and Seo 263/21 (89.81 t/ha). On the basis of CCS yield t/ha genotype SeoL 427/21 (12.37 t/ha) was found promising followed by SeoL 433/21 (12.29 t/ha) and Seo 263/21 (11.72 t/ha). In the month of November highest sucrose % in juice was recorded in genotype SeoL 433/21 (17.61) followed by Seo 220/21 (17.35) and Seo 263/21 (17.30). Whereas, in the month of January highest sucrose % in juice was recorded in genotype SeoL 433/21 (18.81) followed by Seo 220/21 (18.45) and Seo 427/21 (18.32). Highest sucrose % in juice was recorded in genotype SeoL 427/21 (19.67) followed by standard SeoL 433/21 (19.17) and Seo 220/21 (19.03) in the month of March.

State varietal trial (IInd plant)

In this experiment seventeen varieties namely, CoSe 20451, CoSe 20452, CoSe 20453, CoSe 20454, CoS 19231, CoS 19233, CoS 19234, CoS 20234, S.188/15, CoLk 18201, CoLk 18202, CoLk 18203 were tested along with five standards CoJ 64, Co 0238, CoSe 95422 (Early) CoS 767 and CoPant 972222 (mid-late) in RBD with two replications. On the basis of cane yield, variety CoSe 20254 (96.99 t/ha), was found best followed by CoSe 20453 (95.14 t/ha) and CoSe 20452 (92.13 t/ha). On the basis of CCS yield t/ha variety CoSe 20453 (12.22 t/ha) was found superior followed by CoSe 20454 (12.16 t/ha) and CoSe 20452 (12.13 t/ha). Highest sucrose % in juice was recorded in genotype S. 188/15 (18.91) followed by CoS 19231 (17.66) and CoS 20452 (12.72) in the month of Nov. While, in the month of January highest sucrose % in juice was recorded in the genotype S.188/15 (19.77) followed by CoSe 20452 (18.76) and CoLk 18201 (18.75). In the month of March highest sucrose % in juice was found in the genotype S.188/15 (20.36) followed by variety CoLk 18201 (19.93) and standard variety Co 0238 (19.12).

State varietal trial (Ist plant) ratoon

In this experiment seventeen varieties namely, CoSe 20451, CoSe 20452, CoSe 20453, CoSe 20454, CoS 19231, CoS 19233, CoS 19234, CoS 20234, S.188/15, CoLk 18201, CoLk 18202, CoLk 18203 were tested

along with five standards CoJ 64, Co 0238, CoSe 95422 (Early) CoS 767 and CoPant 972222 (mid-late) in RBD with two replications. On the basis of cane yield variety CoSe 20252 (87.17 t/ha) was found superior followed by CoSe 20454 (84.72 t/ha) and CoSe 20453 (82.17 t/ha). On the basis of CCS yield t/ha variety CoSe 20452 (11.12 t/ha) was found promising followed by CoSe 20453 (10.11 t/ha) and CoS 19231 (9.76 t/ha). Highest sucrose % in juice was recorded in genotype S. 188/15 (18.58) followed by CoSe 20452 (18.37) and CoS 19231 (17.64) in the month of November. Whereas, in the month of December highest sucrose % in juice was recorded in the genotype S.188/15 (19.66) followed by CoS 19231 (18.95) and CoSe 20452 (18.56).

State varietal trial (Ist plant)

Nine varieties, namely CoS 20231, CoS 20232, CoS 21231, CoS 21232, CoS 21233, S. 27/27, S. 310/16, CoSe 21451, UP 21452 along with five standards CoJ 64, Co 0238, CoSe 95422 (Early) CoS 767 and CoPant 97222 (mid-late) were tested in RBD with two replications. Highest cane yield (95.14 t/ha) was recorded in variety UP 21452 followed by CoSe 21451 (88.88 t/ha) and CoS 20231 (88.19 t/ha). Whereas, highest CCS t/ha (12.29 t/ha) was recorded in variety UP 21452 followed by CoSe 21451 (11.56 t/ha) and CoS 20231 (11.41 t/ha). Highest sucrose % in juice was found in the variety S.27/17 (17.64 %) followed by CoS 21231 (17.19 %) and CoSe 21451 (17.00 %). In the month of January highest sucrose % in juice was recorded in the variety CoSe 21451 (18.24 %) followed by standard variety CoS 0238 (18.16 %) and CoLk 94184 (17.87 %). In the month of March highest sucrose % juice was recorded in the variety CoS 21231 (18.80 %) followed by CoSe 21451 (18.72 %) and UP 21452 (18.62 %).

Gola

State varietal trial (Ist plant)

A total no. of 13 genotypes along with four standards (CoJ 64, Co 0238, CoS 767, CoPant 97222) were studied in randomized block design with two replications under recommended fertility levels, for the assessment of their yield potential, juice quality and disease resistance. Highest cane yield (mt/ha.) was recorded in CoS 21231 (85.42 mt/ha) followed by Co 0238 (81.94 mt/ha.) and UP 21452 (81.25 mt/ha). On the basis of juice analysis, maximum sucrose percent in juice was recorded in CoS 21231 (16.62, 17.70, 18.65) followed by Co 0238 (16.37, 17.25, 18.28) and UP 21452 (16.10, 17.22, 18.20) in the month of November, January and March, respectively. Where as highest POL in cane was recorded in CoS 21231 (12.20, 13.43, 14.68) followed by

Co 0238 (11.90,13.40,14.38) and UP 21452 (11.78,13.20,14.22) in the month of November, January and March, respectively. Highest CCS % and CCS

t/ha was recorded in CoS 21231 (12.79) followed by CO0238 (12.51) and UP 21452 (12.40).

Details of seedlings

S.N.	Parcentage	Received Seedlings	Transplanted Seedlings	Developed Plants	Developed Ratoon
1	CoS 87216 G.C.	275	275	206	194
2	Co 8353 x BO 130	239	239	185	176
3	CoPk 89101 x CoPant 97222	289	289	208	196
4	CoS 8371 x CoSe 92423	313	313	202	174
5	CoS 92263 G.C.	244	244	163	150
6	MS 6847 x Co 1148	273	273	135	126
7	CoS 8408 G.C.	267	267	135	129
8	BO 91 G.C.	357	357	185	179
Total		2257	2257	1419	1324

Raising of the seedling

A total no. of 2257 seedling of 8 parents were obtained from Shahjahanpur during 2022-23 out of that 1419 seedlings to develop for next year as ratoon. During the year 2023-24 ratoon established 1324 seedlings (C1 generation) to carry out next generation for (C2), which genotype performing better against standard (Co

0238/CoS 767). On the basis of HR Brix we have selected approx. 100 genotypes for next generation as C2. Same genotypes were transplanted as per the technical programme during the month of march 2024.

C₁ Generation Ratoon 2023-24 Total Genotypes - 1324

Standards(HR,BRIX)	November 2023	January 2024
Co 0238 (20.8, 21.8)	108	215
CoS 767 (19.2, 20.2)	95	150
Total	203	365

100 genotypes were selected for C₂ Generation for year 2024-25

04. BIOTECHNOLOGY

Shahjahanpur

DNA fingerprinting for identification and protection of elite sugarcane (*Saccharum spp*) varieties, using simple sequence repeat (SSR) markers

The purpose of this study was to provide Simple Sequence Repeat (SSR) and Random Amplified Polymorphic DNA (RAPD) based DNA fingerprinting information for sugarcane (*Saccharum spp.* Hybrids) cultivars that were developed in Shahjahanpur research form. Genomic DNAs from 12 cultivars were

amplified with 06 pairs of polymorphic SSR and 4 pair of RAPD primers using Gene Amp PCR System 9700 (Applied Bio systems make, USA). Markers UGSM 354, UGSM 358 and all four RAPD found highly amplification pattern and could distinguish all the cultivars tested. A total of 250 bands were obtained. This system is informative and useful in protecting new varieties and identifying cultivars because it consists of not only important information for a cultivar but also its specific molecular identification (Table 1 and Fig 1).

Table 1. DNA fingerprinting of elite sugarcane genotypes/ varieties with SSR and RAPD markers.

Sl. No.	Variety/ genotype	Presence of band (bp) with specific SSR markers		Presence of band (bp) with RAPD marker	
		UGSM 354	UGSM 358	OPC 1	OPD 20
1	CoS 17231	197, 260, 386, 533	205, 294, 343, 409	500, 610, 683, 756, 1000, 1214	360, 470, 500, 600, 710, 735
2	CoS 18231	191, 250, 300, 379, 522, 589	152, 294, 343	500, 610, 683, 756, 1214	360, 400, 470, 500, 600, 640, 635
3	CoS 18232	265, 357, 511, 600	152, 183, 294, 900	500, 683, 1000, 1214	360, 400, 500, 600, 640, 735, 960, 1250
4	CoS 19231	255, 290, 364, 522, 600	152, 172, 294, 900	500, 683, 1214	360, 740, 500, 600, 710, 735, 900, 1250
5	S. 45/17	194, 260, 300, 336, 364	215, 294	500, 610, 683, 756, 1214	360, 400, 470, 500, 600, 640, 735, 800, 960
6	S. 161/17	191, 250, 285, 321, 364	210, 245, 294, 336	500, 610, 683, 756, 1000	360, 400, 500, 600, 735, 800, 960
7	CoS 17235	191, 250, 295, 364	187, 200, 245, 294, 350	500	360, 400, 470, 500, 600, 735
8	CoS 18233	184, 265, 295, 357, 460, 544	294, 343, 900	500, 683, 1000, 1214	360, 400, 470, 500, 710, 735, 900, 1250
9	UP 14234	197, 295, 371, 500, 589	180, 220, 294	500, 610, 683, 1214	360, 500, 735
10	S. 27/17	191, 250, 285, 350	230, 294	500, 610, 756, 1214	500, 600, 735, 800, 1250
11	CoS 17232	255, 290, 364, 450, 522, 589	294, 357, 900	500, 683, 1214	360, 740, 500, 710, 735
12	CoS 19235	194, 265, 295, 357, 400, 450, 522	185, 294	500, 610, 756, 1000, 1214	1250

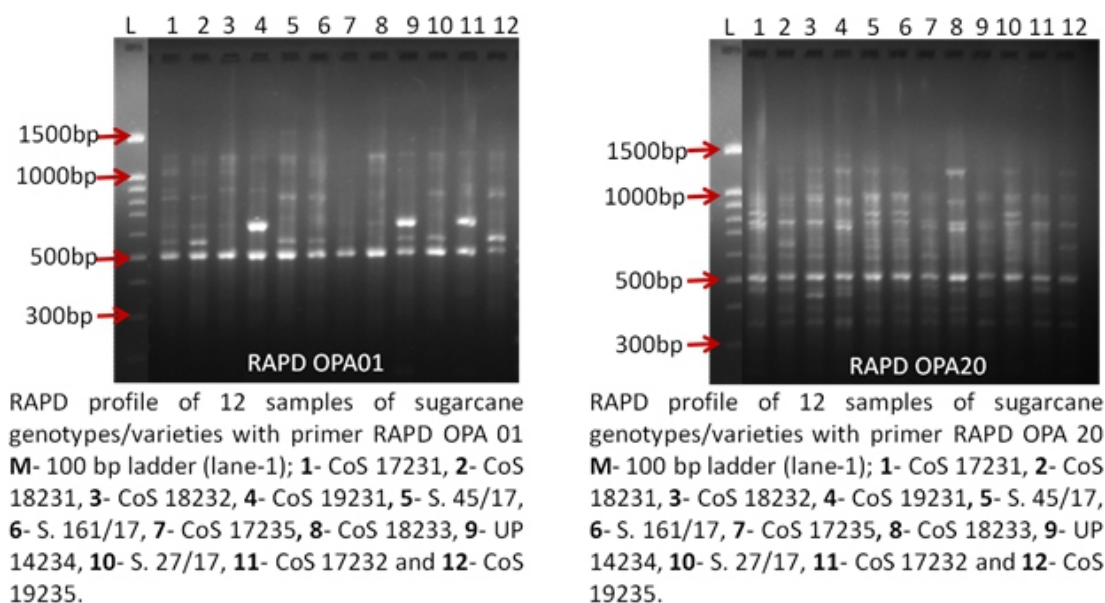


Fig. 1. PCR amplification of 12 genotypes/varieties with two RAPD primers.

Plant growth promoting and salt stress tolerance activity of novel bacteria in sugarcane crop.

A pot experiment was conducted in poly tray and pot conditions under glass houses with the objective “To evaluate the Plant Growth-Promoting activities of novel bacterial strain (*Stenotrophomonas maltophilia* B2132 and *Pseudomonas studzerry* B2133) in sugarcane plant”. The experiment was laid out in a randomized block design with 3 replications. There were three treatments such as T₁: Control- No bacterial inoculation (Inoculation with sterile water), T₂: Inoculation with *S. maltophilia* B2132, T₃: Inoculation with *P. studzerry* B2133 were taken under PGP experiment. Each pot was filled with 6 kg of autoclaved

soil. The soil was analyzed according to standardized protocol of UPCSAR. The main physical and chemical properties of the soil used represented in Table 2. Each pot was planted with three surface-sterilized seeds and irrigated with sterilized tab water. All treatments received the recommended dose of fertilizer. Pots were arranged in a complete randomized block design with three replicates. For inoculation treatments, cane setts were soaked for 2 hrs in the bacterial suspension of 10⁹CFU and placed at the same depth (approximately 2.5 cm below the soil surface) in all inoculated pots. The un-inoculated control treatment consisted of water-treated seeds (with out bacterial inoculation) was included.

Table 2: Mean value of micronutrient in soil and in leaf for PGP treatment.

Mean value of micronutrient in soil										
Treatments	PH	E.C	Organic C (gm/km)	P kg/ha	K kg/ha	S (ppm)	Zn (ppm)	Fe (ppm)	Mn (ppm)	Cu (ppm)
T ₁	7.61	0.10	6.15	7.5	165.76	13.2	2.48	3.73	2.54	1.26
T ₂	7.71	0.10	7.1	7.2	212.8	16.4	2.46	3.66	2.59	1.26
T ₃	7.72	0.10	6	6.5	219.52	12.1	2.68	3.58	2.03	0.9
Control (Initial soil)	7.17	0.2	4.35	7.4	351.68	9.5	1.5	4.04	45.6	1.57
Mean value of micronutrient in Leaf										
Treatments	Zn (ppm)		Fe (ppm)		Mg (ppm)		Cu (ppm)			
T ₁ (Control)	0.336		683.1		11.1		9.5			
T ₂ (<i>S. maltophilia</i> B2132)	0.338		864.6		28.3		7.2			
T ₃ (<i>P. studzerry</i> B2133)	0.308		260		30.4		9.3			

Based on PGP performance, the influence of both the bacterial strain with multiple PGP activities on cane, plant growth was evaluated in a pot and tray experiment (Table 3, Fig.3). Germination were increased by 48.87%, 55.33% in T₂ (*S. maltophilia* B2132) and T₃ (*P. studzerry* B2133) treatments as compared to control (T₁). In case of shoot height were also increased by 59.04%, 65.71% in T₂ (B2132) and T₃ (B2133) treatments, respectively as compared to control. Shoot

fresh weight were also increased by 67.57%, 62.89% in T₂ (B2132) and T₃ (B2133) treatments, respectively as compared to control. Similarly improvements in leaf area, chlorophyll content and biomass weight were also found increased in both the treatments over untreated control (Table 3 & 4). Same trend of PGP activities was recorded under pot condition (Table 5 and Fig 2, 3).

Table 3. PGP activity on germination, plant height, plant weight, root weight and root height in tray planted settlings.

Treatment	Germination (%)	Shoot height (cm)	Plant weight (g)	Root weight (g)	Root height (cm)
T ₁	40.67	52.80	28.33	3.05	34.74
T ₂	62.67	59.92	29.06	3.96	25.63
T ₃	72.00	66.50	31.95	6.30	27.93

Table 4. PGP activity on leaf area, biomass and chlorophyll contents in settlings.

Treatments	Leaf Area (cm)	Biomass weight (g)		Chlorophyll contents (μ mol/m-2)	
		Fresh wt.	Dry wt.	Chlorophyll a	Chlorophyll b B
T ₁	65.67	28.33	9.0	2.175	3.628
T ₂	89.30	29.06	12.0	5.464	6.341
T ₃	100.03	31.95	13.5	3.105	5.321

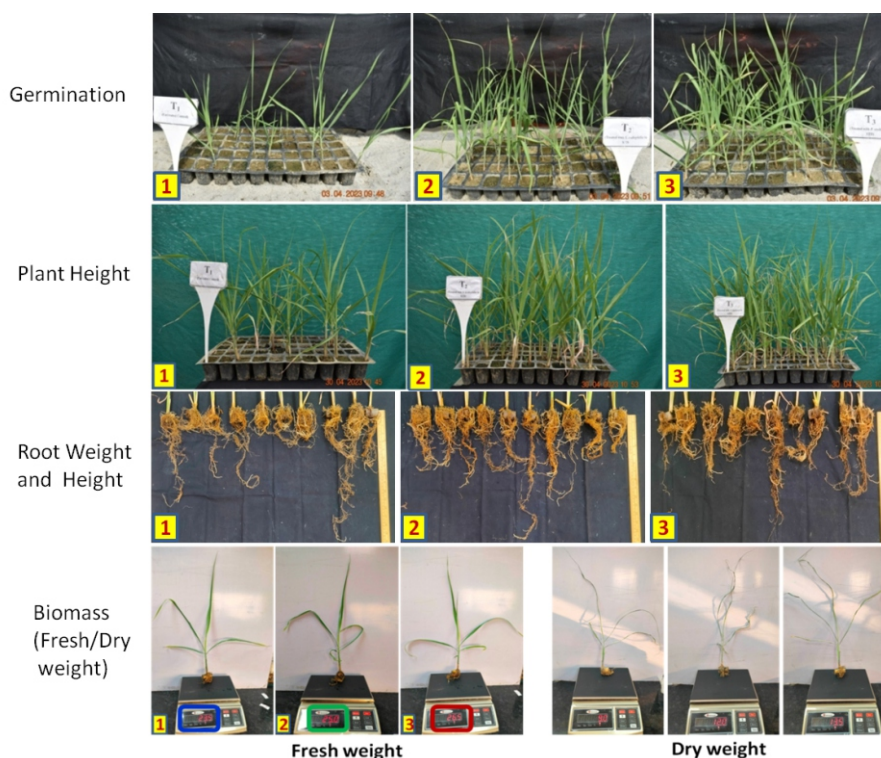


Fig. 2. PGP activity of *S. maltophilia* B2132 and *P. studzerry* B2133.

Table 5. PGP activity on germination, plant height, plant weight, root weight, leaf area, and biomass content under pot condition.

Treatment	Germination (%)	Plant height (cm)	Plant weight (g)	Root weight (g)	Leaf Area (cm)	Fresh wt. (g)	Dry wt. (g)
T ₁	60.00	192.71	197.33	230.50	350.24	87.33	39.50
T ₂	66.67	202.11	571.33	111.00	260.22	269.33	105.33
T ₃	66.67	217.78	488.67	90.67	360.02	235.33	97.83



Fig. 3. PGP activity of *S. maltophilia* B2132 and *P. studzerry* B2133 in pot.

B. To evaluate the efficacy of novel strains to confer salt stress tolerance in sugarcane plant

This study was examined the effects of salt on functional characterization and the capability to reduce plant stress by using novel bacteria. Six

treatments (T₁- Untreated soil (without salinity), T₂- Treated with *S. maltophilia*, T₃- Treated with salt 4 EC, T₄- Treated with salt 8 EC, T₅- Treated with salt 4 EC + *S. maltophilia*, T₆- Treated with salt 8 EC + *S. Maltophilia*) were taken under salt stress experiment. Preparation of bacterial inoculum and cane setts treatment was performed as per standard protocol. Cane setts were surface sterilized by treating with 70% ethanol followed by 2% sodium hypochlorite (NaOCl) solution for 3min. The sterilized seeds were thoroughly washed using sterile water to remove all traces of sodium hypochlorite. The surface-sterilized cane setts were kept in the bacterial suspension for 1h. Five kg serilized soil was used in each pot and salt combination of ZnSO₄, NaCl, CuSO₄ were mixed with serilized soil to maintain the salinity. The salt was mixed based on soil weight to achieve the desired concentration i.e. 4 EC and 8 EC. All the pots were arranged in completely randomized block design with three replications in each treatment. Physiochemical characteristics of soil used for plant growth study have been summarized in Table 6. The present study demonstrates that use of the inoculation with bacterial strain *S. maltophilia* improves the growth with ionic balance at 4 EC in soil (Table 6 and Fig 4). Same experiment would be continued in next year for further confirmation of finding.

Table 6. Efficacy of bacterial strain on PGP activity on germination, plant height, plant weight, root weight, leaf area, chlorophyll content, biomass and juice.

Treatment	Germination (%)	Plant height (cm)	Plant weight (g)	Root weight (g)	Leaf Area (cm)	Fresh wt. (g)	Dry wt. (g)
T ₁	91.67	192.67	70.00	98.67	260.89	41.33	16.00
T ₂	75.00	137.67	111.33	94.67	295.22	66.00	20.50
T ₃	50.00	83.33	136.00	74.67	175.78	70.67	24.67
T ₄	8.33	96.33	70.00	24.00	44.00	37.33	13.17
T ₅	83.33	266.67	160.67	98.00	211.72	88.67	29.00
T ₆	0.00	0.00	0.00	0.00	0.00	0.00	0.00

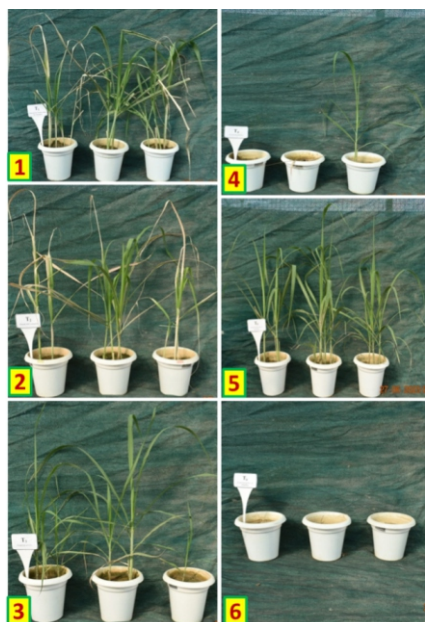


Fig. 4. Activity of *S. maltophilia* B2132 and *P. studzerry* B2133 on salt stress.

2. Antagonistic activity of *Stenotrophomonas maltophilia* (B2132) against *C. falcatum* under in vivo condition

A pot experiment was conducted with the objective “To find out the efficacy of *Stenotrophomonas maltophilia* (B2132) against *C. falcatum*”. The experiment was laid out in a randomized block design with 3 replications. Twenty four eye buds of each treatments in three pots (Eight eye bud in each pot) were planted. The red rot

susceptible varieitey of Co 0238 was taken for study. There were eight treatments such as T_1 - *C. falcatum* + *S. maltophilia* B2132 (Soaking of single bud in suspension); T_2 - Bud soaking in *C. falcatum* suspension; T_3 - bud soaking in *S. maltophilia* B2132 suspension; T_4 - *C. falcatum* mixed in soil mixture + bud soaking in *S. maltophilia* B2132 suspension; T_5 - *C. falcatum* mixed in soil mixture + bud soaking in 0.2% ThioPhanate Methyl; T_6 - *C. falcatum* mixed in soil mixture + untreated bud (Drenching of *S. maltophilia* B2132 at 7 DAP); T_7 - *C. falcatum* mixed in soil mixture + untreated bud; T_8 - untreated bud were taken for study.

Suppression of *C. falcatum* in primary incidence

The standardized grain inoculum of red rot was applied on the setts and in soil under plot to induce red rot disease. Cane setts were also dipped in the suspension of *C. falcatum* for red rot infection. Out of all the treatments, primary infection of *C. falcatum* were appeared 100% in T_1 treatment, where as very less incidence of red rot was observed in T_2 (0.67%), T_4 (4.67%), and T_6 (0.33%). Red rot was not found in T_3 , T_5 and T_8 treatments. The primary infection of red rot were recorded 100 per cent and 39 per cent in T_1 and T_7 , respectively (Table 7 & Fig 5, 6). The treatment *C. falcatum* mixed in soil mixture and drenching of *S. maltophilia* B2132 (T_6) was found effective to inhibit red rot disease under pot condition and also stimulate plant growth. Yield contributing traits were computed high in T_3 , T_4 , T_5 and T_6 followed by T_1 and T_7 (Table 7 & Fig 5). The suppression of red rot is depicted in Fig. 6.

Table 7. Red rot incidence and growth parameter data.

Treatments	Germination	No of leaf	Cane height (cm)	Girth (cm)	NMC Count	Disease incidence % (1 ^o)	Disease incidence % (2 ^o)
T_1	0.0	0.00	0.00	0.00	0.00	100.00	No cane
T_2	50.0	7.40	130.93	2.11	9.33	0.67	1.33
T_3	64.6	6.60	125.80	2.27	11.33	0.00	0.00
T_4	68.0	7.00	127.67	1.95	13.00	4.67	24.67
T_5	81.3	7.20	139.33	2.37	15.00	0.00	3.67
T_6	75.8	7.27	155.67	2.55	16.33	0.33	0.33
T_7	20.8	5.20	79.53	1.27	5.67	39.00	47.33
T_8	66.7	6.20	140.80	2.42	14.00	0.00	0.00

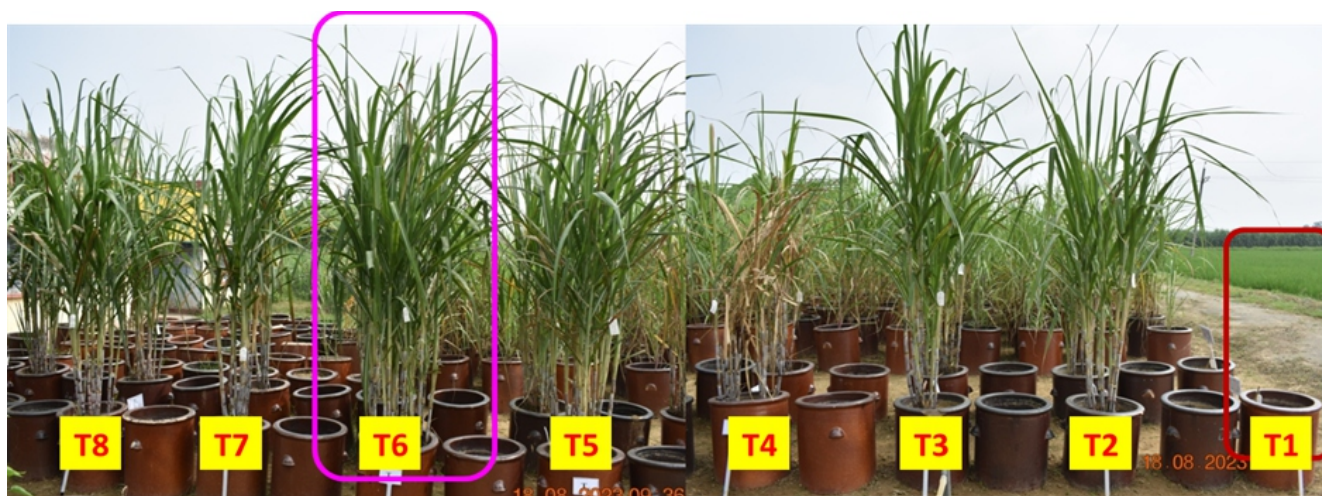


Fig. 5. Growth performance of plant with different treatments.

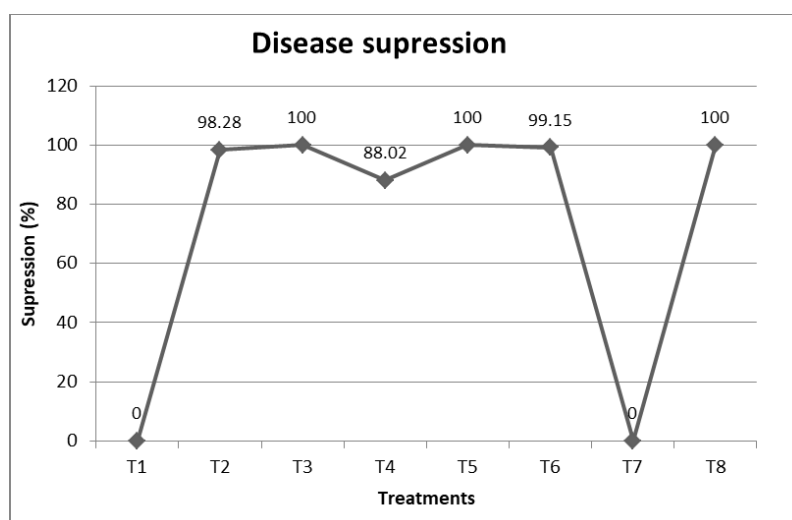


Fig. 6. Disease suppression (%) at initial stage.



05. AGRONOMY

Shahjahanpur

Bio-efficacy of bio-enriched organic manure (KK Pro) in sugarcane

This experiment was conducted during season at Research Farm of U.P. Council of Sugarcane Research Institute, Shahjahanpur to evaluate the effect of bio-enriched organic manure (KK Pro) on Cane yield and juice quality in randomized block design with three replications.

The soil of the experimental field was low in O.C(0.40%), Phosphorus (9.8 Kg/ha) and potassium (144.9 Kg/ha) with PH 6.8. Experimental crop variety CoS 13235 (Early maturing) was planted in October and harvested in January.

Experimental data (Table 1) indicated that significantly higher cane yield (84.94t/ha) was recorded with 100% RDF+KK pro@1.25kg/ha followed by 100% RDF+0% KK pro with Cane yield of 81.57 t/ha. C.C.S percent was not affected with various treatments.

Efficacy of Planting method and material of sugarcane on cane yield and Economics

A field experiment was carried out during autumn season at research farm of U.P. Council of Sugarcane Research Institute, Shahjahanpur to find out the effect of planting methods and economic of sugarcane in randomized block design and replicated thrice.

The soil of the experimental field was low in O.C(0.48%), Phosphorus (9.8 Kg/ha) and potassium (144.6 Kg/ha) with PH 6.8. Experimental crop variety CoS 13235 was planted at the row spacing of 135 cm in October and harvested in January.

Experiment data (Table 2) revealed that raising of one bud setts in tray with coco-pit gave maximum germination (88.26%) and survival (96.20%). Transplanting of three settlings per running meter raised in tray with coco-pit gave significantly higher no. of shoots(186420/ha), no of millable canes (128600/ha) and cane yield(122.90t/ha) followed by transplanting of three settlings per running meter raised in tray with paddy husk than that of conventional planting with two budded setts@ ten buds/running meter.

Agronomical evaluation of newly evolved sugarcane genotypes

This experiment was carried out at research farm of U.P. Council of Sugarcane Research Institute, Shahjahanpur during spring season to find out the fertility levels and plant geometry of promising sugarcane genotypes in factorial RBD with three replications.

The soil of experimental field was low in organic carbon (0.36%) and medium in phosphorus (9.8 kg/ha) and potash (117.70kg/ha) with PH 7.02. The experimental crop were planted in February and harvested in March after 12 months.

Experimental data (Table 3) revealed that higher cane yield (85.24 t/ha) was recorded in genotypes CoS 17231 which is at par with CoS 18231 (82.58 t/ha). Regarding fertility levels, 100% recommended dose of NPK + 25%N through organic + bio-fertilizers (*Azotobactor* + PSB) @10kg/ha each gave significantly higher cane yield (86.44t/ha) than that of 100% recommended dose of NPK (81.39t/ha). In case of planting methods significantly higher cane yield (87.32 t/ha) was obtained in 67:134 cm in deep furrow paired row planting as compared to 30:120 cm in trench paired row planting (80.53t/ha).

Response of various sources of plant nutrients on sugarcane

This experiment was conducted at research farm of U.P. Council of Sugarcane Research Institute, Shahjahanpur to assess the effect of nano DAP, nano urea and sagarika on growth yield and quality of sugarcane in randomized block design with three replications.

The soil of the experimental field was low in O.C (0.36%), Phosphorous (9.8 kg/ha), and potassium (117.70kg/ha) with PH 7.02. The crop variety CoS 13235(early maturing) was planted in February and harvested in March after 12 months.

Experimental data (Table 4) revealed that significantly higher cane yield (87.40 t/ha) was recorded with 100% recommended dose of NPK through inorganics + sagarika @25kg/ha of water followed by 100% recommended dose of NPK through inorganics with the cane yield of 83.50 t/ha. Maximum

net returns Rs138186/ha was also obtained with 100% recommended dose of NPK through inorganics+sagarika @ 25kg/ha . CCS percent was not affected significantly with different treatments.

Efficacy of Potash derived molasses (PDM) in Sugarcane

This experiment was conducted at research farm of U.P. Council of Sugarcane Research Institute, Shahjahanpur during spring season to evaluate the effect of PDM on cane yield and juice quality in sugarcane in randomized block design with three replications.

The soil of the experimental field was low in O.C. (0.36%), Phosphorous (9.8 kg/ha), and potassium 117.7kg/ha with PH 7.02. Experimental sugarcane crop variety CoS 13235(early maturing) was planted in February and harvested in March after 12 months.

Experimental data (Table 5) indicated that significantly higher cane yield (97.58t/ha) was recorded with potash derived molasses (PDM) @ 400kg/ha(60kg potash) 200 kg at planting time and 200kg at earthing time followed by PDM @ 500kg/ha i.e , 75kg potash as basal with cane yield of 96.19 t/ha. CCS percent was not affected significantly with various PDM treatments.

Table.1: Effect of KK Pro on sugarcane yield and quality (mean data of two years) at Shahjahanpur

Treatments	Germination (%)	Shoots (000/ha)	NMC (000/ha)	Cane yield (t/ha)	CCS (%)
T ₁ - KK Pro + 100% RDF	43.13	172.94	127.13	84.94	13.19
T ₂ - KK Pro+ 75% RDF	42.45	166.98	116.14	80.28	13.04
T ₃ - KK Pro + 0% RDF	40.42	125.26	91.16	65.87	13.04
T ₄ - 100% RDF + 0% KK Pro	39.43	160.10	114.27	81.57	12.96
T ₅ - 75% RDF + 0% KK Pro	38.13	151.02	108.62	76.91	13.03
T ₆ - 0% RDF + 0% KK Pro (untreated control)	37.19	117.59	88.36	61.72	13.00
T ₇ - FYM as per recommendation	42.24	168.27	119.92	69.19	12.71
SE	2.81	5.70	2.12	2.25	0.36
CD at 5%	NS	13.90	5.18	5.61	NS

Table.2: Efficacy of Planting method and material on sugarcane yield and quality at Shahjahanpur

Treatments	Germination (%)	Survival (%)	Shoots (000/ha)	NMC (000/ha)	Cane yield (t/ha)	CCS (%)	Net income (Rs/ha)
T ₁ - One bud sett planting @ 5 buds/running meter with covering of 5-6 cm soil thickness	70.00	-	151.43	104.4	103.6	12.60	219240
T ₂ -One bud sett planting @ 5 buds/running meter with covering of 1-2 cm soilthickness followed by light irrigation.	73.00	-	154.61	106.7	105.2	12.38	223048
T ₃ - Two bud sett planting @ 5 buds/running meter with covering of 1-2 cm soil thickness followed by light irrigation.	63.31	-	150.69	102.9	102.7	12.70	208599
T ₄ -Transplanting of three settlings/running meter raised with STP method in soil, sand and organic manure (1:1:1) mixture	75.60 (STP)	88.25	180.70	124.7	110.2	12.27	204901
T ₅ -Transplanting of three settlings/running meter raised with STP method raised on bagasse.	77.20 (STP)	90.00	181.35	125.1	118.3	12.64	196781
T ₆ -Transplanting of three settlings/running meter raised in tray with soil, sand and organic manure (1:1:1) mixture.	77.67 (In tray)	94.50	178.23	122.9	107.4	12.35	195469
T ₇ -Transplanting of three settlings/running meter raised in tray with bagasse.	82.95 (In tray)	95.30	182.52	123.6	109.8	12.62	200549
T ₈ - Transplanting of three settlings/running meter raised in tray with paddy husk	76.26 (In tray)	93.10	181.42	125.2	120.7	12.00	240391
T ₉ - Transplanting of three settlings/running meter	88.26 (In tray)	96.20	186.42	128.6	122.9	12.42	247827

Table.3 :Agronomical evaluation of newly evolved Sugarcane Genotypes (mean data of two years) at Shahjahanpur

Treatments	Germination (%)	Shoots (000/ha)	NMC (000/ha)	Cane yield (t/ha)	CCS (%)	Net income (Rs/ha)
A- Varieties						
V ₁ - CoS 17231	52.90	169.25	118.24	85.24	12.94	134817
V ₂ - CoS 18231	42.97	148.73	103.53	82.58	12.65	126503
SE	1.71	5.21	5.01	1.26	0.18	-
CD at 5%	4.05	12.33	11.85	NS	NS	-
B - Fertility level						
F ₁ - 100% RDF NPK	47.24	154.60	108.94	81.39	12.76	122560
F ₂ - 100% RDF NPK+ 25% N through organic manure + Bio-fertilizers (Azotobacter +PSB @ 10 kg/ha each)	48.63	163.39	112.83	86.44	12.83	126556
SE	1.71	5.21	5.01	1.26	0.18	-
CD at 5%	4.05	12.33	11.85	3.54	NS	-
C - Planting Method						
S ₁ -67 :134 cm in deep furrow paired row planting	44.60	158.13	113.91	87.32	12.98	142083
S ₂ - 30:120 cm in trench paired row planting	51.32	159.85	107.86	80.53	12.73	107173
SE	1.71	5.21	5.01	1.26	0.18	-
CD at 5%	4.05	12.33	11.85	3.54	NS	-

Table.4 :Response of various source of Plant nutrient on sugarcane yield and quality (mean data of two years) at Shahjahanpur

Treatments	Germination (%)	Shoots (000/ha)	NMC (000/ha)	Cane yield (t/ha)	CCS (%)	Net income (Rs/ha)
T ₁ - 100% RDF NPK through inorganic (conventional)	54.69	131322	99295	83.5	12.9	37621
T ₂ - 100% RDF of P ₂ O ₅ and K ₂ O through inorganics + spraying nano urea @5ml/ lit water at 60 DAP and 90 DAP	61.04	117744	97325	72.1	13.1	98290
T ₃ - 50% RDF of P ₂ O ₅ and K ₂ O through inorganics + spraying nano urea @5ml/ lit of water at 60 DAP and 90 DAP	62.40	121268	98777	75.3	13.0	108854



T ₄ - sett treatment with nano DAP @5ml/lit water + spraying nano DAP and nano urea @5ml/lit of water each 60 DAP + spraying of nano DAP and nano urea @5ml/lit water and sagarika @ 5ml/lit of water at 90 DAP	60.9	119506	94631	73.2	12.9	108217
T ₅ - sett treatment with nano DAP @5ml/lit water + spraying nano DAP and nano urea @5ml/lit of water at 60 DAP + spraying of nanoDAP and nano urea @ 5ml/lit and sagarika @ 5ml/lit of water @ 90 DAP and 120 DAP	66.77	122512	97014	77.2	12.7	123978
T ₆ - sett treatment with nano DAP @ 5ml/lit of water + spraying of WSF(19:19:19) @ 1 kg in 100 lit water and nano urea @ 5ml/lit of water @60 DAP and 90 DAP	63.23	118159	93179	76.3	12.8	119666
T ₇ - sett treatmet with nano DAP @ 5ml/lit of water + spraying of WSF(19:19:19) @ 1 kg in 100 lit of water and nano urea @ 5ml/lit of water @ 60DAP, 90DAP and 120 DAP	68.23	121061	95149	78.3	12.3	124561
T ₈ - Conventional + sagarika 25 kg/ha	59.06	132669	102404	87.4	12.6	138186
SE	1.11	4.48	2.50	2.38	0.37	-
CD at 5%	NS	9.60	5.37	5.10	NS	-

Table.5 : Efficacy of Potash derived molasses (PDM) on Sugarcane yield and quality (mean data of two years) at Shahjahanpur

Treatments	Germination (%)	Shoots (000/ha)	NMC (000/ha)	Cane yield (t/ha)	CCS (%)
T ₁ - Potash derived molasses @300 kg/ha i.e , 45 kg Potash	51.93	141221	108416	92.71	13.41
T ₂ - Potash derived molasses @400kg/ha i.e , 60 kg Potash	54.01	148165	113495	95.36	13.36
T ₃ - Potash derived molasses @500kg/ha i.e , 75 kg Potash	54.27	153348	115672	96.19	13.48
T ₄ - Potash derived molasses @400kg/ha i.e , 60 kg Potash , 200 kg at sowing time and 200 kg at earthen up time	58.65	156405	116604	97.58	13.35
T ₅ - MOP @ 75 kg/ha i.e ,45 kg Potash	52.66	140236	105773	90.43	13.46
T ₆ - MOP @ 100 kg/ha i.e ,60 kg Potash	53.28	148995	108779	91.68	13.79
T ₇ - MOP @ 125kg/ha i.e ,75 kg Potash	53.33	151845	109867	93.91	13.36



T ₈ - Control (No Potash)	50.16	135365	107017	75.25	13.67
SE	3.77	2.53	5.13	4.25	16.56
CD at 5%	NS	5.43	11.06	8.72	NS

Muzaffarnagar

Effect of potato and onion transplanting with sugarcane on yield and economics

In order to find out the suitable time of onion transplanting after potato in autumn planted sugarcane for obtaining maximum net returns, this experiment was conducted at research farm of Sugarcane Research Station, Muzaffarnagar during 2022-24. The soil of the experimental field was sandy loam with pH 7.4 having low in organic carbon (0.53%), available phosphorus and medium in available potassium. Four different transplanting time of onion after potato cropping system were adopted and experiment was laid out in randomized block design with four replications. Sugarcane was planted in trenches at 30:120 cm, with plot size 6.0 x 6.0 meter with early maturing variety CoS 13235. Experiment was planted on 21 September, 2022 and harvested on end of December 2023.

The data (Table 6) indicated that impact of various transplanting date of onion after potato was found significantly better on yield attributes and cane yield. Germination was not affected significantly by various cropping system. In case of potato, highest yield (186.11q/ha) was obtained by treatment T5-Sugarcane - potato followed by T2, T4 and T1. In onion cases, higher yield was obtained by Treatment-sugarcane-onion transplanting in 15th January (157.64q/ha) followed by treatment "sugarcane + potato-onion transplanting in 15th January (156.25q/ha), 01st and 30th January 152.08q/ha and 144.40q/ha, respectively. Significantly higher tillers (181179/ha), number of millable canes (134721) and cane yield (115.06 t/ha) were recorded by treatment 'sugarcane + Potato' followed by alone cane while potato and onion intercropped treatments i.e., "after potato- onion transplanting in 01st January produced higher cane yield than 15th and 30th January. All treatments after potato- onion transplanting gave higher net returns than 'cane- onion transplanting, cane+ potato and alone cane" treatments and highest (Rs 404380/ha) was obtained by cane+ potato- onion transplanting in 01st January followed by 15th and 30th January than other cropping systems.

Agronomical evaluation of promising sugarcane genotypes

This experiment was conducted to find out the fertility levels and spacing for newly released sugarcane varieties in spring season. The soil of field was low in organic carbon, available phosphorus and medium in available potassium. Planting spacing was kept in main plot and nutrients management and varieties in sub plot. Thus, eight treatments combination were replicated three times with factorial randomized block design. Experiment was planted on 07-04-23 and harvested on 29.03.24.

The data (Table 7) clearly indicated that significantly higher Shoots (177732), number of millable canes (137268), cane yield (87.31ton), CCS yield (11.42 ton) and net profit (Rs 156052) per hectare were obtained by sugarcane variety CoS 17231 than as compared to CoS 18231. Trench planted crop at 30:120 cm significantly produced higher shoots (177385), number of millable canes (140741), cane yield (88.00t and CCS yield (11.35 t) and net profit (Rs 145754) per hectare than deep furrow planting at 67:134 cm spacing. While, B:C ratio was obtained higher in 67:134 cm deep cane planting than 30: 120 cm trench planting. In regards to fertility levels, significantly higher shoots (173403/ha), number of millable canes (136690/ha), cane yield (85.69t), CCS yield (11.06t) and net profit (Rs 144952) per hectare were obtained with treatment F2-100% RDF + 25 kg N/ha through organics + Bio. Fertilizers (Azoto.&PSB) @ 10 kg /ha each as compared to F1-100% of recommended dose of NPK.

Interaction effect: Maximum cane yield of 91.38 t/ha, CCS yield (11.88t/ha) and net profit (Rs 156556/ha) was recorded by CoS 17231 variety when its planting at 30:120 cm spacing in trenches with 100% RDF + 25 kg N/ha through organics + Bio. Fertilizers (Azoto.&PSB)@ 10 kg /ha each as compared to other treatments combinations (Table 2b&2c).

Response of various plant nutrients on sugarcane

The field experiment was conducted during spring season to study the effectiveness of various nutrient management practices on yield and quality of

Table 6: Effect of potato and onion transplantingon sugarcane yield and economics at MZN

Treatments	2022-24															
	Ger. (%)	Potato yield q/ha	Onion yield q/ha	Shoots (000/ha)	NMC (000/ha)	Cane yield (t/ha)	CCS (%)	CCS yield t/ha	Cost of cultivation (Rs/ha)	Net profit (Rs/ha)	B:C Ratio	Cane wt (kg)	Cane girth (cm)	Cane length (cm)	%Inc. of top borer	%Inc. of shoot borer
T ₁ - Sugarcane + potato-Onion transplanting in 01 st Jan.	70.05	175.69	152.08	174.2	127.3	110.41	10.93	12.06	344980	404380	1.17	1.118	3.20	308	1.03	0.92
T ₂ - Sugarcane + potato-Onion. transplanting in 15 th Jan	70.42	179.16	156.25	173.0	126.7	109.37	10.89	12.10	344408	355881	1.03	1.110	3.18	300	0.59	0.85
T ₃ - Sugarcane + potato-Onion transplanting in 30 th Jan	69.48	183.33	144.44	172.2	126.0	108.95	10.82	11.78	344198	346284	1.00	1.105	3.15	298	1.5	1.67
T ₄ - Sugarcane – Onion – transplanting in 15 th Jan	69.89	176.39	157.64	170.8	124.8	105.27	10.75	11.32	291468	234617	0.80	1.050	3.15	295	1.62	1.94
T ₅ - Sugarcane + potato	70.15	186.11	-	181.1	134.7	115.06	11.15	11.96	279883	290326	1.03	1.135	3.25	319	2.46	2.25
T ₆ - Sugarcane alone	69.79	-	-	175.4	128.5	112.98	11.09	12.53	227953	167477	0.73	1.122	3.20	310	2.62	2.59
SE±	0.64	-	-	1.322	1.97	1.37										
CD at 5%	NS	-	-	2.818	4.20	2.93										

Table 7a: Effect of treatments on yield attributes, cane yield, sugar yield and economics in sugarcane at MZN

Treatments	2023-24											
	Ger. (%)	Shoots (/ha)	NMC (/ha)	Cane yield (t/ha)	CCS (%)	CCS (t/ha)	Height (cm)	Girth (cm)	Wt (g)	Cost of cultivation (Rs/ha)	Net profit (Rs/ha)	B:C ratio
A-Varieties												
V ₁ - CoS 17231	61.68	177732	137268	87.31	13.08	11.42	211.0	2.04	736.5	182292	156052	0.86
V ₂ - CoSe 18231	52.02	164236	131921	82.24	12.78	10.50	245.5	2.18	790.75	185035	133665	0.72
SE±	0.66	2492	2240	1.22	0.01	0.16	-	-	-	-	-	-
CD at 5%	1.41	5345	4805	2.63	0.03	0.33	-	-	-	-	-	-
B-Fertility Levels												
F ₁ - 100% NPK	59.14	168565	132500	83.86	12.95	10.85	225.2	2.08	754.75	180214	144765	0.81
F ₂ - 100% NPK+25kgNthrough organics + Bio-fertilizer	60.56	173403	136690	85.69	12.92	11.06	228.2	2.15	772.5	187112	144952	0.78
SE±	0.66	2492	2240	1.22	0.01	0.16	-	-	-	-	-	-
CD at 5%	1.41	NS	NS	NS	0.03	NS	-	-	-	-	-	-
C-Planting Spacing												
S ₁ - 67:134 cm deep in paired	51.23	164583	128449	81.55	12.96	10.58	224.0	2.11	759.0	172046	143963	0.84
S ₂ - 30:120 cm in trenches	68.47	177385	140741	88.00	12.89	11.35	229.5	2.12	768.25	195281	145754	0.75
SE±	0.66	2492	2240	1.22	0.01	0.16	-	-	-	-	-	-
CD at 5%	1.41	5345	4805	2.63	0.03	0.33	-	-	-	-	-	-

sugarcane and soil physical, chemical and biological properties. Eight treatments were taken on with randomized block design replicated thrice. Fertility status of the experimental field was low in organic carbon (0.43%), av.phosphorus and medium in av.potassium. The experiment was planted on 6.04.23 and harvested on 28-03-24 with CoS 13235 variety. Findings showed (Table 8) that the significantly higher

tillers (177662/ha), number of millable canes (130440/ha), cane yield (96.64t/ha), CCS yield (13.04 t/ha), net profit (Rs 145576/ha) and cost benefit ratio (1: 0.63) were obtained by treatment T8- 100% recommended dose of NPK through inorganics (Conventional) + Sagarica @ 25 kg/ha followed by treatments T1, T2 and T3 than that of other treatments of nano urea & nano DAP.

Table 7b: Interaction effect of variety x spacing x fertility level on cane yield, ccs yield and ccs% at MZN

Variety	Treat.	Cane Yield t/ha			CCS%			CCS Yield t/ha		
		S1	S2	Mean	S1	S2	Mean	S1	S2	Mean
V ₁ - CoS 17231	F1	83.51	89.63	86.57	13.15	13.06	13.11	10.98	11.71	11.34
	F2	84.72	91.38	88.05	13.09	13.00	13.05	11.10	11.8	11.49
	Mean	84.12	90.50	87.31	13.12	13.03	13.08	11.04	11.080	11.42
V ₂ - CoS 18231	F1	78.24	84.07	81.15	12.80	12.75	12.78	10.02	10.72	10.37
	F2	79.72	86.94	83.33	12.81	12.74	12.78	10.21	11.07	10.64
	Mean	78.98	85.50	82.24	12.81	12.75	12.78	10.12	10.90	10.50
		81.55	88.00		12.96	12.89		10.58	11.35	
SE/ CD for VxF		1.73/ NS			0.02/ NS			0.22/ NS		
SE/ CD for FxS		1.73/ NS			0.02/ 0.02			0.22/ NS		
SE/ CD for SxV		1.73/ NS			0.02/ NS			0.22/ NS		
SE/ CD for VxFxS		2.43/ NS			0.03/ NS			0.31/ NS		

Table 7c:-Interaction effect of variety x spacing x fertility level on economics at MZN

Variety	Treat.	Cost of cultivation Rs/ha			Net profit Rs/ha			B:C		
		S1	S2	Mean	S1	S2	Mean	S1	S2	Mean
V ₁ - CoS17231	F1	167050	190785	178917	156585	156531	156558	0.94	0.82	0.88
	F2	173759	197575	185667	154537	156556	155546	0.89	0.79	0.84
	Mean	170404	194180	182292	155561	156543	156052	0.91	0.80	0.86
V ₂ - CoS 18231	F1	170291	192732	181511	132891	133054	132972	0.78	0.69	0.73
	F2	177083	200033	188558	131838	136878	134358	0.74	0.68	0.71
Mean	Mean	173687	196382	185035	132364	134966	133665	0.76	0.68	0.72
		172045	195281		143963	145754		0.84	0.75	

Table 8: Response of various plant nutrients on sugarcane at MZN

SN	Treatments	Ger. %	Shoots/ ha	NMC/ ha	Cane yield t/ha	CCS%	CCS yield t/ha	Net profit Rs/ha	B:C	Wt. g	Length cm	Girth cm
T ₁	100% RDF of NPK through inorganics (conv.)	42.5	174769	128472	93.86	13.42	13.05	137384	0.61	1.02	225	2.51
T ₂	100% recommended of P2O5 and K2O through inorganics + spraying of nano urea @ 5ml/liter of water at 60 Dap and 90DAP	42.60	172685	126852	84.02	13.43	11.29	104436	0.47	1.00	222	2.46
T ₃	50% recommended dose of P2O5 and K2O through inorganics + Sett treatment with nano DAP @ ml/ liter of water + spraying of nano DAP and nano urea @ 5 ml/liter of water at 60 DAP + spraying of nano urea @ 5ml/liter of water and sagarica @5ml/liter of water at 90 DAP	41.93	174190	126157	81.94	13.48	11.05	97644	0.44	0.99	220	2.45
T ₄	Sett treatment with nano DAP 5ml/ liter of water + spraying of nano DAP and nano urea @5ml/liter at 60 DAP and spraying of nano DAP nano urea and sagarica @5ml/liter of water at 90 DAP	40.8	157061	111922	69.56	13.55	9.43	60307	0.29	0.94	218	2.32
T ₅	Sett treatment with nano DAP 5ml/ liter of water + spraying of nano DAP and nano urea @5 ml/liter at 60 DAP + spraying of nano DAP and nano urea @ 5 ml/liter and sagarica @5ml/liter of water at 90 DAP and 120 DAP	41.41	167246	121297	73.95	13.50	9.98	69208	0.32	0.97	222	2.42
T ₆	Sett treatment with nano DAP @5ml/ liter of water + Spraying of WSF (19:19:19) @ 1.0 kg in 100 liter of water and nano urea @ 5ml/liter at 60 DAP and 90 DAP	41.14	171412	125463	77.66	13.58	10.55	87761	0.41	0.97	221	2.41
T ₇	Sett treatment with nano DAP 5ml/ liter of water + Spraying of WSF (19:19:19) @ 1.0 kg in 100 liter of water and nano urea @ 5ml/liter at 60 DAP, 90 DAP and 120 DAP	40.73	172454	126157	79.39	13.58	10.80	93023	0.43	0.98	222	2.45
T ₈	100% recommended dose of NPK through inorganics + Sagarica @ 25 kg/ha	42.71	177662	130440	96.64	13.50	13.04	14576	0.63	1.03	230	2.54
	SE	0.88	9285	4308	5.28	-	-	-	-	-	-	-
	CD	NS	NS	9240	11.33	-	-	-	-	-	-	-

Seorahi

Agronomical evaluation of promising sugarcane genotypes

An experiment was conducted in spring season to find out the suitable fertility levels and planting method for promising sugarcane genotype. The soil of the experimental site was found medium in organic carbon and phosphorus and low in available potash with pH 7.79. On the basis of the data (Table 9) germination percent was not significantly affected by the different genotypes, fertility levels and planting methods. Shoot population and NMC were found significantly higher in variety CoS 17231 i.e., 140.300

and 115.400/ha) as compared to CoS 17451. Genotype CoSe 17451 produced significantly higher cane yield (91.20 t ha^{-1}). Application of recommended dose of NPK+25 per cent N through organic manure + biofertilizers produced significantly higher shoot population i.e. 141.400/ha), NMC 112.600/ha) and cane yield (90.65 t/ha) than the recommended dose of NPK. Effect of plant geometry on NMC was significantly higher in 30:120 cm trench method i.e. 118.900/ha. CCS per cent was not affected significantly by both planting methods. Variety CoS 17231 produced significantly higher CCS per cent (12.12) against CoSe 17451 (11.65).

Table 9: Agronomical evaluation of new sugarcane genotypes at Seorahi

Treatments	Germination (%)	No. of Shoots (000/ha)	NMC (000/ha)	Yield (t/ha)	CCS (%)
Genotypes					
CoS 17231	54.80	140.3	115.4	80.30	12.12
CoSe 17451	55.30	130.0	106.5	91.20	11.65
SEm\pm	1.3	2.01	5.21	2.94	0.07
CD(P=0.05)	NS	6.11	NS	8.93	0.22
Fertility levels					
100 % RDF	57.03	128.8	109.4	80.85	11.68
100 % RDF+25 % O. M.	53.21	141.4	112.6	90.65	12.09
SEm\pm	1.37	2.01	5.21	2.94	0.07
CD(P=0.05)	NS	6.11	NS	8.93	0.22
Planting method					
67:134 cm	54.61	129.7	103.1	79.75	11.87
30:120 cm	55.63	140.5	118.9	91.75	11.90
SEm\pm	1.37	2.01	5.21	2.94	0.07
CD(P=0.05)	NS	6.11	11.16	8.93	NS



Performance of different genotypes at Seorahi

Response of various sources of plant nutrients on sugarcane

An experiment was conducted in randomized block design with three replications to find out the effect of Nano DAP, Nano urea, and Sagarika on growth, yield and quality of sugarcane in spring season. The soil of the experimental plot was medium in organic carbon, low in available phosphorus and potash with pH 7.86. This experiment consisted of eight treatments i.e. T₁- 100 per cent recommended dose of NPK through inorganic (Conventional), T₂- 100 per cent recommended dose of P₂O₅ and K₂O through inorganic+spraying nano urea@5ml/litre of water at 60 DAP and 90 DAP, T₃-50 per cent recommended dose of P₂O₅ and K₂O through inorganic +sett treatment with nano DAP@5ml/litre water+spraying nano DAP and nano urea@ 5ml/litre water at 60 DAP+spraying of nano urea@5 ml/liter water and Sagarika@5 ml/liter of water at 90 DAP, T₄- Sett treatment with nano DAP @ 5ml/litre water +Spraying Nano DAP and Nano urea @5 ml/liter of water at 60 DAP +

Spraying of Nano DAP and Nano urea @5ml/liter and Sagarika@5 ml/liter of water at 90DAP, T₅- Sett treatment with nano DAP @ 5ml/litre water +Spraying Nano DAP and Nano urea @5 ml/liter of water at 60 DAP + Spraying of Nano DAP and Nano urea @ 5ml/liter and Sagarika@5 ml/liter of water at 90DAP and 120 DAP, T₆- Sett treatment with nano DAP@5 ml/liter of water +spraying of WSF (19:19:19) @ 1.0kg in 100 liter water and nano urea @ 5 ml/liter of water at 60 and 90 DAP, T₇- Sett treatment with nano DAP@5 ml/liter of water +spraying of WSF (19:19:19) @ 1.0kg in 100 liter water and nano urea @ 5 ml/liter of water at 60, 90 and 120DAP and T₈- Conventional + Sagarika@ 25 kg/ha. Based on the data (Table 10) germination and commercial cane sugar per cent were not significantly affected by various treatments. Conventional + sagarika@ 25 kg/ha produced significantly higher shoot population i.e. 153.100/ha) and NMC 119.300/ha) as compared to the other treatments except T₁. T₈-Conventional + sagarika@ 25 kg/ha produced significantly higher cane yield (87.35 t ha⁻¹) but found numerically at par with T1 treatments.

Table 10 : Response of various sources of plant nutrients on sugarcane productivity at Seorahi

Treatments	Germination (%)	No. of Shoots (000/ha)	NMC (000/ha)	Cane Yield (t/ha)	CCS (%)	B:C ratio
T ₁	45.24	146.9	115.6	81.40	12.46	1.31
T ₂	42.98	135.4	103.4	74.09	12.41	1.08
T ₃	49.11	120.6	101.9	64.79	12.71	0.93
T ₄	50.68	117.9	106.4	65.77	12.49	0.94
T ₅	47.86	124.4	103.9	62.17	12.86	0.83
T ₆	50.26	133.1	105.7	62.79	11.97	0.95
T ₇	44.76	132.2	102.8	63.85	12.18	0.94
T ₈	42.32	153.1	119.8	87.35	12.23	1.46
SEm±	2.08	5.86	3.60	2.87	0.47	0.08
CD(P=0.05)	NS	17.93	10.71	8.79	NS	0.25

06. SOIL CHEMISTRY

Shahjahanpur

Soil survey, testing, fertility mapping and fertilizers recommendation

Under the regular feature programme during the year 2023-24, the work was undertaken on the soil survey, testing, fertility-mapping and fertilizer recommendation in Dalmia Bharat Sugar and Industries Ltd. Bareilly zone. They provided 1000 representative furrow depth soil samples which were collected in the central U.P. zone. Samples were processed and analyzed for major nutrients. Analytical results showed that most of the soils were found deficient in nitrogen and phosphorous while low to medium in potash. The nutrients index percent of the Organic carbon, Phosphorus and Potash were recorded low i.e. 1.2, 1.22 and 1.41 respectively. On the basis of results fertilizer recommendations were given and fertility map has been prepared. Apart from this, soil samples were obtained from other circle of sugar mill zone of central and western Uttar Pradesh for testing and fertilizer recommendation to maintained the sugarcane standard.

Major Nutrients-

- * Nitrogen @180-200 kg/ha
- * Phosphorous @ 60-80 kg/ha through single super phosphate
- * Potash @40-60 kg/ha

The fertilizer recommendation through soil health card and fertility map was given to person concerned.

Soil testing and fertilizer recommendation

A total 3362 soil samples and plants samples were analyzed for major nutrient and micronutrients under soil testing programme. About 1477 soil samples were received from farmers/ cane growers from different villages and sugar mill zones of central and western Uttar Pradesh as well as 1885 soil samples were received from different departments and centers of U.P. Council of Sugarcane Research, Shahjahanpur. After analysis of soil samples, nutrient status and fertilizer recommendations were given to person concerned through soil health card.

Among all soil samples 276 soil samples were received from Seed Multiplication Center, Katya Sadat (Gazipur) for the analysis. This center is situated in Eastern UP which soil samples were found alkaline in nature. Soil testing results showed that pH ranged from 7.36-9.90 with a mean value of 8.73, poor in organic carbon percentage 0.095-0.56 with mean value 0.267%, low in phosphorus (6.0-12.5 with mean value 8.09 kg/ha) and medium to high in potash with mean value 286.71 kg/ha. Maximum adequacy was observed in Mn and Fe micronutrients groups. Fertilizer recommendation were also prepared on the basis of above result and given to person concerned.

S.N .	Name of the sugar mill zones	Soil samples collected	Soil samples analyzed	Prepared Recommendations
1.	Gobind Sugar mill, Aira, (Lakhimpur-Kheri)	165	165	165
2.	Dalmia Bharat Sugar & Industries, Awla (Bareilly)	1000	1000	1000
3.	Kisaan Sahkari Chini Mill, Tilhar, Shahjahanpur	50	50	50
4.	Chhata-Mathura, L.H.S.F. -Pilibhit and SCM Bulandsahar	64	64	64
5.	DCM Sriram, Hariyawan, Hardoi	20	20	20
6.	Research Farm, Shahjahanpur	140	140	140
7.	SMC Katya Sadat, Gazipur	276	276	276
8.	Departments of SRI UPCS, Shahjahanpur	1283	1283	1283
9.	Plant samples from GSSBRI Seorahi, Kushinagar	186	186	186
10.	Farmers/ cane growers	178	178	178
	Total	3362	3362	3362

Nutrient status and fertilizer recommendation for spring and autumn plantation at research farm, Shahjahanpur

Total 140 soil samples were collected from different plots of U.P. Council of Sugarcane Research farm, Shahjahanpur before spring and autumn planting seasons. Soil samples were processed and analyzed for fertility status. Results showed that the pH ranged from 6.80 to 7.66 with a mean value of 7.17, EC (dsm^{-1}) ranged from 0.145 to 0.340 with a mean value of 0.215, Organic carbon (percent) ranged from 0.306 to 0.610% with a mean value 0.403%, available phosphorus (kg/ha) ranged from 7.1 to 13.4 with a mean value of 8.81 and available potash (kg/ha) ranged from 80.64 to 212.8 with a mean value of 137.41. Most of the soil samples were deficient in Zinc and Manganese as per rating of critical limit in respect of micro-nutrients. Available sulphur (ppm) ranged from 6.2 to 14.8 with a mean value of 8.67 ppm. It indicates that most of the soil samples were poor in nitrogen, phosphorous and sulphur whereas potash was found medium while zinc and manganese were found near to critical limit. Plot wise major and micro nutrients fertilizer recommendations were prepared as per results for respective crop and given to the farm superintendent.

Studies on different mode of nitrogen utilization efficiency in sugarcane

Field experiment was conducted during the year 2023-24 in spring planting season at the farm of U.P. Council of Sugarcane Research, Shahjahanpur in RBD with three replications. The initial status of

experimental soil had pH 6.94, EC $0.144 (\text{dsm}^{-1})$, organic carbon 0.39%, available Phosphorus 11.30 kg/ha , available potash 132.70 kg/ha , Zinc 0.643 ppm, Iron 11.56 ppm, Manganese 1.78 ppm, Copper 0.658 ppm and Sulphur 8.9 ppm. The treatment comprised as follows:

The treatment comprised as follows :-

T₁- Basal + 2 top dressing (90+120 DAP)

T₂-Three Top dressing (30, 60 & 90 DAP)

T₃-Two Top dressing (60 & 120 DAP) +F1

T₄-Two Top dressing (60 & 90 DAP) F4+F5

T₅-One Top dressing (120 DAP) +F2+F3

T₆-One Top dressing (90 DAP)+F2+F4+F5

T₇-Basal Azotobacter +One Top dressing (90 DAP) +F1+F2

T₈- Azotobacter + F1+F2 and Top dressing (90 DAP) +F5

* Note- F1, F2, F3, F4 and F5 urea foliar spray @ 1% at the time of 45, 60, 90, 120 and 150 DAP. Recommended dose of Phosphorous and potash were applied in all the plots.

Results revealed that application of nitrogen as two top dressing at the time of 60 and 120 days along with single foliar application at the time of 45 days after planting gave highest cane yield (90.122 t/ha) in the comparison to recommended dose of nitrogen (86.295t/ha). These treatment saved 57 kg nitrogen/ha in the comparison to flat recommendation. As regarded the sucrose percent in juice the application of T₃ as two Top dressing (60 and 120 DAP) and F₁ as foliar spray (45 DAP) also increased @3.52% and 2.55% at the 10th and 12th months of crop age but these data did not reach to significance level (Table 1).

Table 1- Effect of different mode of nitrogen utilization on yield and quality of sugarcane (2023-24)

Treatments	Sucrose %		Yield(Mt/ha)
	10 months crop age	12 months crop age	
T ₁	16.47	18.02	86.295
T ₂	16.61	18.23	87.036
T ₃	17.05	18.48	90.122
T ₄	17.02	18.07	88.363
T ₅	16.18	17.88	81.264
T ₆	16.34	17.86	83.425
T ₇	17.07	17.95	81.172
T ₈	16.77	17.90	82.098
CD	N S	N S	N S

Experimental results of pooled data of three years (2021-22, 2022-23 and 2023-24) also revealed that the application of nitrogen as two top dressing at the time 60&120 days of planting along with single foliar spray at 45 days after planting (T_3) increased sucrose percent

at 10th and 12th month (2.50%, 2.69%) of crop age while cane yield increase up to (8.64%) in comparison to control (T_1) Basel + 2 top dressing (90+120 days). Data significantly proved 12th month sucrose% & yield with compared to control (Table-2).

Table 2- Effect of different mode of nitrogen utilization on yield and quality of sugarcane (Pooled Data)

Treatments	Sucrose %		Yield(Mt/ha)
	10 months crop age	12 months crop age	
T_1	17.58	18.52	85.657
T_2	17.54	18.78	88.949
T_3	18.02	19.02	93.064
T_4	17.59	18.62	85.421
T_5	17.24	18.79	79.721
T_6	17.42	18.37	82.982
T_7	17.36	18.67	80.996
T_8	17.57	18.36	79.896
CD	NS	0.36	3.06

Effect of Fasal Amrit (Organic hydrogel) in sugarcane cultivation (paid experiment).

Field experiment was conducted during the year 2023-24 in spring planting season at the farm of U.P. Council of Sugarcane Research, Shahjahanpur in RBD design with three replications. The experimental soil had pH 6.94, EC 0.144 (dsm⁻¹), organic carbon 0.390%, available Phosphorus 11.30 kg/ha, available potash 132.70 kg/ha, Zinc 0.643 ppm, Iron 11.56 ppm,

Manganese 1.78 ppm, Copper 0.658 ppm and Sulphur 8.9 ppm,.

Results revealed that application of organic Hydrogel retained soil moisture longer days in compared to control the sucrose percent was recorded higher (3.12%) at 10th months and (5.57%) at 12th month while cane yield (5.52%) in the comparison to control (T_1).



Picture: Micronutrient analysis by AAS



Picture: Potassium analysis by Flame Photometer



Picture: Organic Carbon analysis by Titration method

Muzaffarnagar

Soil Testing:- Total numbers of 1650 soil sample were received from different sugar Mill zones and analysis of 1650 soil sample were done. The nutrient index percentage of the organic carbon(1.46) showed low in nitrogen, phosphorus(1.76) and medium in Potash(1.80) was found. The pH recorded in the range between 7.41-8.20 and E.C. ranged between 0.11-0.27 ds/m⁻¹ found in all the soil sample. After soil analysis the fertilizer recommendation were made and given to

the concerned cane growers of different sugar mill zones.

Effect of sources of Nitrogen (PMT 2023-24):- Study are under progress to find out the effect of continuous application of organic manure and inorganic fertilizers on yield and quality of sugar cane since 1949-50 at Muzaffarnagar in an monoculture rotation of sugar. Seven treatment were followed (i) Control (No Manure) (ii) FYM (iii) GN Cake (iv) Urea (v) F.Y.M. + Urea (vi) G.N. Cake + Urea (vii) F.Y.M. + G. N. Cake + Urea used at before planting time with four replication in R.B.D. Results revealed that increasing level of different treatment. The germination %, tillers, N.M.C., yield and sucrose percentage of up to level of FYM + GN cake + Urea. The Maximum tillers/ha.(165817), number of millable cane/ha. (124342), yield t/ha (87.66) and sucrose percentage (17.04) and (17.19) at 10th and 12th Month of crop age was found in significantly treatment FYM+GN cake + Urea. The minimum number of tillers/ha (141340), number of millable cane/ha (106188), yield MT/ha (74.86) and sucrose percentage (16.18) & (16.58) at 10th and 12th Month crop age in the treatment of control i.e. (No manure).

Table 3- Effect of sources of nitrogen

Sl.N o.	Treatment 135 kg N/ha	Germination %	Tiller/ ha	NMC/ ha	Yield MT/ha	Suc.% Oct.	Suc. % Dec.
1	Control(No manure)	41.59	141340	106188	74.86	16.18	16.58
2	FYM @135 kg N/ha	42.97	146218	110841	78.14	16.47	16.70
3	G.N.Cake@135 kg N/ha	42.73	148862	112920	79.61	16.61	16.74
4	Urea @ 135 kg N/ha	41.96	151347	114527	80.74	16.66	16.82
5	FYM+Urea@67.5kg N/ha	45.88	156230	117843	83.80	16.77	16.89
6	G.N. cake +Urea @ 67.5 kg N/ha	44.18	157486	119765	84.43	16.88	17.01
7	FYM+ GN cake +Urea @ 45 kg N/ha	46.51	165817	124342	87.66	17.04	17.19
	C.D.	Nil	9860	2018	2016	0.068	0.064

Seorahi

The effect of different doses of fertilizers on yield and quality of sugarcane

An experiment was conducted to detect the impact of soil test based fertilizer recommendation on yield and quality of sugarcane in a randomized block design (RBD) with four replications.

Table 4: Effect of different doses of fertilizers on yield and quality of sugarcane

Treatments	Germination (%)	Shoots (000/ha)	NMC (000/ha)	Sucrose (%)	Yield (MT/ha)
T ₁	41.85	163.6	108.3	18.30	69.44
T ₂	40.19	167.1	111.6	18.56	65.58
T ₃	40.06	160.1	106.1	18.49	73.07
T ₄	43.42	169.9	113.5	18.43	76.38
T ₅	44.19	181.5	121.8	18.22	83.33
T ₆	42.31	175.6	117.1	18.55	81.40
S.E	1.50	1.80	1.29	0.67	3.17
C.D	NS	5.8	3.91	NS	9.56

Soil test based F.R. as chemical fertilizer for major and minor nutrients i.e. 190 N: 70 P: 50K: 25Zn: 40S (Kg/ha) treatment produced significantly higher cane yield (83.33t/ha) as compared to other fertilizer treatments.

Based on the results germination and juice quality were not found significantly affected by different fertilizer application treatments.

Table 5: Soil status at research farm, Seorahi

Contents	Range		Average
pH	7.31	8.19	7.75
E.C (dsm ⁻¹)	0.09	0.34	0.21
O.C (%)	0.320	0.740	0.530 (medium)
P (kg/ha)	8.65	27.54	18.09 (Low)
K (kg/ha)	28.74	147.02	87.88 (Low)

According to pH, most of the soils of research farm were found alkaline in nature. Organic carbon was found medium and the status of phosphorus and potash was low.

Soil Analysis

A total of 977 soil samples of farmers' field received through different sugarcane councils of

Luxmiganj, Captanganj, Khadda, Ramkola, Ramkola, Kathkuiyan, Padrauna, Hata, Chittauni and Seorahi were analyzed in soil testing lab for N, P, K, EC and pH content. A total 1107 samples received from Triveni sugar mill were also analyzed for pH, EC N, P, K, Zn, Fe, Cu and Mn. Bulk density of 24 soil samples were also analyzed.

S. No.	Samples	No. of Samples	Type of nutrients analyzed
1.	G.S.S.B.R.I. Seorahi farm	100	Major
2.	Triveni sugar mill	1107	Major and Minor
3.	Cane union	977	Major
4.	Bulk density (g/cm ³)	24	-
Total		2208	

Juice Analysis

During 2023-24 a total of 1354 samples of juice and 107 samples of bagasse were analyzed.

S. No.	Name	No. of Samples
1.	Juice	1354
2.	Bagasse	107
Total		1461

07. SUGAR CHEMISTRY

Shahjahanpur

Juice analysis programme

Juice samples from C2 generation crops through the release of varieties were analyzed in various breeding division programs. Quality assessment was also conducted on juice from experimental plots across disciplines during cane harvesting to gauge any

quality differences due to different treatments or experiments. A total of **5698** cane juice samples were collected in which **3386** samples were assessed for Brix, pol %, and purity % in cane, **1156** cane samples were analyzed for pol% in cane and fiber % in cane (Table 1). The findings were disseminated to relevant departments for further analysis and review (Table 1).

Table 1: Juice samples analyzed during the year 2023-24 from different divisions

Name of the Section	Brix, Pol% & Purity	Pol % in cane	Fiber % cane	Total
Breeding	2171	1094	1094	4356
Physiology	198	-	-	198
Sugar Chemistry	85	85	85	255
Entomology	174	-	-	174
Agronomy	498	-	-	498
Soil Chemistry	102	-	-	102
Pathology	89	-	-	89
Bio- Chemistry	50	-	-	50
Bio Technology	22	-	-	22
Total	3389	1179	1179	5747

Screening of elite sugarcane varieties for sustainable sugar recovery

In the pursuit of selecting superior sugarcane clones with high sucrose content for commercial cultivation, twelve varieties—six early-maturing and six mid-late-maturing—were evaluated. Early varieties such as Co 15023, Co 0118, CoS 17231, CoS 16233, Co 0238, and CoS 13235, along with mid-late varieties CoS 767, CoS 09232, CoS 08279, CoS 17234, CoS 10239, and CoS 14233, were harvested from October to March and subjected to evaluation based on sucrose percentage, juice purity (pol percentage), and fiber content. The early-maturing varieties consistently exhibited promising characteristics across sucrose percentage, fiber content, and pol percentage compared to the mid-late varieties. Initially, the sucrose content in juice for early varieties ranged from 14.29% (CoS 16233) to 16.55% (Co 15023) in October, with a gradual increase up to March, peaking between

19.33% (CoS 16233) and 19.68% (Co 0238). Conversely, mid-late varieties showcased lower sucrose content, starting from 11.49% (CoS 10239) to 15.54% (CoS 08279) in October, rising to 17.78% (CoS 10239) to 19.13% (CoS 08279) in March. This trend persisted throughout the harvesting period, indicating the consistent superiority of early-maturing varieties. Similar patterns were observed in pol percentage cane values. Fiber content in early varieties ranged between 13.18% (Co 15023) to 13.52% (CoS 16233) in October, increasing to 14.52% (Co 0238) to 14.88% (CoS 17231) by March. Meanwhile, mid-late varieties exhibited fiber content ranging from 13.70% (CoS 14233) to 13.90% (CoS 10239) in October, escalating to 14.96% (CoS 17234) to 15.15% (CoS 767) by March. These findings underscore the significance of balancing early and mid-late maturing varieties and implementing precise harvesting schedules to optimize sugar recovery (Table 2).



Table 2: Varietal evaluation for sustainable sugar recovery 2023-24

S.No.	Varieties	Months					
		Oct	Nov	Dec	Jan	Feb	Mar
Sucrose % in juice							
Early maturing							
1	Co 15023	16.55	17.73	18.74	18.91	19.13	19.51
2	Co 0118	16.02	17.34	17.53	17.88	18.48	19.65
3	CoS 17231	15.69	16.54	17.44	17.78	18.46	19.40
4	CoS 16233	14.29	16.41	17.39	17.66	18.41	19.33
5	Co 0238	15.50	15.86	18.22	18.46	18.72	19.68
6	CoS 13235	15.84	15.89	17.56	17.76	18.13	19.36
Mid-late maturing							
7	CoS 767	13.74	15.55	16.64	16.86	17.22	17.82
8	CoS 09232	15.42	16.29	17.49	17.54	17.71	18.77
9	CoS 08279	15.54	15.60	17.46	17.56	17.76	19.13
10	CoS 17234	13.96	14.44	16.44	16.66	16.88	18.02
11	CoS 10239	11.49	14.12	16.31	16.46	16.61	17.78
12	CoS 14233	15.29	16.66	17.17	17.29	17.44	17.90
Pol % in cane							
Early maturing							
1	Co 15023	12.59	12.94	13.32	13.41	13.62	13.98
2	Co 0118	12.30	12.65	12.79	13.01	13.25	14.09
3	CoS 17231	11.85	12.36	12.72	12.93	13.21	13.88
4	CoS 16233	10.50	12.01	12.68	12.85	13.21	13.84
5	Co 0238	12.01	12.24	13.08	13.30	13.44	14.12
6	CoS 13235	12.15	12.20	12.92	13.09	13.09	13.89
Mid-late maturing							
7	CoS 767	10.03	11.90	12.26	12.47	12.54	12.94
8	CoS 09232	11.76	12.07	12.72	12.76	12.95	13.60
9	CoS 08279	11.86	12.00	12.74	12.86	12.96	13.73
10	CoS 17234	10.21	11.00	12.00	12.24	12.37	13.08
11	CoS 10239	7.72	9.00	11.06	11.28	11.57	12.90
12	CoS 14233	11.60	12.50	12.62	12.74	12.86	13.01
Fiber % in cane							
Early maturing							
1	Co 15023	13.18	13.50	13.87	14.12	14.37	14.70
2	Co 0118	13.31	13.63	13.94	14.22	14.48	14.80
3	CoS 17231	13.44	13.72	14.01	14.28	14.57	14.88
4	CoS 16233	13.52	13.82	14.07	14.32	14.54	14.77
5	Co 0238	13.28	13.56	13.90	14.09	14.24	14.52
6	CoS 13235	13.22	13.54	13.89	14.03	14.31	14.67
Mid-late maturing							
7	CoS 767	13.83	14.28	14.56	14.76	14.95	15.15
8	CoS 09232	13.77	14.19	14.50	14.70	14.92	15.10
9	CoS 08279	13.81	14.22	14.46	14.73	14.96	15.02
10	CoS 17234	13.78	14.25	14.40	14.61	14.91	14.96
11	CoS 10239	13.90	14.27	14.42	14.68	14.98	15.07
12	CoS 14233	13.70	14.26	14.36	14.59	14.94	15.14

Impact of planting season on quality attributes of plant and ratoon sugarcane

This study aimed to investigate the influence of planting dates on the yield and growth parameters of popular sugarcane varieties in sub-tropical conditions. Over three years 2020-2023 (two plants and one ratoon), a comprehensive field study was conducted, encompassing autumn, spring, and late spring planting seasons. Utilizing a split-plot design with three replications, the varieties were planted in October (autumn), February (spring), and May (late spring), adhering to standard cane package practices. Each planting season (2020-2022) was characterized by specific preceding crops (Fig 1): green manuring in autumn (October), mustard crops in spring (February), and wheat in late spring (May). These sequential planting practices ensured effective crop rotation and optimal resource utilization. The study assessed the impact of different planting seasons on the yield, growth, and juice quality attributes of two early varieties (Co 0238 & UP 05125) and two mid-late varieties (CoS 08276 & CoS 09232). Harvesting took place in February (plant) and December (ratoon), followed by subsequent analysis to evaluate growth and qualitative parameters. Results revealed significant effects of planting time on both yield and quality attributes of sugarcane. Autumn-planted cane exhibited a yield, between 97.48 (UP 05125) to 106.95 t/ha (Co 0238) in plant and 76.68 t/ha (CoS 08276) to 91.14 t/ha (Co 0238) in ratoon canes. Spring-planted

cane yielded 80.30 t/ha (UP 05125) to 96.15 t/ha (Co 0238) in the plant and 90.01 t/ha (Co 0238) to 75.77 t/ha (CoS 08276) in ratoon cane. While late-planted cane produced 73.54 t/ha (UP 05125) to 89.35 t/ha (Co 0238) in plant and 77.70 t/ha (CoS 08276) to 92.88 t/ha (Co 0238) in ratoon. Similarly, the highest CCS% was observed in autumn-planted cane, followed by spring and late-planted varieties in both plant and ratoon crops. The yield of late spring plant cane was lower than that of spring plant cane, but in the ratoon crop, late spring yield slightly surpassed that of spring, although both remained lower than autumn-planted cane. This may be attributed to the preceding wheat crop residue in late spring planting, which likely enhanced soil structure and fertility during the ratoon crop cycle. The study's outcomes emphasize a Clear preference for autumn planting when it comes to both the cropping of Lahi, Wheat, and sugarcane, as well as sugarcane alone during autumn, spring, and late spring seasons. This is because even considering the added return from Lahi & Wheat with sugarcane during the latter seasons, it fails to counterbalance the enhanced returns achieved through the autumn planting of sugarcane alone. Farmers can significantly enhance prospects of higher yields by aligning with these findings, leading to improved economic outcomes for both farmers and millers. These findings emphasize the need for further research to understand the interactions between varieties and environmental factors to develop more resilient and high-yielding cultivars.



Fig 1: Sugarcane planted during autumn (after green manuring), spring (after mustard harvest and late spring (after wheat harvest)



Testing of sugar recovery in different sugar mills, 2023-24

Under this program six sugar mills viz; (1).Avadh Sugar & Energy Ltd., Unit-Roza, (Shahjahanpur) (2). Parle Biscuits Pvt. Ltd., Unit-Paresendi (Bahraich), (3).The Kisan Sahkari Chini Mills Ltd, Puranpur, (Pilibhit), (4).Avadh Sugar & Energy Ltd., Unit-Seohara,(Bijnor), (5).Shravasti Kisan Sahkari Chini Mill Ltd, Unit- Nanpara (Bahraich), and (6)L H Sugar Mill Pilibhit were tested for their sugar recovery. The program was aimed at the quality assessment of major varieties under cultivation from farmer fields. The cut-to-crush losses in terms of Pol%

in cane in the field, in fiberized cane, and losses during processing, were evaluated. Sugar losses were also estimated in bagasse, molasses, and press mud cake separately at different time intervals, and total losses were calculated. All the analytical work was performed in the quality control laboratory of the concerned mill with the help of laboratory chemists. After analysis, necessary suggestions were given to the sugar mills for improving the varietal composition and also for reducing cut-to-crush losses and processing losses so that the overall sugar recovery could be increased (Table 3).

Table 3. Testing of sugar recovery and losses in different sugar mills (2023-2024)

S. No	Name of Factory	Date of Testing	Fresh Cane (Pol % in cane)	Yard Cane (Pol % in cane)	Fiberized Cane (Pol % in cane)	Manufacturing Losses %				Difference in Recovery
						Total Loss by Scientific Analysis	Recovery Analyzed by Scientist	Loss Shown by Sugar Mills	Recovery Shown by Sugar Mills	
1	Avadh Sugar & Energy Ltd., Unit- Roza,(Shahjahanpur)	07.12.2023	13.86	13.36	12.93	2.08	10.85	1.88	10.40	0.45
2	Parle Biscuits Pvt. Ltd.,Unit- Paresendi (Bahraich)	04,05.02.2024	14.21	13.84	-	5.20	10.84	5.0	08.14	2.7
3	The Kisan Sahkari Chini Mills Ltd, Puranpur, (Pilibhit)	13,14.02.2024	12.04	11.56	11.19	2.47	8.72	2.14	8.10	0.62
4	Avadh Sugar & Energy Ltd., Unit- Seohara,(Bijnor)	17,18.02.2024	14.58	14.08	-	1.84	12.24	1.72	11.50	0.74
5	Shravasti kisan sahkari chini mill Ltd,Unit- Nanpara (Bahraich)	09,11.04.2024	13.80	13.30	13.00	2.86	11.00	2.10	10.0	1.00
6	L H Sugar Mill Pilibhit	26,27.05.2023	Field study was carried out to analyze impact of soil, agronomic, and varietal planning on sugar recovery.							

08. GUR CHEMISTRY

Shahjahanpur

Varietal Screening for Jaggery Production

Juice is the primary factor determining the quality of jaggery, factors affecting the juice quality also affect the jaggery quality. Studies have shown that regardless of the method of boiling and clarifying, the chemical nature of the juice is what most strongly influences the quality of the jaggery. To determine which sugarcane varieties are best for producing high-quality jaggery, a study was conducted at

Shahjahanpur. Out of 10 varieties Co 0238, CoS 13235, CoS 17231 and CoS 96275 proved most suitable for jaggery production. These varieties produced higher, gur yield, gur % cane and higher gur % juice than other varieties. Variety CoS 17231, CoLk 14201 and CoS 767 showed relatively better quality than other varieties with respect to pol% gur & invert sugar % ash%, and colour. These varieties could be used for large scale production of quality jaggery (Table 1).

Table 1: Comparative performance of different varieties of sugarcane for yield and quality of jaggery

S.No.	Varieties	Cane Yield t/ha	Gur Yield t/ha	Gur % in Cane	Pol % in Gur	Invert Sugar	Colour Reading
1	CoLk 14201	107.2	11.12	10.37	76.6	2.48	118
2	CoS 13235	105.5	11.15	10.57	83.0	2.67	120
3	Co 0238	108.0	12.50	11.62	80.8	2.57	130
4	CoS 16233	91.0	10.05	11.04	81.0	2.72	120
5	CoS 17231	104.5	10.74	10.27	85.0	2.61	118
6	CoS 18231	95.3	9.91	10.39	83.8	2.38	130
7	CoS 10239	104.1	10.64	10.21	80.4	2.65	135
8	CoS 96275	96.6	10.17	10.75	85.4	2.70	120
9	CoS 16232	92.1	9.96	10.58	81.2	2.77	130
10	CoS 767	104.8	10.67	10.18	81.8	2.46	128

To find out the effect of biotic and abiotic stresses on the physico-biochemical qualities of jaggery

The analysis of various quality attributes of jaggery across different treatments reveals notable variations. Notably, the Red rot treatment exhibits the lowest Pol% jaggery at 68.0%, suggesting a negative impact on its purity. Additionally, it shows the highest Color Reading at 155, indicating a significant effect on jaggery color. Conversely, the control and Drought conditions display the lowest color readings. Red rot and Rain-fed conditions demonstrate higher RS

values, suggesting elevated levels of reducing sugars in jaggery under these conditions. Salinity water logging exhibits the highest Ash% content, while Drought conditions have the lowest at 2.65%. Moreover, Red rot conditions have the highest moisture%, potentially posing challenges in molding. Mineral contents such as Zn, Fe, Mn, and Cu vary across treatments, with Salinity water logging showing higher Fe and Cu content, and Rain-fed conditions presenting lower values for Zn, Fe, and Mn. Considering these findings, particularly the adverse

effects observed in the Red rot treatment, it is imperative to assess the implications for jaggery's

quality and suitability for various applications, including marketability and nutritional value.

Table 2: Effect of biotic and abiotic stresses on the physico-biochemical qualities of jaggery

S. No.	Treatments	Pol% Jaggery	Purity %	Color reading	RS mg/ml	Ash %	Moisture % jaggery	NR Value
1	Control	80.4	67.28	110	2.5	2.40	2.65	69.5
2	Red rot	68.0	66.10	155	14.90	5.80	7.40	32.8
3	Pokkhaboeng	77.6	66.61	140	3.85	3.76	3.15	60.59
4	Salinity water logging	77.4	67.89	135	3.80	2.65	2.90	64.32
5	Rain fed conditions	79.2	66.55	120	2.94	3.45	3.95	64.18
6	Drought conditions	80.0	67.11	110	3.40	3.10	3.81	65.75



Fig 1. Jaggery prepared from biotic stress-affected sugarcane

Allelopathic effect of lemon grass (*Cymbopogon citrates*) on quality attributes of jaggery

The study so far suggests that while the sugarcane yield was minimally impacted by the intercropping with lemon grass, there were discernible effects on the quality attributes of jaggery. Specifically, jaggery produced from sugarcane grown without lemon grass exhibited slightly better characteristics such as pol% jaggery, moisture%, and NR value.

However, the jaggery from sugarcane intercropped with lemon grass displayed enhanced mineral content, including iron, manganese, copper, and zinc. Therefore, the presence of lemon grass in intercropping seems to influence the mineral composition positively, potentially contributing to the nutritional profile of jaggery. The study emphasizes the need for a balanced evaluation of both yield and quality parameters when considering intercropping practices in sugarcane cultivation.

Muzaffarnagar

Varietal screening for gur/jaggery production

The field experiment was conducted to identify the sugarcane varieties suitable for gur production under different climate condition. This experiment was conducted with 9 sugarcane variety viz; CoS 767, Co 0238, CoS 13235, CoS 15233, CoS 16233, CoS 17231, CoS 18231, CoLk 14201 and Co 15023 in randomized block design with three replications in spring season. The crop was planted on 08-4-23 and harvested on 30-03-24. All varieties were raised with recommended

practices and jaggery/ gur sample manufactured on 22 Feb,2024. In this experiment, highest cane yield was obtained from CoS 0238 (81.01t/ha) followed by CoS 13235 (80.24t/ha), CoS 17231 (78.70 t/ha), CoS 18231 (77.93 t/ha) and CoLk 14201 (76.38t/ha). As regards to gur % in cane, the sugarcane variety Co 15023 produced higher (11.72), followed by CoS 13235 (11.500), Co 0238 (11.38), CoS 17231 (11.33), CoLk 14201 (10.83). In respect of gur yield ton per hectare, highest was obtained in CoS 13235 (9.22) followed by 0238 (9.22), CoS 17231 (8.92), Co 15023 (8.60), CoLk 14201 (8.27) over standard CoS 767 (5.65) (Table 3).

Table 3: Effect of different sugarcane variety on jaggery/ gur yield

2023-24						
S.N.	Varieties	Cane Yield (t/ha)	CCS (%)	Gur % in cane	Gur % in juice	Gur yield (t/ha)
1	CoS 767	52.41	12.34	9.36	16.05	5.56
2	Co 0238	81.01	13.05	11.38	17.97	9.22
3	CoS 13235	80.24	12.98	11.500	18.25	9.22
4	CoS 15233	73.45	12.78	9.83	18.57	7.22
5	CoS 16233	70.21	12.92	9.36	16.33	6.57
6	CoS 17231	78.70	12.96	11.33	18.62	8.92
7	CoS 18231	77.93	12.98	9.46	16.18	7.37
8	CoLk 14201	76.38	12.95	10.83	18.25	8.27
9	Co 15023	73.76	13.15	11.72	18.37	8.65
	SE±	4.79	-	-	-	-
	CDat 5%	10.0	-	-	-	-

09. BIOCHEMISTRY

Shahjahanpur

Distribution of macro and micro nutrients in leaf, sheath and whole plant in promising sugarcane varieties

To study the utilization of major and micro nutrients and relationship between nutrients and physico-biochemical parameters with yield and quality of sugarcane, 16 promising sugarcane varieties *viz.* Co 0238, Co 0118, CoS 08272, UP 05125, CoS 13231, CoS 13235, CoLk 14201, CoS 09232, UP 05011, CoS 08279, CoS 10239, CoS 08276, CoS 16232, CoS 16233, CoSe 13452 and CoS 14231 were taken. After harvesting of cane, plant samples were processed and samples were analyzed for the comparative analysis of macro-nutrients (N, P and K) and micro-nutrients (Zn, Fe, Mn and Cu) in leaf, leaf sheath and whole cane as well as Nitrate reductase activities (NRA) in leaf by standard predefined procedures.

In case of macronutrients studies the analytical results showed that, highest average 'N' content was observed 1.30% in Co 0238 followed by Co 0118 and CoS 08272 while lowest value (1.08%) was observed in CoS 10239. The Phosphorus content was more in whole plant in comparison to leaf and sheath and highest content was recorded 0.32% in Co 0238 followed by Co 0118 and CoS 08272 while lowest 0.21% in CoS 08279. Maximum Potassium (K) content was observed in CoLk 14201 (3.74%) followed by Co 0238 and CoS 08272 whereas minimum in CoS 16232 (2.61%). This was also found that N and K contents were decreased from leaf to whole cane in all the varieties. Statistical analysis on correlation coefficient values indicated that N, P and K were positively correlated with the sucrose percent and yield.

Regarding micronutrients studies the analytical results showed that, Zinc content was increased from leaf to whole plant. Zinc content was varied from 2.7 to 38.5 ppm in all the parts of sugarcane. However, average content was found maximum (21.1 mg/kg) in CoS 16233 followed by Co 0238 (20.0 ppm) while minimum in CoSe 13452 (11.3 ppm). The average plant content of Iron (Fe) was found maximum in CoS 08272 (460.0 mg/kg) followed by Co 0238 (442.1 mg/kg) whereas minimum in Co 05011 (204.1 ppm). The average plant content of Copper (Cu) was detected maximum in CoS 0238 (13.57 ppm) while in leaf it was

maximum in CoS 16233 (20.3 ppm) whereas minimum in UP 05125 (7.31 ppm). The Manganese content in all part was varied from 10.7 mg/kg to 49.9 mg/kg. However, the highest 'Mn' value (average plant content) was observed in CoS 14231 (34.37 ppm) and lowest in Co 05011 variety (19.43 ppm).

The nitrate reductase enzyme activities (NRA) were also determined in leaf samples of these promising sugarcane varieties. The maximum NRA activity was recorded in variety Co 0238 (2.68 $\mu\text{m/gm/hr}$) followed by CoS 14231 and CoS 08272 varieties while it was lowest in CoS 08279 (1.39 $\mu\text{m/gm/hr}$). After statistical analysis, the correlation coefficient values revealed that nitrate reductase enzyme activity was positively correlated with sucrose content and yield in all the varieties studied.

It was concluded that over all higher major and micronutrient values were observed in Co 0238, CoS 08272, CoS 14231 and CoLk 14201 varieties in comparison to other varieties may be one of the factor for higher yield and early maturing variety. Higher Zn, Mn and Cu contents were observed in high yielding and early varieties i.e. Co 0238, Co 0118, CoS 08272, CoLk 14201 and CoS 16233 while lower in CoS 08276, CoS 08279, CoS 10239, CoS 16232, UP 05011 and CoSe 13452 variety, therefore the inclusion of these nutrients is may be required as fertilizer recommendation for higher sugar and cane yield (Table 2). The correlation analysis of micronutrients revealed that they were positively correlated with the sucrose percent but negatively with the cane yield except in case of iron. The results suggested that the amendment of higher doses of zinc, manganese and copper in soil may increase the cane yield as well as sucrose content.

Effect of micronutrients application on sugarcane

To find out the effect of micronutrients namely Zn, Cu and Mn on qualitative and quantitative parameters of sugarcane a field experiment was done in spring planting season 2021-22, 2022-23 and 2023-24. Four promising sugarcane varieties *viz.* CoS 13231, CoS 13235, CoS 17231 and UP 05125 were taken for this analysis. ZnSO_4 , CuSO_4 and MnSO_4 were taken as fertilizer for the application of micronutrient. Four treatment combination *viz.* T_1 (Control)-NPK+Zn, T_2 -(NPK+Zn+Cu), T_3 -(NPK+Zn+Mn) and T_4 -(NPK+Zn+Cu+Mn) along with three replicate made



for this analysis. The effect of Zn, Cu and Mn on enzymes activity associated with growth and sucrose accumulation of sugarcane i.e. Sucrose Phosphate Synthase, Sucrose Phosphate Synthase, Acid Invertase, Neutral Invertase and Nitrate Reductase activities were analyzed by standard predefined procedures using Spectrophotometer. The effect of these micronutrients on qualitative parameters *viz.* germination per cent, NMC, HR brix, Sucrose per cent and yield were also recorded.

In case of micronutrients studies the analytical results showed that, in the month of September at grand growth phase Sucrose Phosphate Synthase (SPS) activity in leaf was increased up to 10.7% by application of Zn and Cu along with RDF. The same trends were observed in case of Sucrose Synthase (SuSy) activity in all varieties which were increased up to 10.6% by application of Zn and Cu along with RDF

while Acid Invertase and Neutral Invertase activity did not showed any significant changes. Nitrate Reductase (NR) activity increased up to 11.6%, 8.1%, 10.5% and 9.8% in CoS 17231, UP 05125, CoS 13231 and CoS 13235 respectively by application of Zn and Cu.

Germination per cent was significantly increased up to 9.4%, 7.5%, 6.45% and 10.06% in CoS 17231, UP 05125, CoS 13231 and CoS 13235 respectively by application of Zn, Mn and Cu along with RDF. The higher HR Brix and Sucrose % in juice were recorded in UP 05125, CoS 13231 and CoS 13235 by application of Zn and Cu along with RDF while it was maximum in CoS 17231 by application of Zn and Mn. These results showed that by the application of ZnSO_4 , CuSO_4 and MnSO_4 as micronutrient fertilizers along with the recommended dose of N,P,K the qualitative and quantitative traits of sugarcane could be enhanced.

10. PLANT PHYSIOLOGY

Shahjahanpur

Evaluation of promising sugarcane varieties under soil moisture stress

Promising sugarcane varieties namely CoSe 01434, CoLk 94184, CoS 16233, CoLk 14201, CoS 17231, CoS 18232, CoS 18231, CoS 16231, CoS 08279 & CoS 14233 were evaluated for drought tolerance under water stress condition at the research farm of U.P. Council of Sugarcane Research, Shahjahanpur. Two moisture levels were maintained during pre-monsoon period. Under normal soil moisture condition, five pre-monsoon irrigations were given while under



Treatmental irrigation for Deficient moisture

Evaluation of varieties under saline soil condition

An experiment was conducted in glazed pots with ten promising sugarcane varieties viz., CoS 08279, CoS 10239, CoS 16233, CoS 17231, CoS 18231, CoS 14233, CoLk 14201, Co 15023, CoS 17234 and CoS 18232. Salinity level 8 EC was maintained artificially by mixing calcium chloride, sodium chloride and sodium sulphate in appropriate amounts. The performances of varieties growing in normal and saline soils were compared. Varieties CoS 16233, CoLk 14201, CoS 17231 and CoS 18231 gave higher tillers/clump, millable canes/clump and cane yield than other varieties growing under saline soil condition. Varieties Co 15023, CoS 17231 and CoLk 14201 gave higher Sucrose percent in Juice. Conclusively, varieties CoLk 14201, CoS 18231, CoS 17231 and CoS 16233 were found relatively more tolerant to salinity.

deficient irrigation only two pre-monsoon irrigations were applied.

The results indicated that varieties CoS 16233, CoS 18231, CoS 14233 and CoLk 14201 maintained higher Germination. However maximum cane yield under water stress condition was observed in varieties CoLk 14201, CoS 16233 and CoS 17231 along with minimum yield reduction percent which indicated their water stress tolerance character. Sucrose percent in juice was not affected significantly due to moisture stress. Variety CoS 18231, CoS 17231, CoLk 94184 and CoLk 14201 gave higher sucrose percent in juice.



Varieties under salt and normal soil condition

Evaluation of promising sugarcane varieties under water logging condition.

To find out the suitable varieties for water logging condition varieties viz, CoS 08279, CoS 96436, CoS 17231, CoS 13231, UP 05125, UP 9530, CoSe 13452, CoLk 14201, CoS 10239 and SL146/10 were taken for study. Water logging conditions was maintained naturally at Gola research farm for approximately 55-60 days in rainy season. Varieties UP 05125, CoS 14233, CoS 10239 and CoLk 14201 maintained higher germination. Varieties UP 05125, CoS 14233, CoS 10239, CoS 17231 and CoLk 14201 CoS 08279, UP 9530, CoSe 96436 and CoS 13231 showed higher shoot population, shoot height and number of millable canes under water logging condition. Leaf area of LTM was higher in CoS 08279, CoS 10239, CoLk 14201, CoS 96436, SL 146/10 and CoSe 11453. Varieties CoSe 96436, CoS 13231, UP 09530 and CoS 08279 gave higher yield under water logging condition



Studies on physiological and morphological parameters for ratooning ability in sugarcane

To test the efficacy of ratooning ability of new elite promising sugarcane varieties CoS 13235, CoS 13231, CoS 17231 CoLk 14201, Co15023 and Co 0118 in association of plant crop, an experiment was conducted at SRI shahajahanpur in two cycles of one plant and two ratoon crop each and plant crop was planted in RBD, three replication with all recommended practices were followed. The plantsample was made at formative and maturity stage for regarding various morphological and physiological parameters. The total chlorophyll contain (mg/gm leaf^{-1}) was higher in CoS 13235 in both formative and maturity stage followed by CoS 17231 and CoS 13231. Plastochron (day/leaf^{-1}) was higher in CoLK 14201 followed by CoS 17231 and CoS 13231 at maturity stage. Maximum leaf area was obtained in Co 0118 followed by CoLK 14201 and Co 15023 at maturity stage. Regarding yield contributing parameters higher germination was observed in CoS 13235 and significant higher tillers, NMC was recorded in CoS 17231. Maximum sucrose contain was obtained in Co 15023 at harvest. CoS 13235 gave significantly higher yield among all the varieties. The above data on physiological, morphological and growth parameters recorded in plant crop of different varieties will be correlate with next cycle of first ratoon and second ratoon crop and it will decided the rationing potential of different varieties.

Seorahi

Evaluation of sugarcane genotypes for water logging tolerance

An experiment was conducted during 2023-24 with 08 sugarcane varieties viz., CoS 13231, UP 05125, CoLk 94184, Co 98014, CoS 08279, CoSe 15453, UP 9530 and CoSe 96436 with three replications in RBD design.

The result indicated that all the varieties were affected due to water logging condition. The experimental plot was remained water logged 60 days with 24.0 cm to 46.0 cm depth of water. Leaf area was found maximum in Co 98014 (401.33 cm^2). Data showed the highest germination percent in variety CoS 08279 (54.17%), maximum number of tillers ($181176/\text{ha}$) and highest NMC ($102818/\text{ha}$) were also recorded in variety CoS 08279. Maximum Growth rate was recorded in variety Co 98014 (2.20 cm/day) followed by CoS 08279 (1.97 cm/day). Highest sucrose percent (17.16%) was obtained in variety CoS 13231 followed by CoLk 94184 (17.08%). Maximum plant height was recorded in variety Co 98014 (321.0 cm) followed by CoS 08279 (316.0 cm). The highest yield (80.43 t/ha) was found in CoS 08279 followed by UP 05125 (69.45 t/ha) and CoSe 15453 (69.24 t/ha).

Genotypes/variety performance of sugarcane varieties under alkaline soil conditions

An experiment was planted in autumn season during 2022-24 in the pot with 08 new sugarcane genotypes/varieties viz., CoSe 17451, CoS 13235, CoS 13231, UP 05125, CoS 08279, CoS 09232, CoS 10239, and CoSe 13452 with three replications in RBD design. The result indicated that all varieties were affected due to alkaline soil condition. Leaf area was found maximum in CoSe 13452 (301.23 cm^2). Data showed that highest Germination percent recorded in CoS 10239 (86.66%). Maximum number of tillers ($13.67/\text{Pot}$) and highest NMC ($8.00/\text{Pot}$) were also recorded in variety CoS 10239 and UP 05125. Aerial roots were observed in variety CoS 09232 (7.8 cm/pot) and CoS 13231 (6.2 cm/pot). Maximum plant height was recorded in variety CoSe 13452 (261 cm.). High sucrose percent (18.17%) was obtained in CoS 13235 and CoS 13231 (17.95%). The highest yield was found in CoSe 13452 (04.56 /pot) followed by CoS 13235 (04.19 /pot) and UP 05125 (03.92 /pot).

11. Soil Microbiology

Shahjahanpur

Soil Microbiology section is involved in producing a quality Bio-products viz: Azotobacter, PSB, Organo decomposer, *Beauveria bassiana* & *Metarrhizium manisopliae* and Ankush, for improving organic status of soil and management of soil borne fungal diseases, termite, white grub of sugarcane and also the production of Vermi compost. All these products are made and available to the farmers and Sugar mills according to their demand (Table-1).

Production of Bio-fertilizers, Bio-agents (Ankush) and Organo decomposer.

- 1- To maintain the sustainability of soil fertility and its health along with saving of inorganic fertilizer, a carrier based (powdered) bio-fertilizer i.e. **Azotobactor** and Phosphorus solubilising bacteria (**PSB**) were produced and supplied to the farmers, sugar mills in the amount of 1405 and 5060 kg respectively.
- 2- For quick initial decomposition of organic waste materials in a short duration a powdered based cellulolytic culture inoculant named "**Organo-decomposer**" was produced an quantity of 1885

kg and supplied to the farmers and sugar mills.

- 3- To manage soil borne fungal disease like root-rot, pine-apple and wilt disease of sugarcane through a bio-agent "**Ankush**" was produced an amount of 48572 kg and supplied to the farmers and sugar mills. It is an eco-friendly device of disease management and also useful in preventing primary infection of red-rot through soil, present in previous crop debris.
- 4- For the management of Termite and white grub a carrier based bio pesticide *Beauveria bassiana* & *Metarrhizium manisopliae* was produced an amount of 407 kg and supplied to the farmers and sugar mills.
- 5- 1630 kg of all bio products supplied, free of cost to the research institute/centres of UPCR, Shahjahanpur.
- 6- A total of 1530 kg of Vermi compost was produced, out of which 470 Kg was sold to earn an income of Rs.1470.00 and 1060 kg. was given free of cost to different section of SRI Shahjahanpur.

Table 1. Supply of Bio-products (2023-24)

SN	Name of the Bio fertilizers / Bio agents	Total production/supply in Kg.	Total income (Rs.)
1	Ankush	48572	32,17,218.00 (Rs. Thirty two lakhs seventeen thousands two hundred eighteen) only
2	Azotobactor	1405	
3	PSB	5060	
4	Organo decomposer	1885	
5	<i>Beauveria bassiana</i> & <i>Metarrhizium anisopliae</i>	407	
	Total	57329	

12. Entomology

Shahjahanpur

Varietal behavior towards insect pests of sugarcane.

State Varietal trial behavior towards insect pests (SVT 1st plant, spring)

In SVT 1st plant, (Spring 2023-24) 8 genotypes / varieties such as CoS 20232, CoS 20231, CoS 21232 CoS 21233, CoS 21231, UP 21452, S-27/17 and S-310/16 along with

5 standards Co 0238, Co 05011, CoJ 64, CoPant 97222 and CoS 767 were taken and all the varieties showed less susceptible reaction against Shoot borer (Cumulative) and top borer at hot weather and at the time of harvest. All varieties/genotype including standard is also showed less susceptible reaction against top borer and Stalk borer on the basis of infestation index.

Table:1 SVT 1st plant

S. No	Variety/ Genotype	Early shoot borer %		Root Borer % incidence	Top Borer % incidence	Stalk borer	
		Cumulative Incidence	Grade			Infestation Index	Grade
1	CoS 21232	10.01	L.S.	2.71	3.87	0.15	LS.
2	UP 21452	9.86	LS	2.75	3.22	0.76	LS.
3	CoS 21233	4.21	LS	1.67	3.89	0.27	LS.
4	CoS 20231	8.04	LS	1.85	3.12	0.27	LS.
5	S. 27/17	5.40	LS	1.29	2.74	0.33	LS.
6	S. 31/16	4.84	LS	2.24	3.29	1.78	LS.
7	CoS 21231	4.27	LS	1.08	4.43	1.36	LS.
8	CoS 20232	6.17	LS	1.09	3.31	0.44	LS.
9	Co 0238	3.97	LS	1.53	1.76	0.63	LS.
10	Co 05011	5.74	LS	1.03	3.06	1.77	LS.
11	CoJ 64	4.66	LS	1.17	2.13	0.54	LS.
12	CoPant 97222	4.89	LS	1.00	1.67	1.04	LS.
13	CoS 767	5.22	LS	1.18	3.93	1.34	LS.
	CV	42.25		55.41	64.20	105.24	
	SE	2.05		0.72	1.63	0.71	
	CD	NS		2.71	NS	NS	

State Varietal trial (SVT 2nd Plant)

In SVT 2nd Plant (Spring 2023-24) 11 varieties such as Cos 19234, CoS 19233, CoLk 18201, CoLk 18203, CoLk 18204, Seo 685/14, Seo 1019/16, S-188/15, S-1581/16, Seo 565/16 with 5 standards such as CoS 767, Co 0238, Co 05011, CoJ 64 and CoPant 97222 were taken and all

varieties/genotypes showed less susceptible reaction against Shoot borer (Cumulative basis) and top borer at hot weather, all varieties/genotype including standard showed less susceptible reaction against Top borer, Root borer at the time of harvest as well as Stalk borer on the basis of infestation index.

Table: 2 SVT 2nd Plant

S.N	Variety/ Genotype	Early shoot borer %		Root Borer % Incidence	Top Borer % Incidence	Stalk borer	
		Cumulative % Incidence	Grade			Infestation Index	Grade
1.	S.188/15	5.87	L.S.	1.90	3.82	0.22	L.S.
2.	CoS 19234	5.67	LS	2.04	3.60	0.40	L.S.
3.	CoLk 18201	3.11	LS	1.97	3.75	0.17	L.S.
4.	Seo 685/14	4.61	LS	1.67	3.01	0.35	L.S.
5.	S. 1581/16	4.72	LS	4.21	2.74	0.71	L.S.
6.	CoLk 18204	2.73	LS	2.73	3.07	0.29	L.S.
7.	Seo 1019/16	2.43	LS	1.93	4.67	0.29	L.S.

S.N	Variety/ Genotype	Early shoot borer %		Root Borer % Incidence	Top Borer % Incidence	Stalk borer	
		Cumulative % Incidence	Grade			Infestation Index	Grade
8.	Seo. 565/16	5.22	L.S	1.80	2.96	0.70	L.S.
9.	CoLk 18203	3.17	L.S	2.30	2.36	0.58	L.S.
10.	CoS 19233	4.78	L.S	2.19	4.85	0.47	L.S.
11.	Seo. 565/16	2.69	L.S	1.43	2.46	0.95	L.S.
12.	CoPant 97222	2.21	L.S	3.67	3.72	0.87	L.S.
13.	CoS 767	3.14	L.S	2.29	1.44	0.13	L.S.
14.	Co 05011	3.72	L.S	1.98	2.51	0.38	L.S.
15.	CoJ 64	2.96	L.S	2.20	3.1	0.28	L.S.
16.	Co 0238	4.18	L.S	2.22	1.83	0.69	L.S.
	C.V.	48.47		76.47	63.39	113.58	
	SE.	1.51		1.43	1.61	0.43	
	C.D.	NS		NS	NS	NS	

Survey and surveillance of sugarcane insect pests (2023-24)

Extensive survey and surveillance was conducted during pre-monsoon and post-monsoon in thirteen sugar factories of different districts viz District Shahjahanpur (Roza chini mill), Dalmiya chini mill unit, Nigohi), District Hardoi (DSCL unit Roopapur, DSCL, unit Loni), District Lakhimpur kheri (BHL unit Ajwapur, DSCL Paliya Kala, Govind chini mill Era, BHL unit, Khambharkhera), District Sitapur (Dalmiya

chini mill unit Jawaharpur, Awadh sugar energy Haragaon), District Bahraich (Parley biscuit Pvt. Ltd.), District Bareilly (Dwarikesh chini mill) of central U.P., to know the condition of major insect pests of sugarcane during survey. Shoot borer % incidence 3.5 – 10.5%, Top borer 3.5 – 12.5%, except 30% in parley biscuit Pvt. Ltd. Bahraich, Root borer 2.5 to 11.5%, Stalk borer 8-15% in L.H sugar factory (Pilibhit) Mites, Grass hopper, White fly as well as Army worm, found in sporadic form and Thrips were observed in patches.

Table: 3 Survey and surveillance of sugarcane insect pests in central UP.

S. NO	Location	Varieties	Name of pest	%Incidence /Population		
				Min.	Max.	Avg.
1.	Bajaj Hind.Ltd. unit Paliya kala Lakhimpur kheri	Co0238,Co98014, Co15023,CoS 88230,CoLk 14201, CoJ85	Early shoot borer % incidence	2.0	10.0	6.0
			Top borer % incidence	2.0	10.0	6.0
			Thrips/ plant intensity	20.0	30.0	25.0
			Mite /leaf intensity	5.0	8.0	6.5
			Grass hopper/clumps intensity	1.0	2.0	1.5
			White flies/leaf intensity	10.0	14.0	12.0
2.	Dalmiya chini unit Nigohi ,Shahjahanpur	Co 0238, Co 0118, Co 15023, CoLk 14201, Co 98014, CoS13235, CoS 17231	Early shoot borer % incidence	2.0	5.0	3.5
			Top borer % incidence	2.0	5.0	3.5
			Root borer % incidence	2.0	3.0	2.5
			Thrips/ plant intensity	10.0	30.0	20.0
			Grass hopper/clump intensity	1.0	2.0	1.5
			White flies/leaf intensity	10.0	10.0	10.0
3.	DSCL , Unit Rupapur, Hardoi	Co 0238, Co 15023, CoS 13235	Early shoot borer % incidence	2.0	10.0	6.0
			Top borer % incidence	1.0	6.0	3.5.3.
			Root borer % incidence	1.0	5.0	0
			White flies/leaf intensity	2.0	10.0	6.0
			Thrips/ plant intensity	3.0	30.0	16.5
			Mite /leaf intensity	2.0	8.0	5.0
4.	DSCL, Unit Loni Hardoi	Co 0238, Co 15023, Co 98014, CoLk 14201, CoPk 05191, CoS 13235	Grass hopper/ clump intensity	1.0	4.0	2.5
			Early shoot borer % incidence	2.0	10.0	6.0
			Top borer % incidence	2.0	5.0	3.5
			Root borer % incidence	2.0	5.0	3.5
			Stalk borer % incidence	2.0	5.0	3.5
			Army worm/ plant intensity	1.0	2.0	1.5
			Mite /leaf intensity	5.0	20.0	12.5
			Grass hopper/ clump intensity	1.0	5.0	3.0
			Thrips/ plant intensity	2.0	6.0	4.0
			Pyrilla/ plant intensity	1.0	3.0	2.0



S. NO	Location	Varieties	Name of pest	%Incidence/Population		
				Min.	Max.	Avg.
5.	Awadh Sugar Energy Hargwon Sitapur	Co 0238, Co 15023, Co 0118, Co 0238	Early shoot borer % incidence	2.0	10.0	6.0
			Top borer % incidence	6.0	12.0	9.0
			Root borer % incidence	2.0	5.0	3.5
			Army worm/ plant intensity	2.0	12.0	7.0
			Thrips/plant intensity	10.0	20.0	15.0
			Pyrilla/ plant intensity	4.0	10.0	7.0
			Grass hopper/clump intensity	3.0	10.0	6.5
6.	Bajaj Hind. Ltd. Khambharkhera Lakhimpur Kheri	Co 0238, Co 15023, Co 0118, CoLk 14201, CoS 13235, CoS13231, CoS 17231	Early shoot borer % incidence	4.0	15.0	9.5
			Top borer % incidence	8.0	17.0	12.5
			Root borer % incidence	5.0	12.0	8.5
			Black Bug/ plant intensity	12.0	15.0	13.5
			Army worm/ plant intensity	4.0	5.0	4.5
			Pyrilla/ plant intensity	3.0	15.0	9.0
7.	Govind Chini Mill Era Lakhimpur Kheri	Co 0238, Co0118, , Co 15023, CoLk 94184, CoLk 14201	Early shoot borer % incidence	1.0	10.0	5.5
			Top borer % incidence	1.0	6.0	3.5
			Root borer % incidence	2.0	8.0	5.0
			Thrips/plant intensity	2.0	5.0	3.5
			Army worm/plant intensity	3.0	7.0	5.0
8.	Dalmiyan Chini Mill Jawaharpur Sitapur	Co 0238, CoLk 94184, CoLk 14201	Early shoot borer % incidence	6.0	15.0	10.5
			Top borer % incidence	5.0	15.0	10.0
			Root borer % incidence	8.0	15.0	11.5
			Black Bug/plant intensity	5.0	15.0	10.0
			Army worm/plant intensity	4.0	14.0	9.0
			Pyrilla/plant intensity	5.0	20.0	12.5
9.	DSCI Unit Ajwapur Lakhimpur Kheri	Co 0238, Co 15023, CoS 13235	Early shoot borer % incidence	2.0	8.0	5.0
			Top borer % incidence	2.0	5.0	3.5
			Root borer % incidence	2.0	3.0	2.5
			Thrips/plant intensity	15.0	20.0	17.5
			Grass hopper/ clump intensity	1.0	2.0	1.5
10.	Dwarikesh Chini Mill Faridpur Barielly	Co 0238, Co 15023, Co 0118, CoS 13235, CoS 8436, CoLk 14201	Early shoot borer % incidence	2.0	15.0	8.5
			Top borer % incidence	4.0	14.0	9.0
			Root borer % incidence	3.0	10.0	6.5
			Thrips/plant intensity	3.0	15.0	9.0
			Grass hopper/clump intensity	5.0	12.0	8.5
			Mealy Bug/plant intensity	2.0	8.0	5.0
11.	Parley biscuit Pvt. Ltd.), Bahraich	Co 0238, Co 15023, CoLk 14201	Top borer % incidence	5.0	55.0	30.0
			Root borer % incidence	3.0	7.0	5.0
			Stalk borer % incidence	2.0	10.0	6.0
			Internode borer % incidence	5.0	4.0	4.5
12.	Roza chini mill, Shahjahanpur	CoS 13235, Co 15023, CoLk 14201	Top borer % incidence	2.0	8.0	5.0
			Stalk borer % incidence	2.0	6.0	4.0
			Mealy Bug/plant intensity	10.0	30.0	20.0
13.	L.H. Sugar factory, Pilibhit	Co 0238, Co 15023, CoLk 14201	Top borer % incidence	20.0	40.0	30.0
			Stalk borer % incidence	8.0	15.0	11.52
			Mealy Bug/ plant intensity	15.0	30.0	2.5

Impact of eco friendly products on biotic stress (Spring & Autumn, 2023-24).

A field experiment was conducted with the objective "To study the efficacy of various effective and sustainable alternatives for the management of insect pests in sugarcane" during autumn & spring season. The experiment was laid out in a split plot design with 3 replication with two varieties Co 0238 and Co 0118.

The experiment consisted five treatments.

In autumn season, germination percent was recorded higher in T_1 in Co 0238 and T_4 in Co 0118 than chemical control (T_3 & T_5). Highest shoot population, number of millable cane and cane yield were recorded in chemical treated plots such as T_3 & T_5 . Minimum and very low insect pest was recorded in autumn planted crop

T ₁	Nutrient application through natural resources and insect pest disease control through natural.
T ₂	Nutrient application through natural resources and insect pest/ disease control through bio products.
T ₃	Nutrient application through chemical resources insect pest diseases control through natural resources.
T ₄	Nutrient application through natural resources insect pest and disease control through chemicals.
T ₅	Nutrient application through chemical resources and insect pests, disease control through chemicals.

Autumn crop in spring season also reflected almost same results in the quantitative characters. Germination was found better with Ghanjeevamrut, Jeevamrut, wherever sugar cane setts were treated with beejamrut. Severe infection of insect pest was recorded in T₁, T₂ & T₄ treatment wherever natural product were applied.

In spring, germination percent was recorded higher in T₃ (Co 0238 and Co 0118 highest shoot population, number of millable cane and cane yield were recorded in chemical treated plots such as T₃. Germination was found better with Ghanjeevamrut, Jeevamrut, wherever sugarcane sett were treated with beejamrut severe infection of insect pest was recorded in T₁, T₂ & T₄ treatment wherever natural product were applied.



Co 0238

Table: 4 Germination percent (Spring 2023-24)

Varieties/Treatments	T ₁	T ₂	T ₃	T ₄	T ₅	Mean (S)
V1 (Co 0238)	38.43	47.57	49.88	46.06	43.75	45.14
V2 (Co 0118)	55.84	53.59	55.90	55.90	53.59	53.46
Mean	47.14	50.58	52.89	50.98	50.58	
Statistical Analysis						
	Factor V	Factor T	Factor (T) at same level of V	Factor (T) at different level of V		
CV	24.36	18.40	-	-		
CD	NS	NS	NS	NS		
SE	3.07	3.67	5.19	5.56		

Table: 5 Shoot populations per hectare.

Varieties/Treatments	T ₁	T ₂	T ₃	T ₄	T ₅	Mean(S)
V1 (Co 0238)	130323.24	148224.36	165353.88	151696.56	146681.16	148455.84
V2 (Co 0118)	135878.76	132020.76	146449.68	145060.80	149304.60	141742.92
Mean	133101.00	140122.56	146449.68	145060.80	147992.88	
Statistical Analysis						
	Factor V	Factor T	Factor (T) at same level of V	Factor (T) at different level of V		
CV	16.37	8.10	-	-		
CD	NS	NS	NS	NS		
SE	6133.33	4800.42	6788.82	8630.66		

Table: 6 NMC/ha Two way table.

Varieties/Treatments	T ₁	T ₂	T ₃	T ₄	T ₅	Mean(S)
V1 (Co 0238)	92900.64	94443.84	103394.40	95832.72	105554.88	98425.30
V2 (Co 0118)	86342.04	87190.80	92592.00	89351.28	103162.92	91727.81
Mean	89621.34	90817.32	97993.20	92592.00	104358.90	
Statistical Analysis						
	Factor V	Factor T	Factor (T) at same level of V	Factor (T) at different level of V		
CV	6.79	6.11	-	-		
CD	NS	5023.71	NS	NS		
SE	1667.66	2369.67	351.22	3430.11		

Table: 7 Yield Mt/ha

Varieties/Treatments	T ₁	T ₂	T ₃	T ₄	T ₅	Mean (S)
V1 (Co 0238)	69.37	53.47	102.62	55.25	102.66	76.674
V2 (Co 0118)	37.50	46.60	46.99	44.14	89.66	52.978
Mean (T)	53.435	50.035	74.81	49.695	96.16	-
Statistical Analysis						
	Factor A	Factor B	Factor (B) at same level of A	Factor (A) at different level of B		
CV	17.75	17.25	-	-		
CD	12.73	9.63	13.62	13.70		
SE	2.96	4.54	6.43	6.46		

Table: 8 Juice (Sucrose %).

Varieties/Treatments	T ₁	T ₂	T ₃	T ₄	T ₅	Mean(S)
V1 (Co 0238)	18.79	18.88	18.39	19.01	18.71	18.76
V2 (Co 0118)	19.45	19.60	18.36	19.14	17.90	18.89
Mean	19.12	19.24	18.37	19.08	18.31	
Statistical Analysis						
	Factor V	Factor T	Factor (T) at same level of V	Factor (T) at different level of V		
CV	3.90	1.98	-	-		
CD	NS	0.32	0.46	0.57		
SE	0.19	0.15	0.21	0.27		

Table: 9 Early shoot borer (Cumulative) % incidence.

Varieties/Treatments	T ₁	T ₂	T ₃	T ₄	T ₅	Mean(S)
V1 (Co 0238)	10.88	6.91	3.55	9.54	5.69	7.31
V2 (Co 0118)	13.46	15.76	5.95	13.23	4.60	10.6
Mean	12.2	11.3	4.8	11.4	5.1	
Statistical Analysis						
	Factor V	Factor T	Factor (T) at same level of V		Factor (T) at different level of V	
CV	6.89	20.27	-		-	
CD	0.69	1.57	2.22		2.02	
SE	0.16	0.74	1.0		0.95	

Table: 10 Percent incidence of top borer

Varieties/Treatments	T ₁	T ₂	T ₃	T ₄	T ₅	Mean(S)
V1 (Co 0238)	0.21	0.39	0.00	0.66	0.21	0.294
V2 (Co 0118)	0.48	0.61	0.12	0.77	0.25	0.447
Mean	0.3	0.5	0.1	0.7	0.2	
Statistical Analysis						
	Factor V	Factor T	Factor (T) at same level of V		Factor (T) at different level of V	
CV	64.57	92.01	-		-	
CD	NS	0.29	NS		NS	
SE	0.06	0.14	0.20		0.19	

Table: 11 infestation index of Stalk Borer.

Varieties/Treatments	T ₁	T ₂	T ₃	T ₄	T ₅	Mean(S)
V1 (Co 0238)	0.91	0.34	0.42	0.73	0.50	0.58
V2 (Co 0118)	1.34	1.62	0.38	1.80	1.02	1.23
Mean	1.1	1.0	0.4	1.3	0.8	
Statistical Analysis						
	Factor V	Factor T	Factor (T) at same level of V		Factor (T) at different level of V	
CV	203.23	57.30	-		-	
CD	NS	NS	NS		NS	
SE	0.48	0.21	0.30		0.55	

Table: 12 Germination percent (Impact of eco friendly products on biotic stress Autumn (2022-24).

Var/Treatments	T ₁	T ₂	T ₃	T ₄	T ₅	Mean (S)
V1 (Co 0238)	51.16	58.22	57.87	51.62	54.28	54.63
V2 (Co 0118)	50.93	55.96	52.08	52.08	61.00	54.41
Mean (T)	51.04	57.09	54.98	51.85	57.64	-
Statistical Analysis						
	Factor A	Factor B	Factor (B) at same level of A		Factor (A) at different level of B	
CV	N/A	-	-		-	
CD	1.459	3.647	5.157		4.838	
SE	1.031	2.579	2.306		3.421	



Table: 13 Shoot population

Varieties/Treatments	T ₁	T ₂	T ₃	T ₄	T ₅	Mean (S)
V1 (Co 0238)	104512	84790	121456	87776	105484	100803
V2 (Co 0118)	73471	82290	88818	68887	103401	83359
Mean (T)	88991	83505	105137	78332	104442	-
Statistical Analysis						
	Factor A	Factor B	Factor (B) at same level of A	Factor (A) at different level of B		
CV	15,690.547	11,750.356	20,336.872	20,234.312		
CD	3,387.143	5,495.549	7,771.879	7,732.685		
SE	2,395.072	3,885.940	5,355.543	5,467.834		

Table 14 NMC/ha Two way table.

Varieties/Treatments	T ₁	T ₂	T ₃	T ₄	T ₅	Mean(S)
V1 (Co 0238)	93956.83	73540.49	100345.62	77082.10	95067.92	87998.59
V2 (Co 0118)	68332.24	73887.71	81179.26	61,249.02	93679.06	79269.57
Mean	81144.54	73714.10	90762.44	77082.10	94373.49	-
Statistical Analysis						
	Factor V	Factor T	Factor (T) at same level of V	Factor (T) at different level of V		
CV	10.83	11.27	-	-		
CD	NS	7978.77	NS	NS		
SE	2288.03	3763.57	5322.49	5281.88		

Table: 15 Yield Mt/ha

Varieties/Treatments	T ₁	T ₂	T ₃	T ₄	T ₅	Mean (S)
V1 (Co 0238)	36.32	32.36	88.55	39.03	102.64	59.78
V2 (Co 0118)	33.54	32.08	71.39	27.92	94.58	51.90
Mean (T)	34.92	32.22	79.97	33.47	98.61	-
Statistical Analysis						
	Factor A	Factor B	Factor (B) at same level of A	Factor (A) at different level of B		
CV	12.85	12.65	-	-		
CD	NS	0.29	NS	NS		
SE	0.09	0.14	0.19	0.19		

Table: 16 Early shoot borer Cumulative incidence.

Varieties/Treatments	T ₁	T ₂	T ₃	T ₄	T ₅	Mean(S)
V1 (Co 0238)	1.42	1.35	1.09	1.04	0.81	1.142
V2 (Co 0118)	9.11	9.50	2.08	8.73	2.19	6.322
Mean	5.27	5.43	1.59	4.89	1.50	-

Table: 17 Infestation index of Stalk Borer.

Varieties/Treatments	T ₁	T ₂	T ₃	T ₄	T ₅	Mean(S)
V1 (Co 0238)	0.34	0.18	0.08	1.05	0.48	0.34
V2 (Co 0118)	0.28	0.33	0.08	0.27	0.22	0.21
Mean	0.3	0.2	0.07	0.54	0.29	-
Statistic Analysis						
	Factor V	Factor T	Factor (T) at same level of V	Factor (T) at different level of V		
CV	139.23	66.08	-	-		
CD	NS	0.19	0.27	0.35		
SE	0.12	0.09	0.13	0.16		

Table: 18 Top Borer % incidence

Varieties/Treatments	T ₁	T ₂	T ₃	T ₄	T ₅	Mean (S)
V1 (Co 0238)	8.6	7.2	0.2	6.0	0.2	4.44
V2 (Co 0118)	6.5	3.0	0.1	5.3	0.3	3.02
Mean (T)	7.5	5.1	0.1	5.6	0.2	-
Statistical Analysis						
	Factor A	Factor B	Factor (B) at same level of A	Factor (A) at different level of B		
CV	N/A	N/A	-	-		
CD	0.231	0.264	0.374	0.406		
SE	0.163	0.187	0.365	0.287		

Production of Trichocards.

The infestation of Top borer controlled by *Trichogramma japonicum* and other borers except top borer by *Trichogramma chilonis*. Trichocards are being produced and selling to cane growers, sugar factories

and also used in research experiment and foundation seed nursery from June to October last week. During 2023-24 (from 1st April 2023 to 31 March 2024) 11063 trichocard has been produced and Rs 3,50,450.00 revenue generated for UPCS, Shahjahanpur.



Bio-efficacy of Voliam Flexi 300 SC (Syngenta's Product).

The experiment was framed during 2022-23 in spring season. This was 2nd year of the experiment. The sugarcane Co0118 variety was planted to evaluate the bio-efficacy of voliam flexi 300 SC (Chlorantraniliprole 8% w/w+ Thiamethoxam 17.5% w/w) against sugarcane insect pest. There were 7 treatments such as:-

- T₁:-Untreated, check (control)
T₂:-Voliam flexi 300 SC @ 400 ml/ha
T₃:-Voliam flexi 300 SC @ 500 ml/ha

- T₄:-Voliam flexi 300 SC @ 600 ml/ha
T₅:-Voliam flexi 300 SC @ 1200 ml/ha
T₆:-Virtako 1.5g @ 10 kg/ha
T₇:- Chlorantraniliprole 18.5 SC @ 375 ml/ha

Trial was characterized in to R.B.D with four replications and performed as per protocol of 2022-23 as soil drenching with 1000 liter water at 35 to 45 days. Almost all the doses of Voliam flexi 300 SC found good against the borers (ESB and top borer). The treatment T₄ (Volim flexi 300 SC @ 600 ml/ha) was showed well to such as ESB & top borer.

Table: 19 The mean data for qualitative character against different treatments (Syngenta Product)

Treatment	Shoot borer cumulative % incidence	Root Borer % Incidence	Top Borer % Incidence	Stalk borer Infestation Index
T ₁ Untreated, check (control)	8.78	65.00	11.68	2.18
T ₂ Voliam flexi 300 SC @ 400 ml/ha	4.54	23.75	3.15	0.23
T ₃ Voliam flexi 300 SC @ 500 ml/ha	3.85	35.00	2.41	0.48
T ₄ Voliam flexi 300 SC @ 600 ml/ha	3.12	27.50	1.07	0.29
T ₅ Voliam flexi 300 SC @ 1200 ml/ha	1.94	12.50	1.76	0.18
T ₆ Virtako 1.5g @ 10 kg/ha	2.40	43.75	2.12	0.29
T ₇ Chlorantraniliprole 18.5 SC @ 375 ml/ha	2.70	36.25	1.73	0.31
C.V.	14.72	50.04	26.88	-
SE.	0.41	12.32	0.67	-
C.D.	0.85	25.89	1.40	-

Bio-efficacy of BAL 175 in Comparison to standard insecticide for control of Early Shoot borer, Top borer and Termites in sugarcane crop (Seedling India Pvt. Ltd).

The experiment was farmed during 2023-24 spring season. This was the first year of the experiment. The sugarcane varieties Co 0118 planted to evaluate the bio-efficacy of photo toxicity and residues analysis of BAL 175 formulation against the Early shoot borer, Top borer and Root borer in sugarcane, there were 9 treatments, such as -

- T₁:- BAL 175@ 1200ml/ha
T₂:- BAL 175@ 1500ml/ha
T₃:- BAL 175@ 1800ml/ha
T₄:- BAL 175@ 3000ml/ha
T₅:- Check 1: Chlorantraniliprole 18.5% SC@ 375 ml/ha

T₆:- Check 2 : Emmamamectin benjoate 5% SG@ 450 g/ha

T₇:- Check 3: Novaluron 10% EC @ 2000 ml/ha

T₈:- Check 4: thiamethoxam 75% W/W SG @ 160 g/ha

T₉:- Untreated Check

T₁₀:-BAL 175 @ 2500ml/ha

Experiment was characterized in to R.B.D with three replications and performed as per protocol of 2023-24 by soil drenching with 1000 liter water, at planting and 30, 60 and 90 days after planting. Almost all the doses BAL 175 found good against the ESB, Top borer & Root borer. The treatment T₃ BAL 175 @ 1800 ml/ha was showed economically well to all the borers such as ESB, Top borer & Root borer.

Table: 20 Mean data for qualitative characters against different treatments (Seedling India Pvt. Ltd. Product).

Treatment	Shoot borer Cumulative % Incidence	Root Borer % Incidence	Top borer % Incidence	Stalk borer Infestation Index
T ₁ BAL 175@ 1200ml/ha	2.19	35.33	0.62	0.20
T ₂ BAL 175@ 1500ml/ha	1.97	26.67	0.52	0.11
T ₃ BAL 175@ 1800ml/ha	1.95	23.67	0.26	0.03
T ₄ BAL 175@ 3000ml/ha	2.11	34.33	0.55	0.16
T ₅ Check 1 Chlorantraniliprole 18.5% SC@ 375 ml/ha	2.16	35.00	0.58	0.18
T ₆ Check 2 Emmamamectin benzoate 5% SG@ 450 g/ha	2.30	49.67	0.76	0.44
T ₇ Check 3 Novaluron 10% EC @ 2000 ml/ha	2.28	44.67	0.69	0.24
T ₈ Check 4 thiamethoxam 75% W/W SG @ 160 g/ha	2.24	36.33	0.66	0.22
T ₉ Untreated Check	5.64	52.33	4.72	1.57
T ₁₀ BAL 175@ 2500ml/ha	2.00	28.33	0.54	0.15
C.V.	28.56	50.61	33.62	-
S.E.	0.51	15.14	0.17	-
C.D.	NS	NS	NS	-

Efficacy of Coragen @ 200 g/l SC against major Lepidopteran insect pests of sugarcane when applied at planting by drenching over cane sett (FMC India Ltd.)

The experiment was framed during 2023-24. This was first year of experiment. The experiment was planted sugarcane varieties Co 0118 with objective, efficacy of Coragen @ 200 g/l SC based application schedule against ESB, Top borer in sugarcane and inclusion of Coragen 200 g/l SC based schedule POP and to record effect of Coragen@200 g/l SC based application schedule on plant growth and yield parameters. There were 6 treatments –

T₁:- Coragen 200 g/l SC @ 375 ml/ha (drenching over cane setts at planting).

T:-T₁+ Ferterra 0.4% G @ 18.75 kg/ha (dropping in line at the June).

T₃:- T₁+ Coragen 200 g/l SC @ 375 ml/ha (in June).

T₄:-T₁+Talstar plus 180 g/l SC (1000 ml /ha at DOP), drenching over cane sett at planting time.

T₅:- Institute (Mechanical control / Biological control/ Fipronil 0.3 GR 20 kg/ha).

T₆:- Untreated (Check).

Experiment was characterized in to R.B.D with 3 replications and performed as per protocol of 2023-24 as soil drenching and dropping with 1000 liter/ha of water. Almost all the doses of Chlorantraniliprole 200 g/l SC@ found good against ESB, Top borer, plant growth, yield parameters and the quantitative attributes of plant. The treatment T₃ Coragen 200 g/l SC @ 375 ml/ha drenching at the time of planting + Coragen 200 g/l SC @ 375 ml/ha (in June) was showed better to Borers.

Table: 21 Mean data for qualitative characters against different treatments (FMC India Pvt. Ltd. Product)

Treatment	ESB Cumulative% Incidence	Root Borer % Incidence	Top borer % Incidence At Harvest	Stalk borer Infestation Index
T ₁ Coragen 200 g/l SC @ 375ml/ha (drenching over cane setts at planting).	2.93	28.33	2.58	0.05
T ₂ T ₁ + Ferterra 0.4% G @ 18.75 kg/ha (Dropping in line near base of shoot June/Pre-monsoon showers).	3.20	18.33	2.50	0.13
T ₃ T ₁ + Coragen 200 g/l SC @ 375 ml/ha (in June).	2.72	16.67	1.70	0.04
T ₄ T ₁ +Talstar plus 180 g/l SC (1000 ml /ha at DOP), drenching over cane sett at planting	3.20	25.00	2.94	0.24
T ₅ Institute standard.	5.52	45.00	3.62	0.26
T ₆ Untreated (Check).	7.85	58.33	6.38	1.42
C.V.	8.02	33.04	29.03	-
SE.	0.28	8.62	0.78	-
C.D.	0.62	NS	1.74	-

Bio-efficacy of UPF 116 against insect pests of sugarcane (UPL Ltd. Bandra. Product)

The experiment was framed during 2023-24. This is first year of the experiment. The sugarcane varieties Co 0118 planted to evaluate the bio-efficacy of UPF, against the insect pests of sugarcane and target pest is white grub, ESB, Top Borer and cut worm, there were 9 treatment –

T₁ UPF 116 @ 937.5 ml/ha.

T₂ UPF 116 @ 1250 ml/ha.

T₃ UPF 116 @ 1562.5 ml/ha.

T₄ Thiamethoxam 30 FS 1042 ml/ha.

T₅ zoxystrobin 23% SC 125 ml/ha.

T₆ Thiophanate methyl 70% WP 201 ml/ha.

T₇ Imidacloprid 48% FS 218.75 ml/ha.

T₈ Untreated Check.

T₉ UPF 116 @ 2500 ml/ha (Phytoxicity).

Experiment was characterized into R.B.D with three replication. The trial was performed as per protocol of 2023-24 as deep the setts with 400 liter water/ha at 30 minute. Almost all the doses of UPF 116 good against, ESB and Top borer,. The treatment T₃ (UPF 116, 1562.5 ml/ha) was showed better control to ESB & Top borer.

Table: 22 Mean data for qualitative characters against different treatments (Seedling India Pvt. Ltd. Product).

Treatment	ESB Cumulative% Incidence	Root Borer % Incidence	Top borer % incidence (harvest)	Stalk borer Infestation Index
T ₁ UPF 116 @ 937.5ml/ha	4.01	65.00	0.35	0.76
T ₂ UPF 116 @ 1250 ml/ha	3.81	45.00	0.18	0.40
T ₃ UPF 116 @ 1562.5 ml/ha	3.52	50.00	0.15	0.74
T ₄ Thiamethoxam 30 FS 1042 ml/ha	4.99	35.00	0.68	1.17
T ₅ Azoxystrobin 23% SC 125 ml/ha	5.10	51.67	0.71	0.08
T ₆ Thiophanate methyl 70% WP 201 ml/ha	4.20	48.33	0.48	0.16
T ₇ Imidacloprid 48% FS 218.75 ml/ha	4.94	28.33	0.57	0.43
T ₈ Untreated Check	8.11	70.00	4.77	1.93
T ₉ UPF 116 @ 2500 ml/ha (phytoxicity)	4.22	28.33	0.54	0.19
C.V.	33.74	50.62	77.94	-
SE.	1.22	19.36	0.31	-
C.D.	NS	NS	NS	-

13. Plant Pathology

Shahjahanpur

Survey of sugarcane diseases in Uttar Pradesh

Surveys were conducted in nineteen sugar mill areas in Central and Western part of UP during the season. Scenario of red rot occurred in previous year and current year are depicted in Fig 1. Severe incidences of red rot recorded up to 100% in Co 0238 in western UP (Fig 2). In central UP incidence of red gradually reduced due to replacement of Co 0238 in almost all the sugar mill areas. Occurrence of red rot in Co 0238, Co 0118, CoPk 05191 and CoJ 85 was observed in various sugar mill areas. Red rot infection through aerial movement was also notice on Co 0238 in September month after heavy rain fall (Fig3). A wide range of red rot incidence was mentioned in Table 1. Mix infection of red rot and wilt was also recorded 20 to 100 per cent on Co 0238 and CoJ 85 in Rani Naagal (Moradabad) mill areas. In addition, the cane varieties such as Co 0238, Co 0118, Co 15023 and CoLk 14201 displayed wilt incidences up to 20 per cent. The incidence of whip smut was recorded from 1 to 12 per cent in varieties

namely Co 0238, CoS 13231, CoS 13235, Co 0118, Co 15023, CoLk 14201, Co 98014 and CoS 8436 in Rosa, Aira, Ajbapur, Nigohi, Faridpur, Jawaharpur, Khambarkheda, Loni, Rupapur, Hargaon and Palia sugar mill areas. The incidence of pokkah boeng was recorded from 2 to 25 per cent on Co 0238, Co 0118, CoS 08279, Co 98014, CoJ 85, CoLk 14201, CoS 13235, CoPk 05191 and CoLk 94184 at various sugar factory areas. YL and mosaic were more common with 30 per cent incidence across the varieties in different districts in the state. The incidence GSD was observed up to 1-10 per cent in various sugar mill areas. Incidence of some minor diseases of sugarcane like leaf binding, leaf fleck, red stripe, leaf scald and banded sclerotial were also found in traces on different sugarcane varieties in various sugar mill area. Stem Gall (Physiological disorder) was also observed up to 30 per cent on varieties CoS 17231 and Co 0238 due to irregular application 2,4 D etc. in Pilibhit, Gola and Shahjahanpur.

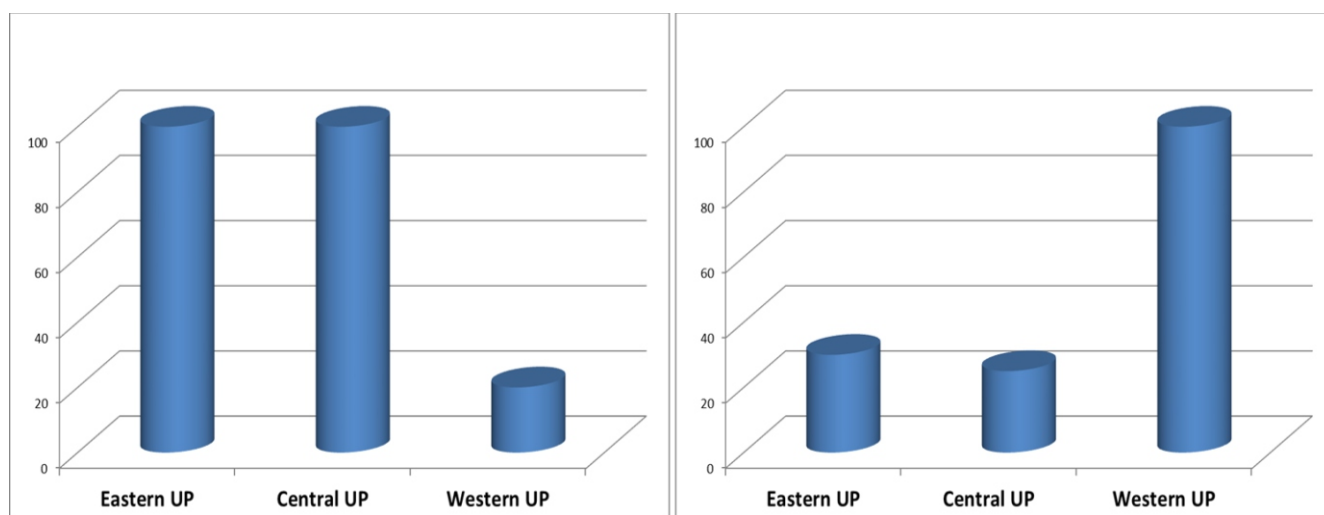


Fig 1. Scenario of red rot in eastern, central and western UP in 2019-20 (Left) and 2023-24 (Right)

Table 1.Incidence of red rot reported in various sugar mill areas.

Sl. No.	Name of sugar mill area surveyed	District	% incidence	Varieties affected	Crop stage
1	Rosa	Shahjahanpur	10-50	Co 0238	8 Months
			15-20	CoPk 05191	7 Months
2	Nigohi	Shahjahanpur	2-10	Co 0238	7 Months
3	Maksoodapur	Shahjahanpur	5-20	Co 0238	7 Months
4	Hargaon	Sitapur	2-5	Co 0238	8 Months
5	Jawaharpur	Sitapur	2-5	Co 0238	4 Months
6	Ajbapur	LakhmpurKheri	5-10	Co 0238	4 Months
7	Gularia	LakhmpurKheri	5-20	Co 0238	5 Months
8	Loni	Hardoi	2-20	Co 0238	6 Months
9	Rupapur	Hardoi	1-5	Co 0238	4 Months
10	Aira	LakhmpurKheri	3-10	Co 0238	4 Months
			0-6	CoPk 05191	4 Months
			0-10	Co 0118	5 Months
11	Faridpur	Bareilly	3-60	Co 0238	8 Months
			0-3	CoS 8436	4 Months
			0-6	Co 0118	4 Months
12	Rani Nangal	Moradabad	20-100	Co 0238	5 Months
			100	CoJ 85	6 Months
13	Belwara	Moradabad	10-85	Co 0238	5 Months
14	Agwanpur	Moradabad	20-90	Co 0238	6 Months
15	Belari	Moradabad	20-40	Co 0238	7 Months
16	Pooranpur	Pilibhit	40-50	Co 0238	5 Months
17	Pilibhit	Pilibhit	60-80	Co 0238	7 Months
18	Rampur	Rampur	80	Co 0238	8 Months
19	Parle Sugar Mill	Bahraich	2-5	Co 0238, Unknown variety	9 Months

**Fig 2.**Complete foliage drying of variety Co 0238 in Rani Nangal area of Muradabad district.**Fig 3.**Red rot infection through aerial movement.

Collection and maintenance of pathogenic isolates of sugarcane diseases

The nineteen new isolates (R 2301 to R 2319) of *C. falcatum* were collected and isolated from variety Co 0238, CoS 20234 (M.Nagar), CoS 20234 (Shahjahanpur), UP 22451, CoPk 05191, CoLk 94184, CoS 19233 and CoJ 85 of different sugar factory areas. Out of 19 isolates of *C. falcatum*, twelve isolates were isolated from variety Co 0238 and other isolates were isolated from different cane varieties namely, CoS 20234 (2 isolates), CoS19233 (1 isolate), CoPk 05191 (1isolate), CoLk 94184 (1 isolate), UP 22451 (1 isolate) and CoJ 85 (1 Isolates) of different sugar factory areas. The nineteen new isolates along with 8 designated pathotypes namely CF 01, CF 02, CF 03, CF 07, CF 08, CF 09, CF 11, CF 13 were cultured and maintained in laboratory for further experimental study.

Characterization and identification of pathotypes/races of red rot pathogen

Ten new isolates (Cf0238, Cf05191, Cf98014) along with 8 designated pathotypes (CF 01, CF 02, CF 03, CF 07, CF 08, CF 09, CF 11, CF 13) were inoculated and disease intensity was rated on 20 host differentials for pathogenic variability. The twenty host differentials viz, Co 419, Co 975, Co 997, Co 1148, Co 7717, Co 62399, CoC 671, CoJ 64, CoS 767, CoS 8436, BO 91, Baragua (*S. officinarum*), Kakhai (*S. sinense*) and SES 594 (*S. spontaneum*), Co 7805, Co 86002, Co 86032, CoSe 95422, CoV 92102 and Co 0238 were used for pathogenic variability of all the isolates by plug method of inoculation. Disease intensity was assessed on the basis of resistant (R), intermediate (X) and susceptible (S) reaction.

The differentials viz, CoS 8436, CoSe 95422, BO 91 and SES 594 exhibited universal resistant behaviour to all the isolates and pathotypes. All the isolates of Cf0238 exhibited virulent behaviour on host differentials such as Co 62399, CoC 671, Co 86032 and Co 0238. The isolates Cf 05191, Cf 98014, and Cf 0238 exhibited almost similar trend of pathogenic virulence on the host differentials. The all isolates of Cf 0238, Cf 98014 and Cf 05191 exhibited similar pathogenic pattern to Cf 0238 while standard pathotypes CF 07, CF 08 and CF 09 exhibited the contrast pathogenic behaviour on same differentials (Co 62399, CoC 671, Co 86032, Co 0238). The red rot development on differential hosts indicated that all the seven pathotypes exhibited more or less similar reactions except CF 13 pathotype and all tested isolates. Result revealed that all collected isolates also originated from of prevalent pathotypes CF 13 (Co 0238) variety.

Evaluation of genotypes/varieties for resistance to red rot

The promising elite genotypes along with standard varieties were evaluated against two red rot standard pathotypes i.e. CF 08 and CF 13 in state varietal trial, preliminary varietal trial and second generation trial by plug method and nodal cotton swab (NCS) method of inoculation. Inoculation was done in second week of August, 2023 with *C. falcatum* conidial suspension. The canes were cut at ground level and were split open longitudinally to assess red rot severity inside the canes after 60 days of inoculation. The following parameters, viz., lesion width, nodal transgression, presence of white spots and condition of the crown, were considered for assessing red rot severity, and they were given maximum scores of 3, 3, 2 and 1, respectively. The disease severity was rated according to standard disease scale of 0 to 9. The disease reactions were scored as resistant (0–2.0, R), moderately resistant (2.1–4.0, MR), moderately susceptible (4.1–6.0, MS), susceptible (6.1–8.0, S) and highly susceptible (8.1–9.0, HS). Red rot susceptible standard Co 0238 and CoJ 64 were used accordingly (Fig. 4).

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State varietal trial (SVT) I plant:

A total of eight genotypes and three standards viz. Co 0238, CoJ 64 and CoS 767 were evaluated against red rot pathotypes CF 08 and CF 13 separately by plug and NCS method. Out of 8, seven genotypes viz; CoS 20232, CoS 21231, CoS 21232, CoS 21233, S. 27/17, S. 310/16 and UP 21452 exhibited moderately resistant (R/MR) to CF 08 and CF 13 pathotypes by plug and resistant (R) to NCS method. The genotypes such as CoS 20231 was evaluated MR to CF 08 and MS to CF 13 by plug and R to both pathotypes by NCS method. Susceptible standard Co 0238 and CoJ 64 expressed HS reaction to CF 13 and CF 08, respectively (Fig 4).

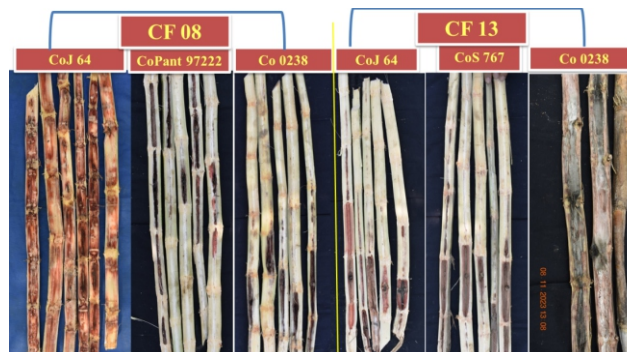


Fig 4. Red rot disease behaviour of standard varieties.



State varietal trial (SVT) IInd plant:

A total of eleven new genotypes were judged against CF 08 and CF 13 separately by plug and NCS method. Out of 11 genotypes, five genotypes namely CoLk 18201, CoS 19231, Seo. 565/16, Seo 85/15 and Seo 1019/16 were identified as MR to both pathotypes by plug and R to NCS method of inoculation. Three genotype namely CoLk 18203, CoS 19234 and S. 188/15 was rated as R/MR to CF 08 by plug and R by NCS method. The genotypes CoLk 18203 and S. 188/15 were evaluated MS to CF 13 by plug, R and S by NCS method, respectively. Two genotypes CoLk 18204 and Seo. 158/16 was expressed MS to both pathotypes and CoS 19233 found S/HS to both pathotypes by plug, and S by NCS method. Susceptible standard Co 0238 and CoJ 64 expressed HS reaction to CF 13 and CF 07/08, respectively.

Preliminary varietal trial (PVT)

A total of one hundred eleven elite genotypes along with two red rot standards were tested to red rot using two pathotypes CF 08 and CF 13 separately by plug and NCS method of inoculation. Red rot susceptible CoJ 64 and Co 0238 were found dry (HS) to CF 08 and CF 13 pathotypes, respectively.

Pathotype CF 08: Out of 111 genotypes, sixty eight genotypes viz, S. 04/19, S. 21/19, S. 22/19, S. 42/19, S. 58/19, S. 74/19, S. 78/19, S. 86/19, S. 113/19, S. 105/19, S. 114/19, S. 120/19, S. 121/19, S. 122/19, S. 144/19, S. 147/19, S. 159/19, S. 168/19, S. 211/19, S. 216/19, S. 222/19, S. 229/19, S. 234/19, S. 236/19, S. 240/19, S. 274/19, S. 303/19, S. 307/19, S. 311/19, S. 313/19, S. 314/19, S. 323/19, S. 327/19, S. 328/19, S. 340/19, S. 344/19, S. 361/19, S. 371/19, S. 372/19, S. 383/19, S. 402/19, S. 403/19, S. 404/19, S. 411/19, S. 423/19, S. 428/19, S. 429/19, S. 430/19, S. 431/19, S. 434/19, S. 437/19, S. 439/19, S. 440/19, S. 449/19, S. 456/19, S. 459/19, S. 461/19, S. 468/19, S. 472/19, S. 473/19, S. 481/19, S. 488/19, S. 488/19, S. 493/19, S. 494/19, S. 510/19, S. 511/19 and S. 1531/19 were identified R/MR to CF 08 by plug and R by NCS method. Eleven genotype such as S. 05/19, S. 151/19, S. 215/19, S. 238/19, S. 271/19, S. 277/19, S. 330/19, S. 336/19, S. 346/19, S. 390/19 and S. 422/19 were evaluated MS by plug and R by NCS method. Thirty one genotype such as S. 23/19, S. 70/19, S. 80/19, S. 125/19, S. 145/19, S. 146/19, S. 148/19, S. 149/19, S. 154/19, S. 160/19, S. 163/19, S. 169/19, S. 200/19, S. 217/19, S. 244/19, S. 269/19, S. 301/19, S. 304/19, S. 306/19, S. 375/19, S.

389/19, S. 392/19, S. 406/19, S. 407/19, S. 413/19, S. 418/19, S. 452/19, S. 466/19, S. 470/19, S. 475/19 and S. 483/19 was screened S/HS by plug and S by NCS method. One genotypes S. 202/19 was not germinated.

Pathotype CF 13: Out of 111 genotypes, sixty one genotypes such as S. 04/19, S. 05/19, S. 22/19, S. 42/19, S. 58/19, S. 74/19, S. 78/19, S. 86/19, S. 105/19, S. 122/19, S. 145/19, S. 151/19, S. 154/19, S. 159/19, S. 160/19, S. 163/19, S. 200/19, S. 211/19, S. 215/19, S. 216/19, S. 217/19, S. 234/19, S. 236/19, S. 238/19, S. 240/19, S. 269/19, S. 307/19, S. 311/19, S. 313/19, S. 323/19, S. 327/19, S. 330/19, S. 340/19, S. 344/19, S. 361/19, S. 371/19, S. 383/19, S. 389/19, S. 390/19, S. 402/19, S. 403/19, S. 407/19, S. 418/19, S. 422/19, S. 428/19, S. 430/19, S. 431/19, S. 437/19, S. 439/19, S. 456/19, S. 459/19, S. 461/19, S. 468/19, S. 472/19, S. 473/19, S. 475/19, S. 481/19, S. 488/19, S. 488/19, S. 493/19 and S. 494/19 were evaluated R/MR by plug and R by NCS method. Fifteen genotypes such as S. 113/19, S. 114/19, S. 146/19, S. 149/19, S. 148/19, S. 222/19, S. 301/19, S. 303/19, S. 346/19, S. 392/19, S. 423/19, S. 434/19, S. 466/19, S. 510/19 and S. 1531/19 were recorded MS by plug and R by NCS method. Thirty one genotypes such as S. 21/19, S. 23/19, S. 70/19, S. 80/19, S. 121/19, S. 125/19, S. 147/19, S. 168/19, S. 169/19, S. 229/19, S. 244/19, S. 271/19, S. 274/19, S. 277/19, S. 304/19, S. 306/19, S. 314/19, S. 328/19, S. 336/19, S. 372/19, S. 375/19, S. 404/19, S. 406/19, S. 411/19, S. 413/19, S. 429/19, S. 440/19, S. 449/19, S. 452/19, S. 483/19 and S. 511/19 were found S/HS by plug and S by NCS method. Four genotypes S. 202/19 was not germinated.

C₂ generation

Sixty five newly developed progenies were examined against red rot resistance by using two standard pathotypes namely CF 08 and CF 13 by plug and NCS method of inoculation. Red rot susceptible standard CoJ 64 expressed HS reaction to CF 08 and Co 0238 as HS to CF 13 pathotypes. The results are as follow:

Pathotype CF 08 and CF 13: A total of thirty one out of 65 progenies viz, S. 10/20, S. 16/20, S. 18/20, S. 20/20, S. 23/20, S. 24/20, S. 25/20, S. 31/20, S. 32/20, S. 33/20, S. 38/20, S. 47/20, S. 49/20, S. 60/20, S. 63/20, S. 66/20, S. 73/20, S. 75/20, S. 87/20, S. 88/20, S. 88/20, S. 94/20, S. 97/20, S. 103/20, S. 110/20, S. 113/20, S. 131/20, S. 143/20, S. 159/20, S. 161/20 and S. 163/20 were evaluated R/MR by plug and R by NCS method of inoculation to both the pathotypes.



Pathotype CF 08: Out of 65 genotypes, 12 progenies such as S. 03/20, S. 13/20, S. 37/20, S. 40/20, S. 43/20, S. 55/20, S. 77/20, S. 78/20, S. 79/20, S. 82/20, S. 89/20 and S. 102/20 were screened as R/MR by plug and R by NCS method. Forty progenies such as S. 01/20, S. 11/20, S. 17/20, S. 27/20, S. 29/20, S. 62/20, S. 80/20, S. 96/20, S. 99/20, S. 106/20, S. 116/20, S. 147/20, S. 153/20 and S. 173/20 were screened as MS by plug and R/S by NCS method. The 45 progenies i.e. S. 07/20, S. 15/20, S. 34/20, S. 56/20, S. 91/20, S. 100/20, S. 105/20 and S. 138/20 were screened as S/HS by plug and S to NCS Method of inoculation.

Pathotype CF 13: Out of 65 genotypes, 8 genotypes viz. S. 11/20, S. 15/20, S. 34/20, S. 100/20, S. 105/20, S. 116/20, S. 138/20 and S. 153/20 were showed R/MR reaction by plug and R by NCS method. Six genotypes namely S. 03/20, S. 55/20, S. 77/20, S. 78/20, S. 80/20 and S. 82/20 were showed MS reaction by plug and R/S by NCS method. The 56 genotypes such as S. 01/20, S. 07/20, S. 13/20, S. 37/20, S. 40/20, S. 43/20, S. 56/20, S. 62/20, S. 79/20, S. 91/20, S. 96/20, S. 99/20, S. 102/20, S. 106/20 and S. 147/20 were showed S/HS reaction to Plug method and S to NCS Method of inoculation. One genotypes S. 173/20 was not germinated.

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Multiplication trial: Ten genotypes were tested against CF 08 and CF 13 pathotypes. Six genotypes viz. S. 188/15, S. 310/16, S. 320/17, S. 155/17, S. 2599/17 and S. 168/17 were assessed R/MR reaction to all the aforesaid pathotypes by plug and R by NCS method of inoculation. The genotype S. 1935/18, S. 2032/18 was graded as MS to CF 08 and MR to CF 13 by plug and R by NCS method of inoculation. One genotype S. 374/17 was found Sto CF 08 and MrS to CF 13 by plug method of inoculation. The genotype S. 2186/18 was found MR to CF 08 and HS to CF 13. Susceptible standard Co 0238 and CoJ 64 expressed HS reaction to CF 13 and CF 08 pathotypes.

State varietal trial (SVT) Ist Plant: Eight genotypes and two red standards were tested against CF 08, and CF 13 pathotypes independently by plug and NCS method of inoculation. Six genotypes such as CoSe 21451, CoS 21231, S. 27/17, CoS 20232, U.P. 21452 and CoS 21233 were screened as R/MR to CF 08 and CF 13 by plug and R by NCS method of inoculation. The genotype S. 310/16 and CoS 21232 were evaluated as MR to CF 08

and MS to CF 13 by plug and R by NCS method.

Evaluation of genotypes/varieties for resistance to smut

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State varietal trial (SVT) Ist plant: Smut resistance data was evaluated among eight genotypes. The variety Co 1158 was used as susceptible check to smut. Six out of 11 genotypes such as CoS 21231, CoS 21232, CoS 21233, S. 27/17, S. 310/16 and UP 21452 were identified R/MR against smut. Two genotypes namely CoS 20231 and CoS 20232 were evaluated MS against smut.

State varietal trial (SVT) IInd plant: A total of 11 genotypes were tested for smut resistance and among them four genotypes viz. CoLk 18203, CoS 19233, Seo. 565/16 and Seo. 1019/16 were identified as R/MR against smut. Four genotypes namely CoLk 18201, CoS 19231, CoS 19234 and Seo. 685/15 were MS against smut. Three genotypes such as CoLk 18204, S. 188/15 and Seo. 158/16 were assessed as S to smut disease against smut.

Preliminary varietal trial (PVT): A total of 111 genotypes and two standards were evaluated against smut. One hundred genotypes were evaluated as R/MR, Six as MS and 2 as S/HS to smut. The smut evaluation work would be further repeated in next year.

C₂ generation: Total 65 progenies were evaluated against smut. The fifty two genotypes were found R/MR, five as MS, and seven as S/HS against smut. This data would be repeated further in next year.

Studies on the incidence of diseases in autumn and spring planted crop of sugarcane

This experiment was carried out under natural condition in breeding experimental trials. Periodic observations of various diseases namely red rot, smut, wilt, grassy shoot disease (GSD), leaf scald, pokkah boeng (PB), SCMV, bacterial rot (BR), leaf flack and leaf binding were inspected during season. Eight genotypes along with 4 standards were studied against natural incidence under SVT (Ist Plant). In this trial, minor diseases namely BS, PB, SCMV and BR were noticed with various incidence levels.

In SVT (IInd Plant), twelve genotypes and 4 standards were assessed for various diseases under natural condition. The incidence of red rot was examined 22% on CoS 19333. Pokkah boeng was found from 2 to 21



percent incidence. Wide range of SCMV observed from 10% (CoS 19233) to 40% (CoS 19231). In SVT (Ratoon), incidence of red rot observed 35% on CoS 19233 followed by 18% on CoS 20234. GSD, PB, SCMV and bacterial rot were also assessed in ratoon trial. Under PVT, red rot was recorded 8 per cent on S. 121/19, and a wide range of PB disease varied from 1 to 44 per cent. The range of SCMV, banded sclerotial, GSD, banded chlorosis and bacterial rot disease was also found on different genotypes. The susceptible genotypes identified at early stage for major diseases like red rot, smut and wilt under natural condition in breeding trial. Based on this data, susceptible genotypes may be dropped down at this stage prior to further selection process.

Management of yellow leaf disease through meristem culture

Four sugarcane varieties such as Co 15023, CoS 16233, CoS 13235 and CoLk 14201 produced for virus free healthy seed in tissue culture lab at Sugarcane Research Institute, Shahjahanpur. These tissue culture raised plantlets were observed free from yellow leaf virus. A total of 17000 plantlets of above varieties raised through meristem culture were transplanted in to glass house and 13420 plantlets was transplanted in the field for the production of breeder seed and also close observation was done for yellow leaf disease. The maximum seedlings were survived after transplanting in field. The result revealed that the breeder seed raised by tissue culture are free from yellow leaf disease morphologically. The tissue culture raised breeder seed would be planted for next season as foundation seed.

Behaviour of primary infection of *C. falcatum* in sugarcane varieties having different red rot resistance level

An experiment was conducted to investigate the epidemiology of soil borne inoculum of red rot in sugarcane varieties with various resistance levels and to compare the reaction of new isolates/pathogen from two methods of infections i.e. soil borne inoculum and artificially inoculated infection. In this experiment seventeen varieties such as Co 0238, Co 62399, CoJ 64, CoS 767, Co 0118, Co 98014, CoS 13235, Co 15023, CoLk 14201, CoS 08272, CoS 08279, UP 05125, CoS 13231, CoS 09232, CoSe 13452, CoS 09232 and CoS 17231 were taken for study having different

disease resistance level. Impact of *C. falcatum* on bud germination and post-emergent death of sprouts was assessed as death of buds and drying of germinated sprouts, respectively.

Of seventeen varieties, the results very clearly indicated that resistant variety like CoS 08279, CoS 08272, Co 98014, Co 0118, CoC 671, Co 62399 and Co 0238 suffer due to the origin of new strain *C. falcatum* and expressed susceptibility. The germination percentage reduced in CoS 08279 (22.99%), CoS 08272 (19.14%), Co 98014 (5.56%), Co 0118 (23.15%), Co 62399 (14.66%) and Co 0238 (17.28%) in field condition (Table 2). Apart from these susceptible varieties, resistant varieties recorded no any reduction in germination. Ten resistant varieties such as CoLk 14201, CoS 17231, CoS 16233, CoSe 13452, CoS 09232, CoS 13231, UP 05125, CoJ 64, CoS 767 and Co 15023 exhibited MR reaction and germination losses was not recorded against soil in inoculum of three *C. falcatum* isolates. The seven varieties namely Co 0118, Co 98014, CoS 08272, CoS 08279, Co 0238 and Co 62399 exhibited susceptible to soil inoculum of all the *C. falcatum* isolates. The mean pre-emergence reduction was also recorded in Co 0118 (61.74%), Co 98014 (88.23%), CoS 08272 (58.58%), CoS 08279 (55.13%), Co 0238 (56.79%) and Co 62399 (61.92%), and expressed susceptible reaction by plug to all isolates (Fig 5). Impact of *C. falcatum* on bud germination and post emergent death of sprouts was assessed in Co 0118 (18.89%), Co 98014 (38.89%), CoS 08272 (18.29%), CoS 08279 (8.69%), Co 0238 (31.02%) and Co 62399 (1.04%) as drying of germinated sprouts. Germination in the *C. falcatum* inoculated plots was compared with pathogen-free control plots. In control plots, all the 17 test varieties were planted and found healthy canes without pathogen inoculum.

The two years data revealed that how red rot disease attains epidemic level due to favourable environment in endemic regions. The cane varieties namely Co 0118, Co 98014, CoS 08272, CoS 08279 should avoid for general cultivation in endemic regions of CF 13, is a prevalent virulent pathotype. Overall, this study has given a clear understanding on the role of soil borne inoculum of *C. falcatum* in causing germination losses, disease in the crop and field tolerance in some varieties.

Table 2. Impact of *C. falcatum* inoculum applied to the

soil on sett germination (%) in different sugarcane varieties.

Sl. No.	Varieties	Germination %				
		CF13	Cf 08279	Cf 05191	Mean	Healthy
1	CoLk 14201	46.76	42.59	34.26	41.20	42.5
2	CoS 17231	43.06	40.28	32.41	38.58	40.23
3	CoS 16233	37.50	37.50	36.57	37.19	42.5
4	CoSe 13452	33.80	36.11	48.15	39.35	45.2
5	CoS 09232	51.39	64.81	59.26	58.49	41.23
6	CoS 13231	39.35	35.65	34.26	36.42	42.23
7	Co 0238	6.48	16.20	29.17	17.28	40
8	CoS 13235	43.06	34.72	49.07	42.28	43.5
9	UP 05125	51.39	52.31	39.35	47.69	55.45
10	CoS 08272	3.70	18.52	35.19	19.14	46.2
11	CoS 08279	20.37	10.65	37.96	22.99	51.24
12	CoJ 64	41.20	36.57	35.65	37.81	40.5
13	CoS 767	37.50	35.19	34.26	35.65	43.65
14	Co 62399	6.94	7.87	29.17	14.66	38.5
15	Co 0118	11.11	12.04	46.30	23.15	41.5
16	Co 15023	44.44	45.37	40.28	43.36	56.48
17	Co 98014	1.85	1.85	12.96	5.56	47.2
	CD	11.59	7.02	13.39	-	-
	SE (d)	5.69	3.45	6.57	-	-
	CV	22.80	13.60	21.57	-	-

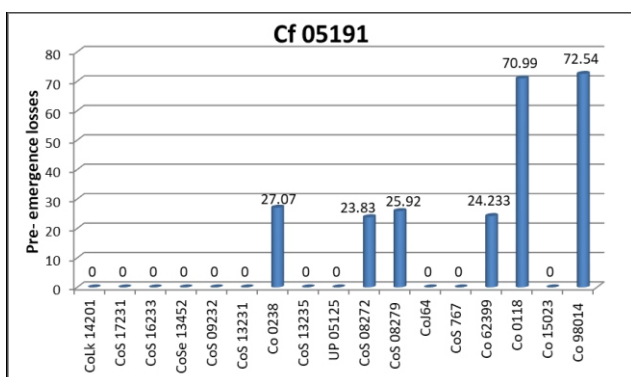
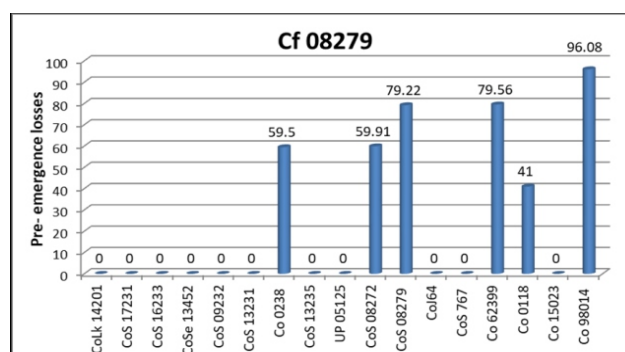
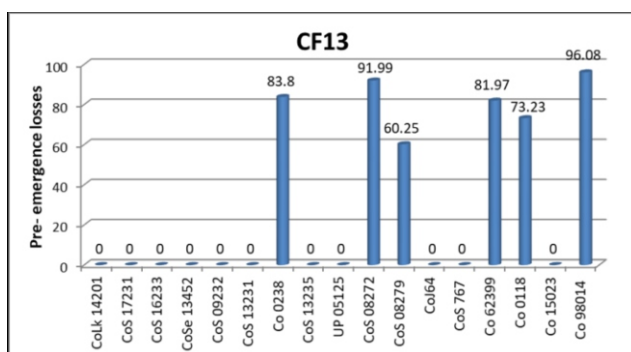


Fig 5. Pre-emergence losses in germination (Per cent) due to *C. falcatum* inoculum applied to soil at the time of planting.

Management of soil inoculum of *Colletotrichum falcatum* causing red rot in sugarcane

This experiment was conducted for the management soil inoculum of *Colletotrichum falcatum* by using the different agrochemicals. The trial was performed during the year by using soil drenching, sett treatment with fungicides and sett treatment device (STD). The sorghum grain with red rot inoculum (150 g of grain inoculum/ 20 feet row) was applied at the time of planting for the induction of primary infection of red rot. There were nine treatments such as T₁- Application of bleaching power @10 Kg per ha with sand; T₂- Application of Thiophanate Methyl with soaking at planting; T₃- Application of Carbendazim

with soaking at planting; T₄- Application of *Trichoderma* @10 Kg per ha and at 45 and 90 DAP; T₅- Application of *pseudomonas* @10 Kg per ha and at 45 and 90 DAP; T₆- Drenching of Thiophanate Methyl at planting and 45 and 90 DAP; T₇- Mechanized sett treatment with Thiophanate Methyl; T₈- Untreated plot (With soil borne inoculum) and T₉- Healthy plot (Without soil borne) were characterized into randomized block design with three replications.

Maximum germination (50%) was found in T₉ healthy treatment followed by 47.92 per cent in T₇, maximum shoot population (140739.84/ha) was found in T₉ treatment followed by T₂ and T₆, maximum number of millable cane (107406.72/ha) was recorded in T₉ treatment followed by T₆ and T₇ (Table 3). The primary

incidence of red rot was observed maximum in T₈ (Untreated plot) from early month of April to June. The primary incidence of red rot was also assessed in almost all the treatments except T₉. In the month of July, secondary incidences of red rot also found in T₉ (5.78%). The very less primary infection of red rot was not recorded in T₇ and T₆ treatments (Table 4). The final data revealed that drenching of Thiophanate Methyl at planting and at 45 and 90 DAP and mechanized sett treatment with Thiophanate Methyl were exhibited good results to prevent primary incidence of red rot and also enhance the germination, and all other quantitative parameters. Soaking with Thiophanate Methyl and carbendazime also found good for red rot management.

Table 3. Mean data of Per cent germination; Shoot population (per ha), Number of millable cane (NMC) and yield.

Treatment	Germination (30 DAP)	Germination (45 DAP)	Shoot Pop. (Per ha)	NMC (Per ha)
T ₁	16.67	25.00	107715.36	89814.24
T ₂	33.33	40.74	127468.32	98456.16
T ₃	27.78	31.25	121912.80	82406.88
T ₄	16.67	30.09	106172.16	79629.12
T ₅	22.92	30.79	100925.28	76542.72
T ₆	34.72	45.83	126851.04	101542.56
T ₇	34.72	47.92	123147.36	99382.08
T ₈	12.27	22.45	53703.36	35184.96
T ₉	27.08	50.23	140739.84	107406.72
CD	10.49	4.75	29711	25294
SE (m)	3.47	1.57	9825	8365
CV	23.91	7.56	15.19	16.92

Table 4. Primary and secondary incidence of red rot.

Treatments	April	May	June	Mean (Primary)	July	August	September	Mean (Secondary)
T ₁	0.83	2.72	0.53	1.36	0.33	3.01	3.39	2.25
T ₂	0.64	0.64	0.25	0.51	0.46	2.23	2.76	1.82
T ₃	0.00	0.69	0.27	0.32	0.23	2.09	3.84	2.06
T ₄	0.00	0.83	0.51	0.45	0.51	2.59	7.48	3.52
T ₅	1.59	0.85	0.28	0.91	1.48	7.52	8.26	5.75
T ₆	0.00	0.00	0.74	0.25	2.25	3.90	7.93	4.69
T ₇	0.00	0.00	0.53	0.18	0.82	4.34	2.53	2.56
T ₈ (U)	14.48	5.45	11.36	10.43	12.61	13.63	4.12	10.12
T ₉ (H)	0.00	0.00	0.00	0.0	1.79	9.76	5.79	5.78
CD	1.99	1.88	2.89	-	3.27	6.76	NS	-
SE (m)	0.65	0.62	0.95	-	1.08	2.23	2.77	-
CV	58.56	86.79	87.73	-	82.33	71.10	93.64	-

Bio-control activity of *Stenotrophomonas maltophilia* strain B2132 and *Pseudomonas studzerry* B2133 against red rot of sugarcane

An experiment was conducted to evaluate the efficacy of novel bacterial strains *Stenotrophomonas maltophilia* B2132 and *Pseudomonas studzerry* B2133 on red rot management under field conditions. The sorghum grain with red rot inoculum (150 g of grain inoculum/20 ft) row was applied in different six treatments at the time of planting. The susceptible variety Co 0238 (CF13) was used for planting. The experiment was conducted in split plot design with three replications. The treatments were characterized into two split plot design such as main plot (S1 - Bacterial strain, B2132 and S2 - Bacterial strain, B2133) and sub-plot (Treatments). The efficacy of five different bacterial treatments *viz*; T₁; Bud soaking in bacterial suspension for 1 hr, T₂; Bud soaking in bacterial suspension for 24 hrs, T₃; Drenching of bacterial suspension over cane set at planting and 7 Days interval till germinating stage,

T₄; Bud treated in bacterial suspension with sett treatment device, T₅; Bacterial suspension alone (15 min), T₆; *Trichoderma* treated alone (15 min) were conducted with Untreated control (T₇) were tested individually against red rot in natural condition.

The results indicated that, new bacterial strain B2132 soaking in 24 hrs and *Trichoderma* were effective against red rot followed by other treatments. Germination and shoot population were also recorded high in bacterial treated plot (T₂) as compare to untreated plot (T₇). Primary and secondary incidence of red rot was found low in T₁ treatment and T₂ as compare to control (T₇). Soaking of bud either 1 h or 24 hrs were recorded good to prevent primary incidence of red rot and also enhance the germination, and all other quantitative parameters. Overall, bacterial strain B2132 was recorded effective against red rot and also to enhance the growth, which offers not only a disease control but also improves yield of sugarcane crop (Table 5-7).

Table 5. Two way table of germination per cent data.

Treatments	T ₁	T ₂	T ₃	T ₄	T ₅	T ₆	T ₇	Mean (B)
B 2132	40.05	43.06	28.70	40.51	39.81	41.44	28.94	37.50
B 2133	37.04	43.75	31.02	32.41	34.49	37.50	27.31	34.79
Mean (T)	38.54	43.40	29.86	36.46	37.15	39.47	28.13	

Table 6. Primary incidence of red rot data of seven treatments of both the bacterial.

Treatments	T ₁	T ₂	T ₃	T ₄	T ₅	T ₆	T ₇	Mean (B)
B 2132	1.08	1.15	1.92	0.65	0.37	0.00	7.13	1.76
B 2133	1.61	1.45	2.25	2.07	0.85	0.53	8.18	2.42
Mean (T)	1.35	1.30	2.08	1.36	0.61	0.26	7.66	

Statistical analysis of primary infection of red rot

	Factor B	Factor T	Factor (T) at same level of B	Factor (S) at same level of T
CD	NS	1.58	NS	NS
SE (m)	0.16	0.53	0.43	0.72
SE (d)	0.23	0.76	1.07	1.02

Table 7. Secondary incidence of red rot data of seven treatments of both the bacterial.

Treatments	T ₁	T ₂	T ₃	T ₄	T ₅	T ₆	T ₇	Mean (B)
B 2132	4.02	4.20	4.27	4.11	2.54	3.72	6.79	4.24
B 2133	4.45	7.54	7.42	7.95	5.61	2.87	11.47	6.76
Mean (T)	4.24	5.87	5.84	6.03	4.08	3.3	9.13	-

Raising of single bud settling by using red rot infected sugarcane bagasse

An experiment was conducted to evaluate the impact of different treatments of red rot infected sugarcane bagasse on raising the single bud settling in poly tray under glass house conditions. The susceptible variety Co 0238 (CF13) was used for planting. The red rot inoculum was applied in all the 10 treatments except healthy bagasse at the time of planting. There were ten treatments such as T₁- Bagasse of healthy canes (untreated); T₂- Bagasse of healthy canes (treated) at 1000C for two hours; T₃- Bagasse of red rot infected cane (untreated); T₄- Bagasse of red rot infected cane (treated) at 1000C for two hours; T₅- Bagasse+C. *falcatum* suspension+treated with carbendazim; T₆- Bagasse + C. *falcatum* suspension + TPM (Thiophanate methyl); T₇- Bagasse + C. *falcatum* suspension + *Trichoderma* culture; T₈- Bagasse + C. *falcatum* suspension + eye buds treated with TPM in STD; T₉- Bagasse + C. *falcatum* suspension + B2132 and T₁₀- Bagasse + C. *falcatum* suspension +B2133 were characterized into randomized block design with three replications. Sugarcane bagasse was collected and

prepared from institute's sugarcane crusher machine, and healthy (T₂) and infected bagasse (T₄) were oven-dried for 2hrs at 1000C, pulverized, cleaned and then retained at normal temperature for further use rest bagasse were treated with respective fungicides etc.

Maximum plant survival was recorded 60.27 per cent (Sett Treatment Device) in T₈ followed by 33.04 per cent in T₅. Highest germination was found 62% and very less red rot incidence was recorded up to 2.38% in T₈ treatment followed by 34.67% in T₅ and 3.51% red rot recorded in T₅ treatment. Result revealed that the mechanized way of treatment of buds with TPM exhibited good result to prevent primary incidence of red rot from infected bagasse and also enhance the germination, and all other quantitative traits. Soaking of bud with carbendazim and TPM were also observed better to reduce the red rot infection from infected bagasse. Maximum plant survival was recorded in sett treatment device with TPM followed by carbendazim and bacterial suspension (B3132). All the growth related data are depicted in Table 8 and Fig. 6.

Table 8. Germination, red rot incidence and growth related data of all the treated buds in poly tray under glass house condition.

Sl. No.	Treatments	Germination (%)	Red rot incidence (%)	Actual Plant Survival (%)	Shoot diameter (mm)	Leaf Area (cm ²)	Shoot Height (cm)	Plant Height (cm)
1	T ₁	28.00	2.38	27.08	2.40	23.12	7.31	39.70
2	T ₂	30.67	8.89	28.15	2.27	22.82	6.22	37.13
3	T ₃	27.33	10.52	24.85	2.27	19.45	5.07	31.63
4	T ₄	29.33	6.73	27.45	2.40	21.04	6.00	33.00
5	T ₅	34.67	3.51	33.04	2.87	27.78	7.37	43.10
6	T ₆	32.67	5.79	30.65	2.67	31.26	6.97	49.87
7	T ₇	27.33	35.97	18.63	2.17	22.71	6.14	37.03
8	T ₈	62.00	2.38	60.27	2.97	30.36	7.69	41.63
9	T ₉	36.00	8.97	32.96	2.00	20.20	5.93	33.43
10	T ₁₀	33.33	15.81	28.32	2.17	26.22	7.12	42.13
11	CD	9.11	12.15	-	0.552	-	1.034	6.930
12	SE (m)	3.04	4.05	-	0.184	-	0.345	2.315
13	CV	15.44	73.03	-	13.201	-	9.086	10.315

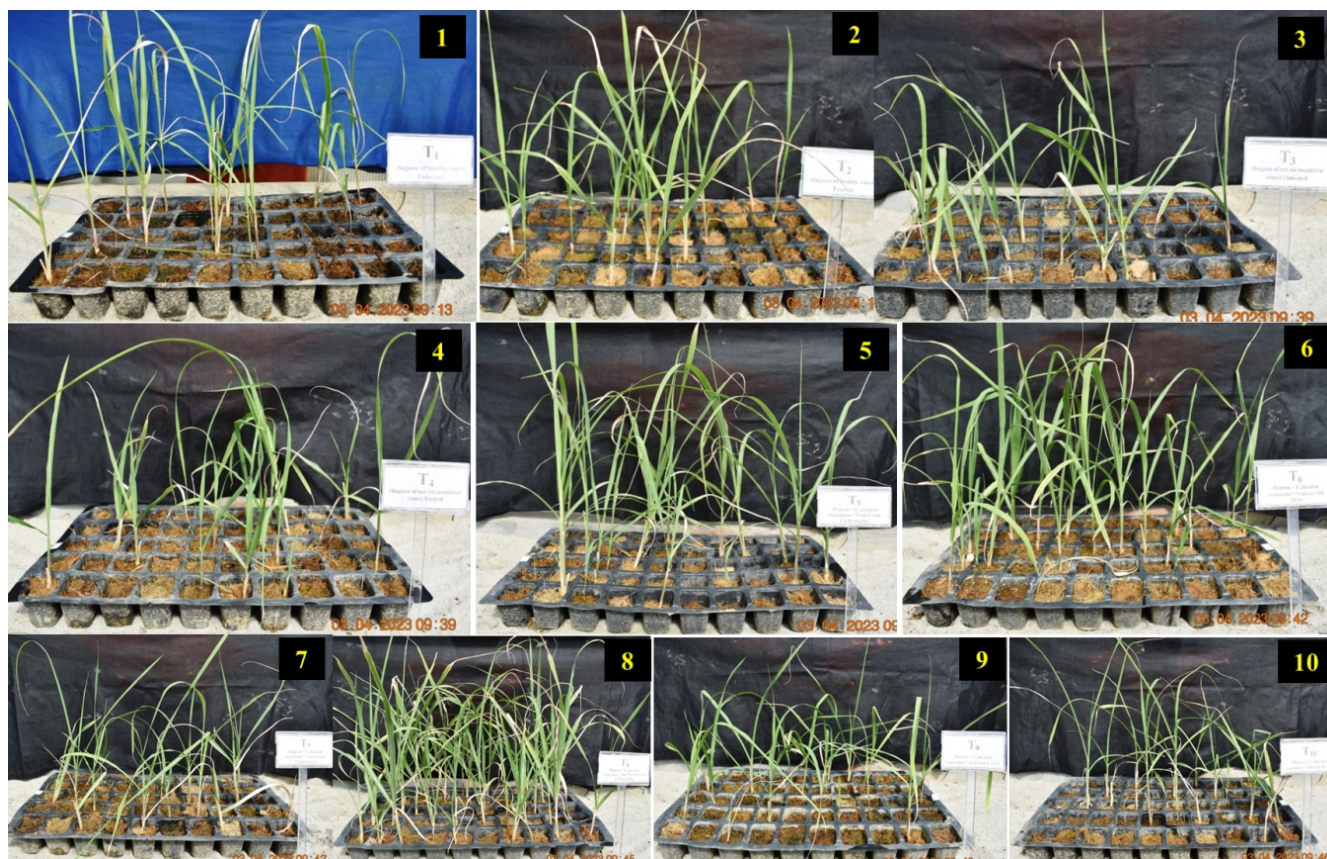


Fig. 6. Efficacy of different treatments on sugarcane bagasse.

Muzaffarnagar

Survey of sugarcane disease in Western U.P.

Periodic observations were recorded in pre monsoon, monsoon and post monsoon to collect the information of different diseases incidence on sugarcane cultivars. The survey was conducted in sixteen sugar factory zone of western U.P. The Co 0238 was dominant cultivars and captured more than 90-95% area of western Uttar Pradesh. The incidence of red rot in eastern part of western U.P. (Moradabad, Amroha, Sambhal and Bijnor districts) of different factory zone (Plot wise surveyed area) in low land area was recorded upto 100% Co 0238 in Agwanpur sugar mill whereas in Dhampur, Seohara, Afzalgarh, Bijnor and Bundki was recorded upto 80% in Co 0238 in low land. A wide range of red rot incidence was recorded on Co 0238. The varieties CoS 8436 was found effected with red rot in Khatauli sugar factory with mild to high form

of incidence in some field. In Bilai sugar factory red rot was also found in upland on Co 0238 with high form incidence (Table 11 & Fig-1). The incidence of smut diseases was also recorded on co 0238 in stray form all the surveyed sugar factory area plant as well as ratoon. Smut disease was also observed different factory zone as well as research farm on CoLk 14201 and CoS 13235 with 1-2 % incidence. Wilt disease was also observed on CoLk 14201 at research farm Muzaffarnagar with incidence of 1-2 clumps. Pokkah boeng was recorded very severe incidence in western U.P. in late planting crop of Co 0238. Bacterial rot was observed stray form on Co 0238, CoS 13235 in each factory zone with sporadic form. YLD was also recorded on CoLk 14201, CoS 8436 and Co 0238 with 30-40% incidence. Some fungal/viral diseases like red stripe, leaf scald, banded sclerotial, eye spot, leaf binding and mosaic were also observed upto various extent in various varieties.

Table-9 Incidence of red rot recorded in different factory zone

Name of Diseases	Varieties affected	Incidence (%)	Factory zones/Districts (Plot wise surveyed area)
Red rot	Co 0238	15-20	Balai (Bijnor)Up and Low land
	Co 0238	10-15	Najibabad (Bijnor)
	Co 0238	5-80	Seohara (Bijnor Low land
	Co 0238	5-80	Afzalgarh (Bijnor) Low land
	Co 0238	5-80	Dhampur (Bijnor) Low land
	Co 0238	5-75	Unit Bijnor (Bijnor) Low land
	Co 0238	3-70	Bundki (Bijnor)Low land
	Co 0238	15-55	Chandpur (Bijnor) Low land
	Co 0238	10-100	Agwanpur(Boradabad) Low land
	Co 0238	5-60	Dhanora (Amroha) Low land
	Co 0238	Stray	Chandanpur (Amroha)
	Co 0238	5-55	Asmoli (Sambhal) Low land
	Co 0238	Stray	Gangnoli (Saharanpur) 3 field
	Co 0238	5-70	Deoband (Saharanpur)
	Co 0238 & CoS 8436	2-10	Khatauli (Muzaffarnagar)
	Co 0238	Stray	Titawi (Muzaffarnagar) 01 Field

**Fig1. Severe incidence of red rot**

Studies on the incidence of diseases in autumn/spring planted crop of sugarcane.

Periodic observation of various diseases namely red rot, smut, wilt, grassy shoot diseases (GSD), leaf scald, pokkah boeng disease (PBD), top rot (Bacterial) and banded sclerotial (BS) were examined during pre-monsoon, monsoon and post- monsoon periods in three trials.

A. State varietal trial (1st Plant):- Under this trial 13 Genotypes/Varieties (9+4) i.e. CoS 20231, CoS

20232, CoS 21231, CoS 21232, CoS 21233, CoSe 21451, U.P. 21452, S-27/17, S-310/16, CoJ 64, CoS 767, Co 0238 and CoPant 97222 were examined under field conditions. Pokkah boeng disease was recorded from 1.0 to 6.6 % on seven genotypes/varieties viz CoS 20231, (5.0 %), CoS 21231 (6.0%), CoS 21232 (2.3%), S-310/16 (1.0%), CoJ 64 (2.0 %) and Co 0238 (6.6%). SCMV was reported on CoS 767 (Upto 15%).

B. State varietal trial (IInd Plant):- Under this trial 17



Genotypes/Varieties (13+4) i.e. CoS 19231, CoS 19233, CoS 19234, CoS 20234, CoLk 18201, CoLk 18202, CoLk 18203, CoLk 18204, S-188/15, Seo-685/15, Seo-565/16, Seo-1019/16, Seo-1581/16, CoJ 64, CoS 767, Co 0238 and CoPant 97222 were examined under natural field condition. Pokkah boeng disease was recorded on eight genotypes/varieties ranged from 1.0-16.0 percent viz CoLk 18201 (1.0%), CoS 19231 (2.1%), CoS 19233 (3.0%), CoS 20234 (7.0%), S-188/15 (6.0%), Seo-565/16 (6.0%), Seo-1581/16 (3.5%) and Co 0238 (16.0%). SVMV was reported on CoLk 18201, CoLk 18203, CoLk 18204, CoS 20234, Seo-1019/16, CoS 767, Co Pant 97222 and CoS 19231 ranged from 8-10 to 25-30 percent.

- C. State varietal trial (Ratoon):-** Under this trial 17 genotypes/varieties (Same set of varieties used in SVT ^{1^{ind}} plant) were examined under natural field condition. Smut was recorded in two varieties i.e. CoS 19231 and CoLk 18201 with incidence 3.9 and 2.8 percent respectively. Red rot was also observed on CoS 20234 with high form incidence. Bacterial rot was observed 0.5 percent incidence on CoLk 18202. Red strip was reported 1.0 percent incidence on S-188/15. Pokkah boeng disease was also recorded on four varieties i.e. Co 0238 (5.0 %), Co Pant 97222 (5.6%), Seo-685/15 (1.6%) and S-188/15 (8.0%).

Evaluation of genotypes/varieties for resistance to red-rot

The various genotypes/varieties were tested against different pathotypes viz CF 08 and CF 13 in state varietal trial and preliminary varietal trial by plug and nodal cotton swab method. Observations were taken after 60 days of inoculation. The diseases severity was graded based on 0-9 scale Srinivasan and Bhatt (1961). The disease indexing were rated at resistant (R; 0-2), moderately resistant (MR; 2.1-4), moderately susceptible (MS; 4.1-6), Susceptible (S; 6.1-8) and highly susceptible (HS; 8.1-above).

- A. State varietal trial:-** Under SVT, 15 genotypes/

varieties (9+4+2) including agronomical and pathological standard were tested against red-rot with two pathotypes viz CF 08 and CF 13. The various genotypes/varieties were tested against different pathotypes separately by plug and nodal cotton swab method. Total 03 varieties (CoS 21231, CoS 21232 and U.P. 21452) were found MR with both the pathotypes by plug method. All the 09 test genotypes/varieties were found resistant (R) with both the pathotypes with nodal cotton swab method. Varieties/Genotypes (CoS 21233 and S-27/17) were found MS with both the pathotypes used the plug method. Variety CoS 20232 and Genotype S-310/16 were found MR with CF-08 whereas these were found MS with CF-13 pathotypes. Excluding standard all the 18 genotypes/varieties almost similar result by nodal cotton swab method. Result and behaviour given in the Table.-10

- B. Primilery varietal trial (PVT):-** Under PVT 33 genotypes excluding standard were tested against red rot with two pathotypes with CF-08 and CF-13 the various genotypes was tested against both pathotypes separately by plug and nodal cotton swab method. Total 12 genotypes viz S-07/19, S-48/19, S-209/19, S-235/19, S-261/19, S-267/19, S-319/19, S-369/19, S-384/19, S-385/19 and S-465/19 were found MR both the pathotypes used in plug method. Twenty two genotypes were found resistant by CF-08 and 21 genotypes were found resistant by CF-13 in nodal cotton swab method. Result and behaviour given in the Table-11

Evaluation of genotypes/varieties for resistance to smut.

Under this trial 09 genotypes/varieties (CoS 20231, CoS 20232, CoS 21231, CoS 21232, CoS 21233, CoSe 21451, U.P. 21452, S-27/17 and S-310/16) were tested against smut excluding Co 1158 as a standard. All the genotypes/varieties were found R/MR against smut except standard.

Table-10 Behaviour of SVT Genotypes/varieties against different pathotypes of red-rot

SN	Genotypes/ Varieties	CF 08			CF 13		
		Plug method		NCSM	Plug method		NCSM
		Behavi.	Av.		Behavi.	Av.	
1	2	3	4	5	6	7	8
1	CoS 20231	MS	4.1	R	S	6.7	R
2	CoS 20232	MR	3.8	R	MS	5.8	R
3	CoS 21231	MR	2.3	R	MR	3.9	R
4	CoS 21232	MR	3.9	R	MR	3.8	R
5	CoS 21233	MS	4.5	R	MS	5.5	R
6	CoSe 21451	MS	4.6	R	S	7.4	R
7	U.P. 21452	MR	2.9	R	MR	2.5	R
8	S-310/16	MR	3.9	R	MS	4.9	R
9	S-27/16	MS	4.3	R	MS	4.5	R
10	CoJ 64	HS	8.6	S	MS	4.4	R
11	CoS 767	HS	9.0	S	MS	5.0	R
12	Co.Pant 97222	MS	5.7	R	MS	7.2	R
13	Co 0238	MS	4.6	R	HS	9.0	S
14	Co 312	HS	9.0	S	HS	9.0	S
15	Co 453	HS	9.0	S	MS	4.5	R

Seorahi

Survey of sugarcane diseases in eastern Uttar Pradesh

Periodic observations were recorded in pre monsoon, monsoon and post monsoon to collect the information on disease incidence in promising sugarcane varieties. The survey was conducted in nineteen sugar factory zones of eastern U.P. Occurrence of red rot in Co 0238, Co 5009, CoJ 85, CoJ 88, CoPk 05191, CoSe 92423, CoS 08272 and CoS 08279 were observed in different sugar mill areas. A major incidence of red rot disease was recorded in variety Co 0238 up to 01 - 100% in Akabarpur, Khadha, Masaudha, Manakapur, Munderwa, Maizapur, Tulsipur, Uttaraula, Kundurkhi, Balarampur, Babhanan, Satiyaon, Ghosi, Pipraich, Dhadha, Ramkola, Siswan Bajar and Seorahi sugar mill areas (Field wise assessment). The incidence of wilt was observed in various sugar mill areas ranged from 1- 16% in varieties *viz.* Co 0238, Co 0118, Co 98014, CoPk 05191, CoSe 95422, CoS 08279, CoS 08272 and CoSe 92423. Trace to 8% incidence of smut was observed in the varieties *viz.* Co 5009, Co 15023, CoS 08272, CoS 13235, CoLk 14201, Co 98014, Co 0238, CoSe 0 1434 and CoS 13231 in many sugar mill areas. Grassy shoot disease was recorded up to 6 per cent in the varieties *viz.* Co 0118, CoLk 14201, Co 15023, CoS

08272, CoS 08279, Co 98014, Co 5009, UP 05125, Co 0238, CoSe 08452, CoSe 11453 and CoLk 94184. The incidence of pokkah boeng was recorded from 1 to 21% in varieties *viz.* Co 98014, Co 15023, CoS 8436, CoS 08279 and Co 0238 at various sugar factory zones. Stinking rot/top rot ranging from trace to 10% was noticed in the varieties Co 15023, CoS 13235, Co 0118, CoS 08279 and Co 0238 incidence. The ratoon stunting disease (1-6%) was found in the varieties *viz.* CoS 08272, Co 0238, CoS 08279 and CoLk 94184. The incidence of yellow leaf disease (YLD) varied from 15-20% in CoLk 14201 at Seorahi farm followed by (trace to 20%) Co 98014, CoJ 88, Co 15023 and CoLk 14201 in various sugar mill areas. Leaf fleck (*Sugarcane bacilliform virus*) was observed in CoLk 14201, CoS13235 and Co 15023 in many sugar mill areas and sugarcane mosaic was also observed up to some extent in many varieties.

Collection and maintenance of pathogenic mycoflora

An extensive survey of various districts of Eastern U.P. was conducted during 2023-24 to collect the isolates *viz.* R2301Seo, R2302Seo, R2303Seo, R2304Seo, R2305Seo, R2308Seo, R2310Seo, R2314Seo, (Source: Co 0238), R2307Seo (Source: CoS 08272), R2309Seo (Source: CoJ 85), R2311Seo (Source: CoS 08279), R2312Seo (Source: CoPk 05191), R2313Seo (Source:

Table-11 Behaviour of PVT Genotypes against different pathotypes of red-rot

SN	Genotypes/ Varieties	CF 08			CF 13		
		Plug method		NCSM	Plug method		NCSM
		Behavi.	Av.		Behavi.	Av.	
1	2	3	4	5	6	7	8
1	S-07/19	MR	2.3	R	MR	3.3	R
2	S-48/19	MR	3.2	R	MR	2.8	R
3	S-120/19	HS	9.0	R	S	6.4	R
4	S-175/19	HS	9.0	S	HS	9.0	S
5	S-193/19	HS	9.0	S	HS	9.0	S
6	S-201/19	MR	3.8	R	MR	3.4	R
7	S-209/19	MR	3.4	R	MR	2.4	R
8	S-216/19	-	-	-	-	-	-
9	S-232/19	MS	4.2	R	HS	9.0	S
10	S-233/19	MR	3.0	R	MS	5.0	R
11	S-265/19	MR	4.0	R	MR	2.5	R
12	S-261/19	MR	4.0	R	MR	4.0	R
13	S-267/19	MR	2.5	R	MR	3.0	R
14	S-315/19	MR	2.8	R	MR	2.8	R
15	S-320/19	-	-	-	MR	3.0	R
16	S-348/19	MR	3.3	R	HS	9.0	S
17	S-357/19	MR	3.4	R	S	7.8	S
18	S-365/19	MR	4.0	R	HS	9.0	S
19	S-369/19	MR	3.6	R	MR	3.8	R
20	S-379/19	HS	9.0	S	MS	5.8	R
21	S-384/19	MR	3.5	R	MR	4.0	R
22	S-385/19	MR	3.6	R	MR	2.6	R
23	S-419/19	-	-	-	-	-	-
24	S-424/19	MR	4.0	R	-	-	-
25	S-426/19	MS	4.4	R	MR	2.4	R
26	S-443/19	MR	4.0	R	MS	5.2	R
27	S-455/19	HS	9.0	S	HS	9.0	S
28	S-465/19	MR	3.0	R	MR	2.8	R
29	S-479/19	-	-	-	MR	3.0	R
30	S-484/19	HS	9.0	S	MR	3.0	R
31	S-486/19	-	-	-	-	-	-
32	S-507/19	MR	3.4	R	HS	9.0	S
33	S-512/19	HS	9.0	S	MR	2.8	R

CoSe 92423 and their cultures were maintained for further identification of red rot disease. Seven designated pathotypes *viz.* CF01, CF02, CF03, CF07, CF08, CF09 and CF13 along with 46 old isolates *viz.* R1601Seo (CoSe 92423), R1602Seo (UP 9530), R1603Seo (Co 0238), R1701Seo (Co 0238), R1702Seo (CoS 8436), R1703Seo (CoS 07250), R1704Seo (CoSe 92423), R1705Seo (CoJ 88), R1801Seo (Co 0238), R1802Seo (Co 0238), R1803Seo (Co 0238), R1804Seo (Co 0238), R1805Seo (Co 0238), R1806Seo (Co 0238), R1901Seo (Co 0238), R1902Seo (Co 0238), R1903Seo (Co 0238), R1904Seo (Co 0238), R1905Seo (Co 0238), R2001Seo (Co 0238), R2002Seo (Co 0238), R2003Seo (Co 0238),

R2004Seo (Co 0238), R2005Seo (Co 0238), R2006Seo (Co 0238), R2007Seo (Co 0238), R2008Seo (Co 0238), R2010Seo (CoS 08272), R2011Seo (CoS 08279), R2101Seo (Co 0238), R2102Seo (Co 0238), R2103Seo (Co 0238), R2104Seo (Co 0238), R2105Seo (Co 0238), R2106Seo (Co 0238), R2107Seo (Co 0238), R2108Seo (CoS 08272), R2109Seo (CoS 08279), R2110Seo (CoSe 98231), R2201Seo (Co 0238), R2202Seo (CoLk 94184), R2203Seo (CoS 08279), R2204Seo (CoS 13231), R2205Seo (CoS 08272), R2206Seo (Co 0238) were maintained and purified for further studies.

Characterization and identification of pathotypes /races of red rot pathogen



Twelve isolates (Source-Co 0238) isolated from different locations of eastern UP showed virulence pattern similar to CF 13 on 20 pathological sugarcane differentials. It was observed that these isolates have originated from CF13 pathotypes, and declared as new pathotypes in India. One local isolate R2204Seo (Source-CoS 13231) which was found virulent showed a new disease pattern other than CF13 (Co 0238). Except the two isolates obtained from R2203Seo (CoS 08279) and R2205Seo (CoS 08272) the virulence patterns of the other isolates were found more or less similar to the existing pathotype of this area. It was observed that both these new isolates have specific virulence.

Varietal resistance test against red rot disease

State varietal trial (SVT) I plant

A total of seven genotypes and five checks *viz.* Co 0238, CoJ 64, CoS 767, CoPant 97222 and CoLk 94184 were evaluated against red rot pathotypes CF08 and CF13 separately by plug and nodal cotton swab method. Seven genotypes were evaluated against red rot and all genotypes (S 310/16, CoS 19235, CoS 20231, CoS 20232, CoSe 21451, UP 21452, CoS 21232) were found moderately resistant by plug and resistant by NCS method.

State varietal trial (SVT) II plant

A total of twelve genotypes were evaluated against red rot pathotypes CF08 and CF13 separately by plug and nodal cotton swab method. Out of twelve genotypes, nine genotypes *viz.* CoLk 18201, CoLk 18202, CoLk 18203, CoS 19232, CoS 19234, CoSe 20451, CoSe 20452, CoS 20234 and CoS 20454 exhibited resistant/moderately resistant (R/MR) reaction, one genotype (S 188/15) was rated as moderately susceptible, whereas two genotypes (CoS 19233 and CoS 20234) were rated as susceptible to CF08. Seven genotypes *viz.* CoLk 18201, CoLk 18202, CoS 19232, CoSe 20451, CoSe 20452, CoS 20234 and CoS 20454 exhibited resistant/moderately resistant reaction, three genotypes (S 188/15, CoS 19234, CoLk 18203) were rated as MS, two genotypes (CoS 19233 and CoS 20234) were rated as highly susceptible to CF13 by plug method. By nodal cotton swab method, ten genotypes were rated as resistant (R) and two genotypes were rated as susceptible (S) to both designated pathotypes.

Preliminary varietal trial (PVT)

In this experiment, eighteen genotypes were tested at Seorahi along with seven standards (CoJ 64, BO 91,

CoSe 95422, CoP 06436, CoS 767, CoLk 94184 and Co 0238) by plug and nodal cotton swab methods of inoculation against two pathotypes i.e. CF08 and CF13. Out of 18 genotypes, 02 genotypes (Seo 177/22, Seo 213/21) were found moderately susceptible, 04 genotypes *viz.* Seo 113/19, Seo 171/21, Seo 208/19, Seo 187/19 were found susceptible and 12 genotypes (SL433/21, SL427/21, Seo 246/21, Seo 94/21, SL369/21, Seo137/21, Seo 76/21, Seo 40/21, Seo 119/21, Seo 220/21, Seo 288/19, Seo 263/21) were rated as R/MR to CF08, while 01 genotype (Seo 113/19) was rated as highly susceptible, 03 genotypes (Seo 171/21, Seo 208/19, Seo 187/19) were rated as susceptible and 12 genotypes (SL 433/21, SL427/21, Seo 246/21, Seo 94/21, SL369/21, Seo137/21, Seo 76/21, Seo 40/21, Seo 119/21, Seo 220/21, Seo 288/19, Seo 263/21) exhibited resistant/moderately resistant reaction to CF13 pathotype.

C₂ generation

Thirty one genotypes were evaluated in C-2 generation, out of which 15 genotypes (Seo 259/21, Seo 173/21, Seo 302/21, Seo 159/22, Seo 31/22, Seo 502/22, Seo 299/22, Seo 51/22, Seo 213/22, Seo 328/22, Seo 512/22, Seo 507/22, Seo 155/22, Seo 180/22, Seo 506/22) were rated as MR, 08 genotypes (Seo 97/22, Seo 85/21, Seo 446/21, Seo 392/22, Seo 504/22, Seo224/22, Seo166/22, Seo 508/22) were rated as MS, 06 genotypes (Seo 372/21, Seo 172/22, Seo 171/21, Seo 492/22, Seo 164/22, Seo 132/22) were rated as susceptible, 02 genotypes (Seo 296/22, Seo 295/21) were rated as highly susceptible to CF08, while 15 genotypes (Seo 259/21, Seo 173/21, Seo 302/21, Seo 159/22, Seo 31/22, Seo 502/22, Seo 299/22, Seo 51/22, Seo 213/22, Seo 328/22, Seo 512/22, Seo 507/22, Seo 155/22, Seo 180/22, Seo 506/22) were rated as MR, 09 genotypes (Seo 172/22, Seo 97/22, Seo 85/21, Seo 446/22, Seo 392/22, Seo504/22, Seo 224/22, Seo 166/22, Seo 508/22) were rated as MS, 06 genotypes (Seo 372/21, Seo 172/22, Seo 171/21, Seo 492/22, Seo 164/22, Seo 132/22) were rated as susceptible and 01 genotype (Seo 295/21) was rated as highly susceptible to CF13 pathotype.

Varietal resistance test against smut disease

Standard varietal trial (SVT) I & II plant: Smut

A total of 19 varieties along with one standard (CoS13231) were tested by primary and secondary methods of inoculation against smut disease. Out of these ,02 genotypes (CoLk 18203, CoSe 19233) were



found moderately susceptible (MS), 03 genotypes (CoSe 21451, CoLk 18202, CoSe 20453) were found moderately resistant (MR), while 14 genotypes *viz.* S 310/16, CoS 19235, CoS 20231, CoS 20232, UP 21452, CoS 21232, CoS19231, S 188/15, CoSe 20451, CoSe 20452, CoS 19234, CoLk 18201, CoSe 20454 and CoS 20234 were found resistant (R) to smut disease.

Studies on the incidence of diseases in autumn and spring planted crop of sugarcane

An incidence of major and minor sugarcane diseases was identified in the breeding trial under natural

condition. Out of 19 genotypes, 02 genotypes (CoS 19233 and CoS 20234) gave moderate and mild symptoms of red rot, while stray incidence was observed in the remaining genotypes. Different diseases such as top rot was observed in CoS 19234, grassy shoot disease was noticed in CoS19231 and CoS 21232, pokkah boeng, smut and leaf scald were also observed in S 188/15, CoS 21231 and CoS 20231 respectively. Stray incidence of minor diseases such as rust, leaf spot and banded sclerotial disease were recorded in standard varietal trial plant and ratoon crop.

14. Statistics

Shahjahanpur

Statistics division of Shahjahanpur institute receives data of research experiments mainly from Shahjahanpur institute and Gola centre and some data from Muzaffarnagar station. During the year 2023-24 about 920 data sheets of experiments conducted by different disciplines of these stations were received for statistical analysis. The data were in different statistical designs mainly in RBD, factorial, split plot, strip plot and CRD. The data were analyzed using appropriate statistical methods in Microsoft Excel and summary results sent to the respective disciplines.

Around 200 data sheets of All India Coordinated Research project from Breeding, Agronomy and Entomology divisions were also received Statistics division for analysis. The data were analysed and summary results were sent to the scientists.

Besides above, the pooled analysis of the data of earlier experiments of some disciplines was also carried out to see the combined effect of the experiments repeated over years.

Appropriate statistical designs and layouts were suggested to the scientists for the new experiments proposed in autumn and spring seasons of planting.

Statistics division conducted sampling by crop cutting method to estimate the yield of various crops at Shahjahanpur. The harvesting, weighing and sale of these crops was also supervised by statistics division as part of committee.

Statistics division managed the centralised diesel procurement and distribution of Shahjahanpur Institute for farm and estate requirements.

The *Jansunwai-Samadhan* system of the government for public was monitored by statistics division and the complaints received were sent to the establishment section for necessary action and the replies received were uploaded on the website.

The quarterly information of *sevayojan* provided by *niyukti khand* was uploaded on the website.

Seorahi

During the year 2023-24, the division of Statistics provided technical advice and statistical guidance to the scientists of various divisions of the centre in planning the experiments. The computer programmes for different statistical designs were developed and installed in the computer.

The division carried out statistical analyses of data received from various divisions of this institute. Approximately 396 data sheets regarding Germination, Tillers, Shoots, Millable cane, yield, C.C.S. (%) and Juice quality etc. were statistically analyzed through software and interpreted. The results were sent to concerning divisions. Comparative study was also done for different attributes with the help of graphs like Bar graphs, Histograms, Line graphs, Pie charts, Stem and leaf plots etc. Crop-cutting survey was made to estimate the yield of wheat, paddy and barley crop at Seorahi, Gorakhpur and Luxmipur.

15. Economics

S. N.	Particulars	2023-24	
		Plant	Ratoon
1.	Field preparation Disc Ploughing - 4 hrs Harrow - 2 - 3 hrs Cultivator - 2 - 3 hrs Pata - 2 - <u>1 hrs</u> 11 hrs Labours - 2	7700 <u>540</u> 8240	- - - -
2.	Seed and preparation Seed - 70 qtl. Harvesting - 12 labour Sett cutting - 8 labour Seed transportation - 1 hr	29750 3240 2160 <u>700</u> 35850	- - - -
3.	Planting Seed treatment - 112g bavistin Labour - 2 Furrow opening - 3 hrs Sett placing - 8 labour Sett covering with soil 4 labour	84 540 2100 2160 <u>1080</u> 5964	- - - -
4.	Ratoon preparation Spreading of trash - 4 labour Shredding with tractor drawn mulcher -4 hrs Seed cane for gap filling - 5qtl. Labour 4	- - - -	1080 2800 2125 <u>1080</u> 7085
5.	Irrigation - 6+1 (pre-sowing) and 5 (15 hrs/ irrigation) Labour - 14 and 10	26250 <u>3780</u> 30030	18750 <u>2700</u> 21450
6.	Manure, fertilizer & application Plant - FYM @ 100 q/t Transportation FYM -2 hr Spreading -4 lab. NPK - 250 Kg Urea - 369 kg MOP - 34 kg Zinc sulphate -25 kg Bio-fertilizer- i.Azotobactor - 10kg ii.PSB - 10kg Labour- 01	7500 1400 1080 7350 1967 1462 2750 - 500 500 270	- - - - - - - -



	Ratoon –		
	NPK -250 kg	-	7350
	Urea -429 kg	-	2287
	MOP -34 kg	-	1462
	Transportation (3/4 hr. ½ hr.)	525	350
	Labour – 3	<u>810</u>	<u>810</u>
		26114	12259
7.	Plant protection		
	Fipronil GR 0.3% – 20 kg	2200	-
	Labour – 1	270	-
	Chlorantraniliprole 18.5 S.C. 0.375 lit.	4102	4102
	Labour- 1	270	270
	Profenofos + Cypermethrin 44% @ 1.0 lit./ h2 times (2.0 lit.)	1260	1260
	Labour – 2	540	540
	Bio-Agent-		
	i. Trichoderma 20kg	1120	-
	ii. Beauveria & Metarhizium 10kg	<u>1680</u>	-
		11442	6172
8.	Interculture operation		
	Hoeing with Tractor (3/2 times)- 6 hrs	6300	4200
	Line hoeing with kassi – (3/2 times) 36/24 labour	9720	6480
	Earthing with tractor 3 hrs	2100	2100
	Manual earthing –1/1 @ 30 labour	8100	8100
	Binding – 2 @ 20 labour/ binding	<u>10800</u>	<u>10800</u>
		37020	31680
9.	Harvesting @ 50/q	40,000	37,500
10.	Supervision	25,000	25,000
Cost of cultivation Rs/ha		2,19,660	1,41,146
11.	Overhead charges		
	i) Rental value of land	40000	40000
	ii) Loading & Transportation @ Rs 15/qtl.	12000	11250
	iii) Depreciation on machines	2196	1411
	iv) Interest on working capital @ 12% for 6 months	<u>13180</u>	<u>8540</u>
		67376	61201
Cost of production Rs./ha		2,87,036	2,02,347
Average yield q/ha		800	750
Cost of production Rs./q		358.79	269.79
Average cost of production		2,44,691	
Average yield q/ha		775	
Cost of production Rs/q		315.73	

Rates

Sugarcane (seed)	Rs 425/ q	Zinc Sulphate	Rs. 110/kg
Tractor	Rs.700/ hr	Carbendazim	Rs. 750/kg
Labour	Rs.270/ day	Fipronil	Rs 110/ kg
FYM	Rs 75/q	Chlorantraniliprole	Rs 10937/lit.
Azotobactor	Rs 50/kg	Trichoderma	Rs 56/kg
PSB	Rs 50/kg	Beauveria& Metarhizium	Rs. 168/kg
Urea	Rs. 533 /q	Profenofos+Cypermethrin 44%	Rs. 630/ lit.
NPK	Rs. 2940/q	Irrigation	Rs. 250/ hr
MOP	Rs. 4300/q		

16. Extension

Shahjahanpur

Result Demonstration

A Varietal Result demonstration of Autumn planting with eight varieties were conducted at Sugarcane Research Farm Shahjahanpur to motivate the farmers regarding high yielding high sugarcane varieties. The purpose of this demonstration is also to motivate the farmers towards Autumn cane planting with new varieties. All varieties were planted by



trench method . Total 08 varieties i.e. CoS 13235, CoLk 14201, Co 15023, CoS 17231, CoS 16233, CoSe 13452, U.P.14234 and CoS 14233 were planted in demonstration. Sugarcane farmers of different districts of Uttar Pradesh and Uttarakhand were visited on demo plot and saw the performance of new released varieties.

Another Result Demonstration of Spring cane planting with same varieties were conducted at Sugarcane research farm Shahjahanpur.

Face Book Live programme

To provide contemporary information of sugarcane cultivation to state cane farmers Extension division conducted Face book live programme on weekly basis. During the year total 53 Face book live programme has conducted through Council face book page covering all aspect of sugarcane cultivation likes Breeding, Agronomy, Entomology, Plant Pathology, Tissue culture, Soil chemistry, Sugar chemistry and

Gur Chemistry, Microbiology etc. This programme is being telecast on every Saturday at 4.00 pm to 5.00 pm named "Mithas". Farmers from all over India and other neighboring country regularly watching this programme. Total 415320 farmers were trained through the Facebook live programme. U.P.C.S.R face book page followers were only 1820 before start of this programme and now it has increased 22574. This programme is very popular among cane farmers and cane development personnel.



Transfer of technology through Mass Media-

To communicate with the large numbers of farmers in short duration, mass media (method of contact) were used by Extension department. Details are as under.

(i) Live T.V Talk at National Channel D.D. Kisan,

Delhi

Four T.V. talk on D.D.Kisan channel under "Hello Kisan" programme were delivered by extension department during the year. All Programmes were based on contemporary issues of sugarcane cultivation. Under Live programme solutions were suggested to the farmers regarding

their problems related to sugarcane cultivation.

(ii) T.V Talk at State Channel D.D.U.P.Lucknow

Three T.V. talk on D.D.U.P channel under “**Krishi Darshan**” programme were delivered. Talk was related to contemporary issue of sugarcane cultivation in which farmers suggested solutions



regarding their problem.

(iii) Talk on All India Radio Delhi

Two Radio talk regarding sugarcane cultivation delivered on AIR Delhi during the year.



(iv) You-Tube Channel

To provide quick & contemporary issues of sugarcane cultivation to the farmer in Audio visual



mode, 14 videos related to variety identification, intercropping, ratoon management, insect and pest control prepared and uploaded time to time for the updating of farmers.



Training Programme:

Conducted 15 training programme (Offline and online) for the sugarcane farmers and sugar mill officials regarding new scientific technique of sugarcane cultivation. Five days paid training programme was conducted during month of September 2022 in which 50 sugar mill representatives were participated from which Rs.3.00 Lakh revenue generated. Another two days paid training

programme was conducted on jaggery production during the month of February 2023 in which 31 rural entrepreneurs participated from which Rs 0.62 Lakh revenue generated. Moreover 13 training programme conducted offline and online free of cost for the sugarcane farmers. Free trainings were conducted with the cooperation of farmer, sugar mills and cane department. Total 1310 people trained during the year of 2022-23 without any budget.



Exhibition-

Participated in three exhibitions and shows the technique of sugarcane cultivation before farmers



so that they can understand easily. These exhibitions were placed at Shahjahanpur, Dhaighat and KVK Niyamatpur. Our stall awarded by excellent award by KVK Niyamatpur.



Lecture on farmers training-

18 lectures delivered on scientific sugarcane cultivation in Village meeting before farmers.



Visitors-During the year 5565 farmers from different places visited our research institute.



“Kisan Mela” (Mithas)

Extension Deptt. conducted “Virat Kisan Mela” at SRI Campus on 21-22 October 2023 in which more than 4000 farmers, sugar mill representatives

and cane development personals participated from all over India as well as Nepal. This is the first time when mini seed kit was distributed through online booking. This is the result of extension activities through social media.



Muzaffarnagar

A varietal demonstration was conducted at research station, Muzaffarnagar farm during the year 2023-24 in spring planting with CoS 13235, Co 0118, Co 1523, CoS 12232, Co 05011, CoS 08279 and Colk 14201 varieties of sugarcane. The highest yield of sugarcane 92.80 t/ha. was recorded in CoS 13235 followed by 89.60 t/ha. in Co0118 respectively.

A method demonstration was conducted at farmers field in 2023-24 during the spring planting with CoS 13235, CoLk 14201, Co 15023 and C 0118 varieties of sugarcane. The highest sugarcane yield of

93.60 was recorded in CoS 13235 followed by 85.60 in Co0118 respectively.

To demonstrate the sugarcane production technology improve the knowledge level, skill and attitudes of the cane growers through different communication media/methods as demonstration, kisan mela, Ghosties, Field days, Exhibitions, Sugarcane talks, No. of visitors counting and literature distribution.

Demonstration-04, G.K.S. Ghosties-180, Hello DD Kisan Chanel-08 Radio talk-08 and training farmers-25, Visitors-540 and literature distribution 580.

17. Seed Production

Planting and maintenance of breeder seed cane nurseries

During 2023-24 breeder seed cane nurseries were planted in 277.30 ha area in autumn 2023 and spring 2024 at research farms and sugar mill's farms (Table 1a & 1b). In autumn 2023 total 77.40 ha area was at research farms while in spring 2024, it was 103.81 ha. At sugar mill farms total 96.09 area was under breeder seed cane out of which 52.15 ha in autumn 2023 and remaining 44.14 in spring 2024. The early maturing varieties covered more area at research and sugar mill's farms.

All approved culture practices *i.e.*, seed selection, seed and soil treatments, fertilizer application, irrigation, hoeing, earthing, binding; plant protection measures etc. were done as per recommendation to raise the healthy breeder seed cane nurseries. These nurseries were kept genetically pure and free from insect-pests and diseases.

Production and distribution of breeder seed cane

Under three tier system of seed-cane production program, prior to distribution of breeder seed-cane for raising foundation seed-cane nurseries, all breeder seed nurseries were thoroughly checked and certified for their genetic purity and freedom from insect-pest and disease, inspected by a team of different subject matter specialists. The certified breeder seed cane was supplied to different Cane Development Councils as per allotment made by the Cane Commissioner, U.P.

During 2023-24 from the breeder seed cane nurseries planted in 2022-23 a total of 92,44,713 single buds of CoS 17231 and CoLk 15466 and **1,19,681.72** qt. of other varieties of breeder seed cane was produced at research and sugar mill's farms. Also **15,00,400 single bud** in form of mini seed kit of new released varieties viz. CoS 17231, CoS 18231 and CoLk 16202 were distributed under online mini seed kit registration programme (Table 2a & 2b).

Table 1a : Planting area of breeder seed cane nurseries at research and sugar mill's farms during 2023-2024

S.N.	Research/Sugar Mill's Farms	Area (ha)		
		Autumn 2023	Spring 2024	Total
A. Research farms				
1	Shahjahanpur	14.48	12.83	27.36
2	Gola	17.43	25.47	42.35
3	Seorahi	21.74	14.09	35.83
4	Muzaffarnagar	4.67	7.80	12.47
5	Sultanpur	2.11	4.50	6.61
6	Balrampur	1.13	2.13	3.26
7	Laxmipur	3.69	8.54	12.23
8	Sadat	5.05	5.00	10.05
9	Sirsha	1.80	6.10	7.90
10	Arnikhana	0.00	6.00	6.00
11	Pipraich	0.00	5.15	5.15
Total		72.10	97.56	169.21
12	IISR Lucknow	5.30	6.70	12.00
Total		5.30	6.70	12.00
B. Sugar Mill's Farms				
i. Private Sugar Mill's Farms				
1	Pilibhit	14.80	3.20	18.00
2	Seohara	4.82	0.00	4.82
3	Dhampur	9.02	10.00	19.02
4	Biswa	6.50	6.40	12.90
5	Neoli	1.08	1.00	2.08
Total		36.22	20.60	56.82
ii. Co-Operative Sugar Mill's Farms				
1	Morna	1.67	2.21	3.88
2	Tilhar	1.79	0.97	2.76
3	Puwayan	1.42	2.03	3.44
4	Semikheda	1.87	2.52	4.39



5	Agauta	1.90	2.50	4.40
6	Sultanpur	1.50	1.50	3.00
7	Baghpath	0.00	0.36	0.36
8	Bilashpur	0.86	1.14	2.00
9	Puranpur	2.00	3.00	5.00
10	Gazraula	0.42	1.10	1.52
11	Ramala	0.31	2.13	2.44
12	Naziwabaad	2.19	0.40	2.59
13	Nanauta	0.00	1.60	1.60
14	Mhemudabaad	0.00	1.89	1.89
Total		15.93	23.34	39.27
Sub -Total		50.85	43.54	94.39
Grand Total		129.25	147.75	277.30

Table 1b : Variety wise planting area (ha.) of breeder seed cane nurseries at research and sugar mill's farms during 2023-2024

S. No.	Varieties	Autumn 2023		Total	Spring 2024		Total	Grand Total (ha.)
		Research Farms	Sugar mill's Farms		Research Farms	Sugar mill's Farms		
1	CoS 18231	0.00	0.00	0.00	2.58	0.00	2.58	2.58
2	CoLk 16202	1.00	0.00	1.00	5.80	0.00	5.80	6.80
3	CoLk 14201	23.93	21.03	43.96	19.62	10.09	29.71	74.65
4	CoS 13235	17.43	13.78	31.21	13.20	12.53	25.73	56.94
5	Co 0118	6.27	5.03	11.3	4.58	3.69	8.27	19.32
6	CoS 17231	10.20	4.38	14.28	35.32	8.04	43.36	57.92
7	Co 15023	0.07	5.07	5.14	0.00	6.43	6.43	11.57
8	UP 05125	2.98	0.00	2.98	3.95	0.00	3.95	6.93
9	CoS 13231	0.02	0.40	0.42	0.35	0.48	0.83	1.25
10	CoLk 11203	1.00	0.00	1.00	1.00	0.00	1.00	2.00
12	Co 98014	0.15	0.00	0.15	0.00	0.00	0.00	0.15
13	CoLk 15466	2.00	0.00	2.00	0.00	0.00	0.00	2.00
14	CoLk 12207	0.00	0.00	0.00	0.12	0.00	0.12	0.12
15	CoLk 9709	0.00	0.00	0.00	0.35	0.00	0.35	0.35
16	CoLk 15201	0.00	0.00	0.00	0.04	0.00	0.04	0.04
Total		65.05	49.69	113.44	86.91	40.86	128.22	241.91
Mid Late Varieties								
1	CoSe13452	2.41	2.00	2.41	0.63	2.00	2.63	7.04
2	CoS 09232	3.90	0.00	3.9	2.90	0	2.9	6.8
3	CoS 10239	1.45	0.00	1.45	5.43	0	5.43	6.88
4	CoSe 08452	2.01	0.00	2.01	3.41	0	3.41	5.42
5	CoS 16233	1.76	2.40	4.16	1.85	0.40	2.25	6.41
6	UP 14234	0.53	0.00	0.53	1.37	0	1.37	1.90
7	CoLk 14204	0.00	0.00	0.00	0.20	0	0.2	0.20
8	CoS 14233	0.26	0.03	0.29	0.05	0.06	0.11	0.40
9	CoLk 15207	0.00	0.00	0.00	0.45	0	0.45	0.45
10	CoLk 15206	0.00	0.00	0	0.30	0	0.3	0.30
11	CoS 15233	0.03	0.03	0.06	0.11	0.22	0.33	0.39
12	CoLk 11206	0.00	0.00	0	0.10	0	0.1	0.10
13	CoLk 12209	0.00	0.00	0	0.10	0	0.1	0.10
Total		12.35	2.46	14.81	16.9	2.68	19.58	34.39
Grand Total		77.4	52.15	129.55	103.81	43.94	147.75	277.30

Table 2a : Single bud and mini seed kit distribution at research farms and sugar mill's farms (2023-2024)

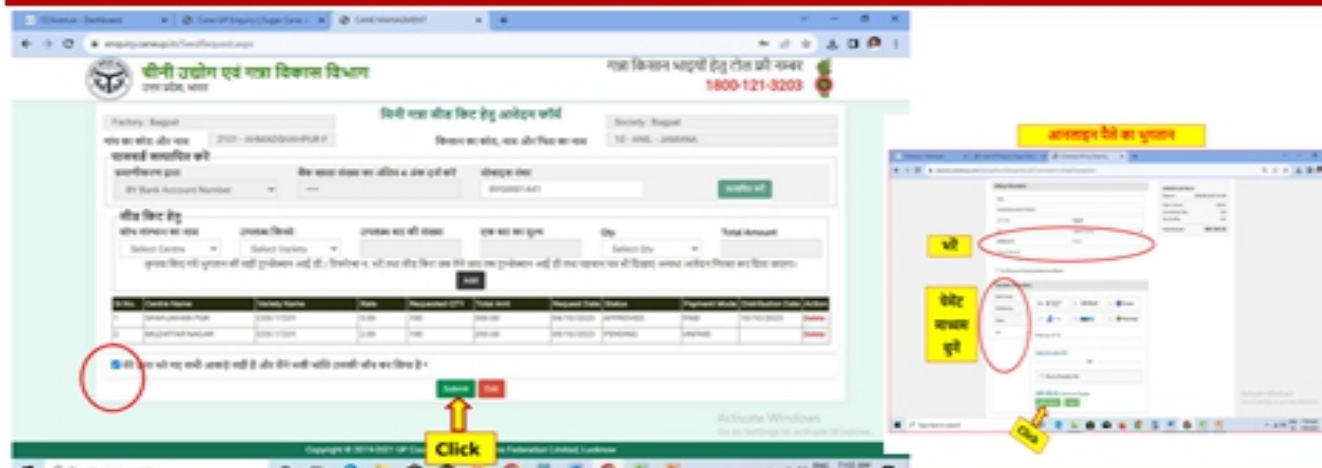
S.N	Research and Sugar mill farms	Autumn 2023		Spring 2024					Grand Total
		CoLk 15466	Single Buds in Seed Mini Kit (CoS 17231)	CoS 17231	CoLk 15466	Single Buds in Seed Mini Kit			
						CoS 17231	CoS 18231	CoLk 16202	
1	Shahjahanpur	-	608200	2838482	-	560200	3700	2300	4012882
2	Gola	-	-	1289096	-	56000	-	-	1345096
3	Muzaffarnagar	-	136600	1576607	-	105200	-	-	1818407
4	Sultanpur	-	-	959225	-	28200	-	-	987425
5	Balrampur	-	-	605624	-	-	-	-	605624
6	Sadat	-	-	172089	-	-	-	-	172089
7	Sirsha	-	-	1065840	-	-	-	-	1065840
8	I.I.S.R.	391550	-	-	296200	-	-	-	687750
9	Biswa	-	-	50000	-	-	-	-	50000
Total		391550	744800	8556963	296200	749600	3700	2300	(10745113)

One mini kit contains 100 single buds

Table 2b : Breeder seed cane production (qt.) at research farms and sugar mill's farms during (2023-24)

S.N.	Research and Sugar mill's Farms	Distribution		Seed cane used in planting (qt)	Single bud (qt)	Sugar mill's supply (qt)	Mini Seed Kit (qt)	Production (qt)
		Autumn 2023	Spring 2024					
A. Research farms								
1	Shahjahanpur	11705.22	5664.98	1905.40	2838.48	4288.76	1174.40	27577.24
2	Gola	6754.80	6915.95	3003.00	1289.10	352.65	56.00	18371.50
3	Seorahi	6986.87	7090.22	2597.00	0	738.10	0.00	17412.19
4	Muzaffarnagar	3793.35	7248.35	872.90	1576.61	0	241.80	13733.01
5	Sultanpur	1112.02	992.56	462.70	959.23	0	28.20	3554.71
6	Balrampur	842.31	464.69	228.70	605.62	0	0	2141.32
7	Laxmipur	2329.34	2373.59	856.10	0	107.90	0	5666.93
8	Sadat	607.36	800.00	700.00	160.05	0	0	2267.41
9	Pipraich	0	947.37	360.50	0	687.10	0	1994.97
10	Arnikhana (mahola)	0	2396.55	420.00	0	0	0	2816.55
11	Sirsha	1259.31	1747.59	593.00	1065.84	0	0	4665.74
12	IISR Lucknow	3680.09	1298.50	840.00	687.75		0	6506.35
Total		39070.67	37940.35	12839.3	9182.67	6174.51	1500.40	106773.74
B. Sugar mill farms								
1	Pilibhit	1602.88	5532.42	1260.00	0	489.00	0	8884.3
2	Seohara	2403.07	7479.55	337.40	0	0	0	10220.02
3	Dhampur	5023.62	450.00	1331.40	0	1280	0	8085.02
4	Neoli	81.30	1421.72	784.00	0	0	0	2287.02
5	Biswa	3142.00	2017.00	103.60	50	280	0	5592.60
6	Mhemudabaad	1042.81	823.95	132.02	0	548.06	0	2546.84
7	Morna	1422.82	630.82	271.04	0	0	0	2324.68
8	Tilhar	669.50	430.48	183.89	0	54.65	0	1338.52
9	Gazraula	106.00	528.00	200.00	0	301	0	1352.00
10	Agauta	1253.43	671.98	308.00	0	0	0	2233.41
11	Bilaspur	0	297.89	148.47	0	1147.88	0	1594.24
12	Puwayan	485.20	1509.64	241.01	0	0	0	2235.85
13	Baghpath	252.71	210.68	25.20	0	179.23	0	682.32
14	Ramala	184.62	0	170.66	0	0	0	355.28
15	Nanauta	913.66	0	112.07	0	0	0	1025.73
16	Nazimabaad	1401.56	0	181.09	0	0	0	1582.65
17	Sultanpur	119.00	0	210.00	0	247.79	0	576.79
18	Puranpur	0.00	0	350.00	0	113.98	0	463.98
19	Semikhera	277.08	0	235.90	0	1266.77	0	1779.75
Total		20395.76	22221.13	6142.36	50.00	3565.69	0	55161.00
Grand total		59451.93	59877.13	19425.05	9232.67	12082.87	1500.40	161934.74

Seed Cane Distribution (Online Mini Seed Kit Booking)



Online seed booking portal was launched for faster seed dissemination.

15004 mini kit of CoS 17231 was distributed on 2023-24.



Table 2c : Variety wise supply of breeder seed cane at research and sugar mill's farms during 2023-2024

S.N.	Varieties’	Research Farms		Total	Sugar mill’s Farms		Total	Grand Total
		Autumn 2023	Spring 2024		Autumn 2023	Spring 2024		
Early Varieties								
1	CoS 18231	0	19.66	19.66	0	0	0	19.66
2	CoS 17231	32.35	86.08	118.43	0	0	0	118.43
3	CoS 13235	14228.83	10412.50	24641.33	8276.67	4392.39	12669.06	37310.39
4	CoS 13231	925.49	352.60	1278.09	13.00	0	13	1291.09
5	CoS 08272	0	0	0	411.80	142.24	554.04	554.04
6	CoLk 16202	0	96.59	96.59	0	0	0	96.59
7	CoLk 14201	13238.42	14445.28	27683.70	5094.51	8936.36	13731.02	41414.72
8	CoLk 94184	0.20	0	0.20				0.20
9	CoLk 11203	576.41	50.40	626.81				626.81
10	CoLk 9709	106.14	0	106.14				106.14
11	CoLk 12207	26.75	3.50	30.25				30.25
12	CoLk 15206	0.70	0	0.70				0.70
13	CoLk 15466	0	0	0				0.00
14	Co 98014	8.30	526.37	534.67				534.67
15	Co 15023	287.60	337.14	624.74	2197.87	2125.36	4323.16	4947.90
16	Co 0118	4331.94	2754.98	7086.92	3450.89	6522.75	9973.64	17060.56
18	UP 05125	440.24	2600.52	3040.76				3040.76
Total		34203.37	31685.62	65888.99	19430.24	72119.10	41263.92	107452.38
Mid Late Varieties								
1	CoS 16233	0	1455.12	1453.120	-			1455.12
2	CoS 12232	0	-	-	-	3.00	3	3.00
3	CoS 09232	1330.27	305.42	1635.69	-	100.00	100	1735.69
4	CoSe 13452	1865.08	677.99	2543.07	951.02		951.02	3494.09
5	CoS 10239	129.66	1129.85	1259.51				1259.51
6	CoS 14233	264.28	439.96	704.24				704.24
7	CoS 15233	29.66	338.48	368.14				368.14
8	CoS 08279	-	25.00	25.00				25.00
9	UP 14234	-	129.56	129.56				129.56
10	CoSe 11453	-	105.01	105.01				105.01
11	CoSe 08452	950.51	915.48	1865.99				1865.99
12	Co 12029	3.24		3.240				3.24
13	CoLk 14204	-	347.25	347.25				347.25
14	CoLk 15207	96.95	321.80	418.75				418.75
15	CoLk 12204	177.95		177.95				177.95
16	CoLk 9204	10.10	72.45	82.55				82.55
17	CoLk 11206	9.60	20.70	30.30				30.30
18	CoLk 15206	-	19.20	19.20				19.20
19	Other	-	5.30	5.30				5.30
Total		4867.30	6308.57	11175.87	951.02	103.00	1054.02	12229.89
Grand Total		39070.67	37994.19	77014.02	20381.26	22222.10	42317.94	119681.72



Mini Seed Kit distribution of newly released variety by ACS Sri Sanjay Bhoosreddy, ACC Sri V.K. Shukla and Director Dr. S.K. Shukla in Kishan Mela



Distribution of online booked mini seed kit to growers by Director Dr. S.K. Shukla, DCO Sri Khushiram and Scientist/Senior Scientist of UPCS



Mini Seed Kit distribution



Mini Seed Kit distribution



Mini Seed Kit distribution by Director Dr. S.K. Shukla, Joint Director Dr. S.C. Singh and Senior Scientific Officer Sri S.P. Singh



Visit of RAC members to Breeder Seed Nursery at SRI, Shahjahanpur

18. Publications

Research Articles

- A.K. Tiwari, G.P. Rao (2023). Production of sugarcane grassy shoot disease free setts by using hot water treatment. *Phytopathogenic Mollicutes*. 13 (1) 73-74.
- N. Mishra, S.P. Dwivedi, J. Singh, A.K. Tiwari, C. Marcone (2023). Variability of phytoplasma associated with weeds grown in and around sugarcane crop in Uttar Pradesh, India. *Acta Phytopathologica et Entomologica Hungarica*. 58 (2) 149-155.
- Priyanka Singh, S. Solomon, Pankaj Rastogi, Kuldeep Kumar, G.P. Rao (2024). Achieving sustainable development goals: A case study of Dalmia Bharat Sugar & Industries. *Sugar Tech*. DOI:10.1007/s12355-023-01343-3
- Priyanka Singh and Arvind Kumar (2022). Impact of ortho silicic acid (OSA) on quantitative and qualitative attributes of early and mid-late sugarcane varieties. *Journal of Sugarcane Research* 12: 200-209.
- Priyanka Singh, Subhash Chandra Singh and S.K. Shukla (2023). The impact of time of planting on the productivity quality of early and mid-late sugarcane varieties e-*Proceeding of STAI*. pp 19 – 26.
- R.B. Singh, Sujeet Pratap Singh, N. Mishra, R.K. Singh, M.L. Sharma (2024). Evaluation of genetic diversity using biochemical markers in sugarcane germplasm collection. *Vegetos*, <https://doi.org/10.1007/s42535-023-00708-z>.
- R.K. Awasthi, Sujeet Pratap Singh, S.N. Singh, A. Kumar, M.M. Sharma and N.N. Tiwari (2024). Assessment of sugarcane genotypes/varieties against pokkahboeng disease and isolation of its pathogen from infected cane. *Biochem. Cell. Arch.* 24, 953-957, <https://doi.org/10.51470/bca.2024.24.1.953>.
- S.K. Pathak, R.K. Kushwaha, A.K. Shah (2023). Assessment of adoption level of trench method of planting in all three zones of Uttar Pradesh. *Agrica* 12 (1) 91-98.
- S.K. Pathak, R.K. Kushwaha, A.K. Shah (2023). Adoption of Trench Method Cane Planting and

its Role in Increasing Cane Yield and Sugar Recovery in Uttar Pradesh. *Sugar Tech* 26, 274-281 (2024). <https://doi.org/10.1007/s12355-023-01333-5>

- S.K. Pathak, R.K. Kushwaha, A.K. Shah (2020). Constraints in adoption of trench planting method in subtropical India. *Indian Journal of Sugarcane Technology* 35 (2) 138-140.
- Satendra Kumar, S.C. Singh and S.K. Shukla (2023). Impact of nutrient management on cane productivity and benefit in green manure sugarcane cultivation. *Agrica* 12(2): 197-201.

Book Chapters

1. A.K. Tiwari, Mona Gazel, Amit Yadav, Abdullah M. Al-Sadi, Saman Abeysinghe, NaghmeHNejat, KenroOshima, Assunta Bertaccini and Govind P. Rao. Overview of phytoplasma diseases in Asian countries. In *Diversity, Distribution, and Current Status*. Eds. by A.K. Tiwari, Kadriye Caglayan, Abdullah Al-Sadi, Mehdi Azadvar, Saman Abeysinghe. Published by Elsevier 2023.
2. A.K. Tiwari, Savarni Tripathi, Jitender Singh, Kiran Kirdat, M. Gurivi Reddy, V. Suryanarayana, Amit Yadav, Govind P. Rao. Diversity, Distribution and Status of Phytoplasmas Diseases in India. In *Diversity, Distribution, and Current Status*. Eds. by A.K. Tiwari, Kadriye Caglayan, Abdullah Al-Sadi, Mehdi Azadvar, Saman Abeysinghe. Published by Elsevier 2023
3. Amin Nikpay, A.K. Tiwari, GuadulopeVejar-Cota, MasumehZiaee, Blake Wilson, Sweta Srivastava and Francois-Regis Goebel. Biotic Stresses in Sugarcane Plants and Its Management. In: Verma, K.K., Song, X.P., Rajput, V.D., Solomon, S., Li, Y.R., Rao, G.P. (eds) *Agro-industrial Perspectives on Sugarcane Production under Environmental Stress*. Springer, Singapore 2023.
4. Chamran Hemmati, Mehrnoosh Nikooei, A.K. Tiwari. Elimination of phytoplasmas: an effective control perspective. In *Characterization, Epidemiology, and Management*. Eds by A.K. Tiwari, Kenro



Oshima, Amit Yadav, Seyyed Esmaeilzadeh-Hosseini, Yupa Hanboonsong, Suman Lakhanpaul. Published by Elsevier 2023

5. Chamran Hemmati, Mehrnoosh Nikooei, A.K. Tiwari. Management of insect vectors associated with phytoplasma diseases. In Characterization, Epidemiology, and Management. Eds by A.K. Tiwari, Kenro Oshima, Amit Yadav, Seyyed Esmaeilzadeh-Hosseini, Yupa Hanboonsong, Suman Lakhanpaul. Published by Elsevier 2023.
6. K. Nithya, Kiran Kirdat, B. Parameswari, Bhavesh Tiwarekar, A. K. Tiwari, G. P. Rao, Amin Nikpay, Trinh Xuan Hoat, R. Viswanathan and Amit Yadav. Updates on Phytoplasma Diseases Associated with Sugar Crops in Asia. In Phytoplasma Diseases of Major Crops, Trees, and Weeds. Eds by A.K. Tiwari, Kadriye Caglayan, Trinh Hoat, Ali Al-Subhi, Naghmeh Nejat, Gurivi Reddy. Published by Elsevier 2023
7. K. Sumi, GP Rao, Saman Abeysinghe, AK Tiwari, R. Manimekalai, Vinayak Hegde and M. Kochu Babu. Updates on Phytoplasma Diseases Associated with Palms in Asia. In Phytoplasma Diseases of Major Crops, Trees, and Weeds. Eds by A.K. Tiwari, Kadriye Caglayan, Trinh Hoat, Ali Al-Subhi, Naghmeh Nejat, Gurivi Reddy. Published by Elsevier 2023
8. Priyanka Singh, S. I. Anwar, M. M. Singh, and B. L. Sharma, Organic Jaggery Production, Hard ISBN: 9781774910580, E-Book ISBN: 9781003283560, August, 2023, pp 584.
9. Widana Gamage S.M.K, Nguyen Ngoc BaoChau, Nguyen BaoQuoc, Saman Abeysinghe, A.K. Tiwari. Novel methods of diagnosis of phytoplasma in Asian Countries. In Characterization, Epidemiology, and Management. Eds by A.K. Tiwari, Kenro Oshima, Amit Yadav, Seyyed Esmaeilzadeh-Hosseini, Yupa Hanboonsong, Suman Lakhanpaul. Published by Elsevier 2023

Books

- Characterization, Epidemiology, and Management, Series of Phytoplasma Diseases in Asian Countries (2023) Eds by A.K. Tiwari, Kenro Oshima, Amit Yadav, Seyyed Esmaeilzadeh-Hosseini, Yupa Hanboonsong, Suman Lakhanpaul. Published by Elsevier

ISBN: 9780323916714.

- Diversity, Distribution, and Current Status in Asian countries (2023) Eds by A.K. Tiwari, Kadriye Caglayan, Abdullah Al-Sadi, Mehdi Azadvar, Saman Abeysinghe. Published by Elsevier. ISBN: 9780323918961
- Phytoplasma Diseases Of Major Crops, Trees And Weeds in Asia (2023) Eds by A.K. Tiwari, Kadriye Caglayan, Trinh Hoat, Ali Al-Subhi, Naghmeh Nejat, Gurivi Reddy. Published by Elsevier Science. ISBN: 9780323918978

Abstracts in Conference/symposia/Seminar

1. A.K. Tiwari (2023) Current Situation of Phytoplasma Affecting Various Crop Species in Asian Countries. Key Note Lecture Invitation from MDMD-2023 held at ICISE, Vietnam.
2. Ananya Sharma, Prasoon Kumar, Sanjay Singh and Priyanka Singh (2023). Quantifying sugar losses in by-products of the sugarcane processing unit, international conference & sugar expo-2023 on sugar industry-modernization & diversification for sustainability, 11-12 October, 2023 at NSI, Kanpur, PP-143-147.
3. Archana, Sujeet Pratap Singh, S K. Vishwakarma, A. Sirari, A. Kumar and S.K. Shukla (2024). Evaluation of sugarcane germplasm against red rot for breeding programme. Natl. Conf. IPS, ICAR-Indian Institute of Sugarcane Research, Lucknow, Uttar Pradesh, February 1-3, 2024, PP (3)-2228-2155, PP 408.
4. Archana Kumar, S.P. Singh and S.K. Shukla (2023). Screening of promising sugarcane cultivars under saline soil condition. International Conference and expo on; Sugar industry- Modernization and diversification for Sustainability. 11-12 October, 2023 at NSI, Kanpur, PP-148-149.
5. G.N. Gupta, Rajesh Gupta and S K Shukla (2023) Influence of micronutrients soil supplementation on yield and sucrose content of sugarcane. International Conference and expo on; Sugar industry- Modernization and diversification for Sustainability. 11-12 October, 2023 at NSI, Kanpur.
6. Harshit Kashyap, Sujeet Pratap Singh, S.K. Vishwakarma, S. Yadav and A. Singh (2024).



- Survey and surveillance of sugarcane diseases in central Uttar Pradesh. Natl. Conf. IPS, ICAR-Indian Institute of Sugarcane Research, Lucknow, Uttar Pradesh, February 1-3, 2024, PP (15)-2272-2198, PP 356.
7. Neelam Kureel and S.K. Shukla (2024). Bio-efficacy of granular insecticide against sugarcane Shoot borer (*Chilo infusatellus*); Indian Phytopathological Society, National Conference "Plant Health for Food Security: Threats and Promises". Venue: ICAR- Indian Institute of Sugarcane Research Lucknow Uttar Pradesh. February 1-3, 2024 pp 232.
 8. Niraj Nath Tiwari, Sujeet Pratap Singh and S.K. Shukla (2024). Optimization of ex vitro rooting for healthy root regeneration in *Agrobacterium tumefaciens* mediated genetic transformation in sugarcane (*Saccharum officinarum*). Natl. Conf. IPS, ICAR-Indian Institute of Sugarcane Research, Lucknow, Uttar Pradesh, February 1-3, 2024.
 9. Prasoon Kumar, Pallavi Singh Arya, Manmohan Singh and Priyanka Singh (2024). "Exploring the influence of renewable sugar industry waste on ratoon sugarcane for improved jaggery quality" Motilal Nehru National Institute of Technology, Prayagraj, Uttar Pradesh, 23-25 February, 2024, PP-71.
 10. Prasoon Kumar, Pallavi Singh Arya, Manmohan Singh and Priyanka Singh. "Mitigating post-harvest deterioration in ratoon sugarcane under high temperatures through the utilization of renewable sugar industry wastes" IPS National Conference at Lucknow, Uttar Pradesh, 01-03 February 2024, PP-355.
 11. Praveen Kumar Verma, Sujeet Pratap Singh, S.K. Vishwakarma and Ajay Kumar (2024). Isolation of different strain of *Fusarium* spp. causing pokkahboeng and wilt disease in sugarcane. Natl. Conf. IPS, ICAR-Indian Institute of Sugarcane Research, Lucknow, Uttar Pradesh, February 1-3, 2024, PP (46)-2234-2175, PP 242.
 12. Priyanka Singh and S.K. Shukla (2023). Enhancing the mojo of millets (shree-anna) through jaggery-based value-added products" Proceedings of National Seminar on Millets for Nutrition and Food Security, 29th April 2023 at DDU Gorakhpur University.
 13. Priyanka Singh, Prasoon Kumar and S.K. Shukla (2023). "The impact of post-harvest processing losses on sugar recovery in sub-tropical sugar mills of India" International Conference & sugar expo-2023 on sugar industry-modernization & diversification for sustainability, 11-12 October 2023 at NSI, Kanpur, PP-206-214.
 14. Priyanka Singh (2024). Harnessing Sugarcane By-Products for Sustainable Chemical Production: Opportunities and challenges. National conference on recent trends in chemical science research and future prospects. St. Andrews College, Gorakhpur, March 20 & 21, 2024.
 15. Priyanka Singh (2023). Technological intervention for organic jaggery production, on Prof. (Dr.) Kirti Singh Memorial Lecture & National Seminar on Natural & Organic Farming For Sustainable Agriculture", 29 December 2023 at ICAR-IISR, Lucknow.
 16. S.K. Shukla and S.K. Pathak (2023) Diversification, sustainability and extending crushing duration upto 180 days in sugar mills of Uttar Pradesh. In Sustainable sugarcane production and utilization: Issue and Initiatives organized at Dr. Rajendra Prasad Central Agricultural University, Pusa, Bihar from 26-27 Oct. 2023.
 17. S.K. Shukla and S.K. Pathak (2023). Diversification and sustainability of sugar industry in Uttar Pradesh. Procc. Of XXII Biennial National Symposium of Indian Society of Agronomy at ICAR-Central Coastal Agricultural Research Institute, Goa during 22-24 Nov. 2023. Pp 196-198.
 18. S.K. Shukla, and Priyanka Singh (2024). Impact of technological interventions on sugarcane productivity vis-a-vis sugar recovery in Uttar Pradesh. 3rd International conference & Exhibition on Sustainable challenges & opportunities in Global Sugar Industry, 12th -14th Jan 2024, VSI, Pune.
 19. S.K. Shukla, Priyanka Singh and S.K. Pathak (2023). "How technology breakthrough improved sugarcane productivity vis-à-vis sugar recovery in Uttar Pradesh" International conference & sugar expo-2023 on sugar industry-modernization & diversification for sustainability, 11-12 October 2023 at NSI, Kanpur.



20. S.K. Vishwakarma, Sujeet Pratap Singh, S. P. Singh, N.N. Tiwari and S.K. Shukla (2024). Pathogenic characterization among newly collected isolates of *C. falcatum* causing red rot of sugarcane. Natl. Conf. IPS, ICAR-Indian Institute of Sugarcane Research, Lucknow, Uttar Pradesh, February 1-3, 2024, PP (10)-2291-2149, PP 412.
21. S.P. Singh, Archana Kumar and S.K. Shukla (2023). Evaluation of elite sugarcane cultivars under deficient moisture stress condition. National Conference of Plant Physiology – 2023 Physiological and Molecular Approaches for Climate Smart Agriculture December 09-11, 2023 New Delhi, India
22. S.P. Singh, Awadesh Dagar, Sujeet Pratap Singh, Arvind Kumar, O.S. Joshia, J.P. Singh and SK Shukla (2024). Screening of sugarcane genotypes against red rot disease of sugarcane. Natl. Conf. IPS, ICAR-Indian Institute of Sugarcane Research, Lucknow, Uttar Pradesh, February 1-3, 2024, PP (11)-2274-2202, PP 413.
23. S.P. Singh, Awadesh Dagar, Sujeet Pratap Singh, S.K. Vishwakarma and SK Shukla (2024). Survey of sugarcane diseases in western Uttar Pradesh. Natl. Conf. IPS, ICAR-Indian Institute of Sugarcane Research, Lucknow, Uttar Pradesh, February 1-3, 2024, PP (54)-2274-2203, PP 247.
24. Sachin Kashyap, Sujeet Pratap Singh, S.K. Vishwakarma, S.P. Singh, N.N. Tiwari and Sourabh Yadav (2023). Screening of sugarcane genotypes against red rot through artificial inoculation. Proc. of Intl. Conf., NSI, Kanpur, October 11-12, 2023, PP 165-170.
25. Sachin Kashyap, Sujeet Pratap Singh, S.K. Vishwakarma, S.P. Singh, N.N. Tiwari and Sourabh Yadav (2024). Behavior of existing sugarcane varieties against new red rot pathotype CF13. Natl. Conf. IPS, ICAR-Indian Institute of Sugarcane Research, Lucknow, Uttar Pradesh, February 1-3, 2024, PP (8)-2200-2129, PP 411.
26. Sarthak Tiwari, SK Vishwakarma, Sachin Kashyap SourabhYadav and Sujeet Pratap Singh (2024). Efficacy of systemic fungicide against *Colletotrichum falcatum* in in vitro condition. Natl. Conf. IPS, ICAR-Indian Institute of Sugarcane Research, Lucknow, Uttar Pradesh, February 1-3, 2024, PP (80)-2255-2184, PP 309
27. Satendra Kumar and S.C. Singh (2023). Agronomic practices of sugarcane cultivation for value addition of jaggery with millets. In souvenir of National seminar on recent approaches for production and value addition of millets (Shree anna) in changing climate scenario, 29 Sept-2023 at Lucknow organized by UPCAR and integral university, pp 48.
28. Satendra Kumar, S.C. Singh and S.K. Shukla (2023). Impact of row spacing arrangement on yield and profitability of sugarcane published in proceedings of International conference and sugar expo held on 11-12 Oct-2023 at National Sugar Institutes Kanpur pp199-205.
29. Shri Prakash Yadav, S.C. Singh, Shravan Kumar Yadav and Sudhir Shukla (2023). Retrospect and Prospect of trench planting in India with special theme to mechanization for sustainable sugar and sugarcane productivity. In proceedings of International conference & sugar Expo held on. 11-12 October, 2023 on “Sugar Industry-modernization & Diversification for sustainability”. Venue N.S.I. Kanpur, India. P.P. 215-219.
30. Sourabh Yadav, Sachin Kashyap, SK Vishwakarma, SP Singh, Arvind Kumar, N.N. Tiwari and Sujeet Pratap Singh (2024). Screening of sugarcane genotypes against smut disease. Natl. Conf. IPS, ICAR-Indian Institute of Sugarcane Research, Lucknow, Uttar Pradesh, February 1-3, 2024, PP (3)-2200-21321, PP 332.
31. Sourabh Yadav, Sujeet Pratap Singh, SK Vishwakarma, SP Singh, Ajay Kumar, Sachin Kashyap and N.N. Tiwari (2023). In-vitro compatibility of bioagent with systemic fungicides. Proc. of Intl. Conf., NSI, Kanpur, October 11-12, 2023, PP 178-185.
32. Sujeet Pratap Singh, Niraj Nath Tiwari, S.K. Vishwakarma, S.P. Singh and S.K. Shukla (2024). An emerging path of red rot infection through aerial movement of *C. falcatum*. Natl. Conf. IPS, ICAR-Indian Institute of Sugarcane Research, Lucknow, Uttar Pradesh, February 1-3, 2024, SO (2)-2199-2177, PP 197.
33. Sujeet Pratap Singh, S.K. Vishwakarma, S.P. Singh, Sachin Kashyap, Niraj Nath Tiwari and S.K. Shukla (2024). Production of disease-free healthy sugarcane seed nursery through Sett Treatment Device. Natl. Conf. IPS, ICAR-Indian Institute of Sugarcane Research, Lucknow, Uttar

Pradesh, February 1-3, 2024, PP (7)-2199-2128, PP 410.

Development of Literature

1. UPCSR at Glance (In English)
2. UPCSR at Glance (In Hindi)
3. One Day Training Booklet
4. Training Booklet for SCSP Scheme
5. RKVY Booklet for 2023-24
6. Autumn Technical Book
7. Spring Technical Book



Awards/Honour

1. **STAI Silver Award-2023 to Dr. Priyanka Singh** for the Paper Titled "Effect of Molybdenum and Boron application on yield and quality attributes of sugarcane" STAI 81st Annual Convention and International Sugar Expo-2023 at Travancore International Convention Centre, Thiruvananthapuram, Kerala, September 6-8, 2023.
2. **Best paper presentation Award-2023 to Dr. Priyanka Singh** for the Paper "Technological intervention for organic jaggery production" on Prof. (Dr.) Kirti Singh Memorial Lecture & National Seminar on Natural & Organic Farming for Sustainable Agriculture, 29 December 2023 at ICAR-IISR, Lucknow.
3. **Best oral paper presentation award to Dr. Sujeet Pratap Singh** for the Paper Title "An emerging path of red rot infection through aerial movement of *C. falcatum*" in National Conference on 'Plant Health for Food Security: Threats and Promises' from February 1-3, 2024 at ICAR-Indian Institute of Sugarcane Research, Lucknow, Uttar Pradesh.
4. **Best poster paper presentation award to Dr. Sujeet Pratap Singh** for the paper title Production of disease-free healthy sugarcane seed nursery through Sett Treatment Device in National Conference on 'Plant Health for Food Security: Threats and Promises' from February 1-3, 2024 at ICAR-Indian Institute of Sugarcane Research, Lucknow, Uttar Pradesh.
5. **Best poster paper presentation award to Dr. Sunil Kumar Vishwakarama** for the paper title "Pathogenic characterization among newly collected isolates of *C. falcatum* causing red rot of sugarcane" in National Conference on 'Plant Health for Food Security: Threats and Promises' from February 1-3, 2024 at ICAR-Indian Institute of Sugarcane Research, Lucknow, Uttar Pradesh.
6. **ISA Gold Medal Award to Dr. Sudhir Kumar Shukla**, Director for his outstanding contribution in Agronomy discipline by Indian Society of Agronomy.

Participation of UPCS in AICRP/National and International Conferences/Seminar/Symposium



Annual Group Meeting of All India Coordinated Research Project on Sugarcane during October 26 & 27, 2023 at the Dr. Rajendra Prasad Central Agricultural University, Pusa, Dist. Samastipur (Bihar)



Visit of AICRP team at UPCS-SRI, Shahjahanpur



National Conference on 'Plant Health for Food Security: Threats and Promises' from February 1-3, 2024 at ICAR-Indian Institute of Sugarcane Research, Lucknow, Uttar Pradesh International Conference on 'Sugar Industry – Modernization & Diversification for Sustainability' during October 11-12, 2023 at National Sugar Institute, Kanpur, India.



MOU with different organization



19. Scientific and Technical Staff

Sugarcane Research Institute, Shahjahanpur

Dr. Sudhir Shukla	Director
BREEDING	
Dr. Arvind Kumar	Sr. Scientific Officer
Dr. Manish Mohan Das	Sr. Sci. Assistant
Shri Nand Kishore Karma	Sr. Scientific Assistant
TISSUE CULTURE	
Shri Atul Chaturvedi	Lab Assistant
AGRONOMY	
Dr. Shri Prakash Yadav	Scientific Officer
Shri Shrawan Kumar Shukla	Sr. Sci. Assistant
Shri Durvijay Singh	Sci. Assistant
Shri S.K. Yadav	Agri. Supervisor
SOIL CHEMISTRY	
Shri Rajesh Kumar Gupta	Sr. Sci. Assistant
ENTOMOLOGY	
Mrs. Neelam Kureel	Scientific Officer
CHEMISTRY/SUGAR CHEMISTRY	
Dr.(Mrs.) Priyanka Singh	Sr. Scientific Officer
Dr. Man Mohan Singh	Sr. Sci. Assistant
PHYSIOLOGY	
Shri Shiv Pal Singh	Sr. Scientific Officer
Dr. (Mrs.) Archana	Scientific Officer
BIO CHEMISTRY	
Dr. Aneg Singh	Sr. Sci. Officer
Dr. Gorakh Nath Gupta	Scientific Officer
PATHOLOGY	
Dr. Sujeet Pratap Singh	Scientific Officer
Dr. Suneel Kumar Vishwakarma	Scientific Officer
SEED PRODUCTION	
Mrs. Sonia Yadav	Scientific Officer
STATISTICS	
Shri Sudhir Kumar Dixit	Statistical Officer
Shri Vivek Kumar Shukla	Sr. Stat. Assistant
EXTENSION	
Dr. Sanjeev Kumar Pathak	Extension Officer
FARM	
Dr. Anil Kumar Singh	Farm Management Officer

Dr. Chidda Singh Poswal	Sr. Farm M. Asstt.
Shri Chandramani Singh	Sci. Assistant
LIBRARY	
Dr. Narsingh Narain Saxena	Sr. Librarian
Sugarcane Research Institute, Muzaffarnagar	
PLANT PATHOLOGY	
Dr. Surendra Pratap Singh	Scientific Officer
BREEDING	
Shri Onkar Singh Joshia	Sr. Scientific Officer
Shri Avdhesh Kumar	Sr. Sci. Assistant
AGRONOMY	
Dr. Jai Prakash Singh	Sr. Scientific Officer
Shri Sunder Pal	Sr. Scientific Assistant
SOIL CHEMISTRY	
Dr. Ved Prakash	Scientific Officer
ENTOMOLOGY	
Shri Ajay Kumar Singh	Sr. Sci. Assistant
ECONOMICS	
Shri Arvind Kumar Sharma	Sr. Eco. Assistant
FARM	
Shri Kiran Singh	Sr. F.M. Asstt.
Shri Pan Singh	Farm M. Assistant
G.S.S.B.R.I., Seorahi (Kushinagar)	
Dr. Subhash Chandra Singh	Joint Director
BREEDING	
Dr. Krishna Nand	Sr. Sci. Assistant
Shri Ajai Kumar Rai	Sr. Sci. Assistant
AGRONOMY	
Dr. Satendra Kumar	Scientific Officer
SOIL CHEMISTRY	
Shri Atul Kumar Srivastava	Sr. Sci. Assistant
SEED PRODUCTION	
Dr. Archana Siraree	Sr. Scientific Officer
PHYSIOLOGY	
Shri Krishna Pal	Scientific Officer
Shri Kishore Kumar Singh	Sr. Scientific Assistant
PATHOLOGY	
Dr. Yogendra Prasad Bharti	Scientific Officer

**ENTOMOLOGY**

Dr. Vinay Kumar Mishra Sr. Sci. Assistant

STATISTICS

Shri Kamal Kishore Sahu Statistical Officer

FARM

Shri Vrdhi Chandra Agri. Sup.

Shri Sanjeev Kumar Mishra Agri. Sup.

Sugarcane Research And Seed Multiplication Centre, Gola, Lakhimpur-Kheri**SEED PRODUCTION**

Dr. Ajay Kumar Tiwari Sr. Scientific Officer

AGRONOMY

Dr. Sarnam Singh Scientific Officer

FARM

Shri Ravi Pratap Singh Sr. Farm M. Assistant

Sugarcane Research Centre, Pipraich-Gorakhpur**PHYSIOLOGY**

Shri Vinod Kumar Shahi Sr. Scientific Assistant

TECHNICAL

Sri Gyaneshwar Kr. Mishra A.E. (Civil)

FARM

Shri Lallan Prasad Fram M. Assistant

Sugarcane Research And Seed Multiplication Centre, Katya-Sadat-Ghazipur**BREEDING**

Shri Ramai Ram Scientific Officer

TECHNICAL

Shri Jyoti Bhushan Singh J.E. (Mech)

Seed Multiplication Centre, Amahat-Sultanpur**AGRONOMY**

Shri Yogesh Sr.Sci.Asstt.

Shri Chandra Pratap Singh Scientific Assistant

SEED PRODUCTION

Dr. Sanjay Pratap Singh Scientific Officer

Seed Multiplication Centre, Luxmipur-Kushinagar**BREEDING**

Shri Kuber Nath Yadav Scientific Asstt.

Seed Multiplication centre, Balrampur**AGRONOMY**

Sri Bhagwan deen Sr. Scientific Asstt.

SUPERANNUATION

No.	Name & Designation	Date of Superannuation	Place
1	Dr. Aneg Singh SSO (Bio Chemistry)	30.06.2023	Shahjahanpur
2	Shri Shrawan Kumar Shukla SSA (Agronomy)	27.06.2023 Death	Shahjahanpur
3	Shri Rajesh Kumar Gupta SSA (Soil Chemistry)	30.09.2023	Shahjahanpur
4	Shri Sunder Pal SSA (Agronomy)	31.12.2023	Muzaffarnagar
5	Shri Pan Singh FMA (Farm)	31.01.2024	Muzaffarnagar
7	Shri Atul Kumar Srivastava SSA (Soil Chemistry)	31.12.2023	Seorahi (Kushinagar)
8	Shri Kuber Nath Yadav SA (Breeding)	30.06.2023	Laxmipur(Kushinagar)
9	Shri Arvind Kumar Sharma SEA	31.12.2023	Muzaffarnagar

20. Weather Report

Shahjahanpur							
S.N.	Months	Temp. Mean(C)		Relative humidity(%)		Total Rainfall (mm)	No. of Rainy Days
		Max.	Min.	Forenoon	Afternoon		
1	April 2023	34.9	19.9	71	54	39.0	06
2	May 2023	37.1	22.9	59	47	12.0	07
3	June 2023	37.6	27.4	56	41	128.0	08
4	July 2023	33.3	26.8	87	73	319.0	19
5	August 2023	33.0	26.8	87	79	169.0	10
6	September 2023	33.3	25.7	88	74	203.0	08
7	October 2023	33.0	19.9	84	65	4.2	01
8	November 2023	29.2	14.8	87	64	9.2	01
9	December 2023	23.7	9.7	87	66	05	01
10	January 2024	15.6	6.9	89	73	NIL	-
11	February 2024	23.8	10.2	83	61	12.0	02
12	March 2024	29.4	15.1	76	44	19.0	03

Muzaffarnagar							
S.N.	Months	Temp. Mean (C)		Relative Humidity(%)		Total Rainfall (mm)	No. of Rainy Days
		Max.	Min.	Fore noon	Afternoon		
1	April 2023	33.9	19.4	55	26	19.6	02
2	May 2023	34.0	22.1	59	37	113.4	06
3	June 2023	35.4	25.3	64	49	37.4	06
4	July 2023	32.1	26.5	87	74	534.6	14
5	August 2023	33.2	26.7	85	71	183.4	09
6	September 2023	33.5	24.7	85	63	140.2	08
7	October 2023	31.3	18.3	81	49	29.6	02
8	November 2023	26.6	13.4	84	56	4.2	03
9	December 2023	22.0	8.0	90	56	-	-
10	January 2024	14.2	5.3	97	76	-	-
11	February 2024	23.2	8.7	83	43	16.0	03
12	March 2024	28.0	13.3	79	40	19.8	02

21. Important Committees

1—	शोध प्राथमिकता, निगरानी एवं मूल्यांकन समिति (क) संस्थान/केन्द्रों की शोध प्राथमिकता, निगरानी एवं मूल्यांकन। (ख) राज्य सरकार, भारत सरकार एवं वाह्य सहायतित परीक्षणों की निगरानी। (ग) शोध कार्यों में गुणोत्तर सुधार हेतु सुझाव। (घ) परीक्षणों से प्राप्त परिणामों का मूल्यांकन।	अध्यक्ष— निदेशक सदस्य— संयुक्त निदेशक, सेवरही एवं सम्बद्ध केन्द्रों के प्रभारी समस्त अनुभागाध्यक्ष लेखाधिकारी सदस्य सचिव— डा. प्रियंका सिंह, वरि. वैज्ञा. अधिकारी
2—	वित्तीय/प्रशासनिक नीति निर्धारण एवं अन्य समीक्षा हेतु समिति (क) परिषद के कार्मिकों के सम्बन्ध में मा. गवर्निंग बाडी के माध्यम से वित्तीय/प्रशासनिक नीतियों के निर्धारण हेतु सुझाव प्रस्तुत करना। (ख) प्रोन्नति/ए.सी.पी./अन्य सेवा सम्बन्धी/वित्तीय लम्बित प्रकरणों की समीक्षा। (ग) समस्त कार्मिकों के सेवा अभिलेखों का ससमय परीक्षण। (घ) सक्षम न्यायालयों में चल रहेवादों की समय-समय पर समीक्षा।	अध्यक्ष— निदेशक सदस्य— श्री एस.पी. सिंह, वरि. वैज्ञा. अधिकारी डा. एन.एन. सक्सेना, वरि. पुस्तकालयाध्यक्ष श्री एस.के. पाठक, प्रसार अधिकारी लेखाधिकारी अथवा उनके द्वारा नामित सदस्य सदस्य सचिव— श्री अविनेश कुमार तिवारी, प्रधान सहायक
3—	अभिजनक बीज उत्पादन कार्यक्रम समिति (क) शासन द्वारा निर्धारित लक्ष्य के अनुरूप अभिजनक बीज गन्ना पौधशालाओं की स्थापना हेतु प्लॉटों का चयन (शोध, चीनी मिल एवं कृषक प्रक्षेत्र) एवं उत्पादन। (ख) किस्मों का चयन, शुद्धता सुनिश्चित करते हुए अभिजनक बीज गन्ना बुवाई, पर्यवेक्षण एवं वितरण। (ग) बीज गन्ना का गर्म जल उपचार। (घ) वितरण के समय बीज प्रमाणीकरण।	अध्यक्ष— डा. अजय कुमार तिवारी, वरि. वैज्ञा. अधिकारी सदस्य— डा. अरविन्द कुमार, वरि. वैज्ञानिक अधिकारी डा. अनिल कुमार सिंह, प्रक्षेत्र प्रबन्ध अधिकारी डा. सुजीत प्रताप सिंह, वैज्ञानिक अधिकारी डा. सी.एस.पोसवाल, वरि. प्रक्षेत्र प्रबंध सहायक सदस्य सचिव— श्रीमती सोनिया यादव, वैज्ञानिक अधिकारी
4—	नियोजन एवं व्यय समिति (क) आवंटित बजट के सापेक्ष व्यय की समीक्षा (ख) वेतन/गैरवेतन व्यय की समीक्षा (ग) राज्य सरकार, भारत सरकार एवं वाह्य संस्थाओं से पोषित परीक्षणों में व्यय एवं प्राप्तियों की समीक्षा। (घ) प्रयोगशाला, अचल सम्पत्ति, प्रक्षेत्र तथा अन्य अनुभागों में लगाये गये श्रमिकों के भुगतान की समीक्षा।	अध्यक्ष— निदेशक सदस्य— डा. प्रियंका सिंह, वरि. वैज्ञानिक अधिकारी डा. अनिल कुमार सिंह, प्रक्षेत्र प्रबन्ध अधिकारी श्रीमती नीलम कुरील, वैज्ञानिक अधिकारी लेखाधिकारी अथवा उनके द्वारा नामित सदस्य सदस्य सचिव— श्री नवल किशोर सक्सेना, लेखाकार
5—	क्रय सलाहकार समिति (क) प्रयोगशाला उपकरणों, कृषि यंत्रों, ग्लासवेयर्स, पलीवेयर्स एवं रसायनों का क्रय। (ख) केन्द्रीय भण्डार से सम्बन्धित समस्त क्रय यथा कार्यालय एवं स्टेशनरी (ग) कम्प्यूटर, प्रयोग शाला उपकरणों तथा अन्य के वार्षिक अनुरक्षण अनुबन्ध सम्बन्धी कार्यवाही। (घ) निष्प्रयोज्य समानों/वाहनों/कृषि यन्त्रों की नीलामी सम्बन्धी कार्यवाही।	अध्यक्ष— डा. प्रियंका सिंह, वरि. वैज्ञानिक अधिकारी सदस्य— श्रीमती सोनिया यादव, वैज्ञानिक अधिकारी श्री सुधीर दीक्षित, सांख्यिकी अधिकारी श्री मौजीलाल यादव, लेखाकार सदस्य सचिव— डा. अर्चना, वैज्ञानिक अधिकारी (दैहिकी)

6—	प्रक्षेत्र सलाहकार समिति	
	<p>(क) प्रक्षेत्र पर नियोजन एवं आधुनिकीकरण (ख) श्रमिकों का उचित उपयोग (ग) प्रक्षेत्र उत्पादित फसलों का निस्तारण एवं उनके उचित मूल्य का निर्धारण। (घ) संविदा पर श्रमिकों को लगाये जाने हेतु उनकी आवश्यकता का निर्धारण (च) परीक्षणों हेतु प्लाट का आवंटन (छ) प्रक्षेत्र हेतु निवेशों यथा बीज, खाद, रसायन, डीजल आदि की आवश्यकता का निर्धारण एवं क्रय समीक्षा। (ज) प्रक्षेत्र की आय बढ़ाने हेतु सुझाव एवं प्रयास। (झ) प्रक्षेत्र पर ट्रैक्टर, नलकूप, कृषि यंत्रों एवं जेनरेटर की मरम्मत</p>	<p>अध्यक्ष—डा. अजय कु. तिवारी, वरि. वैज्ञा. अधिकारी सदस्य— डा. श्रीप्रकाश यादव, वैज्ञानिक अधिकारी डा. सुनील कुमार विश्वकर्मा, वैज्ञानिक अधिकारी श्री मौजीलाल यादव, लेखाकार सदस्य सचिव— डा. अनिल कुमार सिंह, प्रक्षेत्र प्रबन्ध अधिकारी</p>
7—	मानव संसाधन विकास समिति	
	<p>(क) कार्यालय, तकनीकी एवं वैज्ञानिक स्टाफ की ट्रेनिंग सम्बन्धी कार्ययोजना (ख) अध्ययन अवकाश संबंधी पालिसी (ग) वैज्ञानिक/ शोध सहायक स्टाफ को वाह्य संस्थानों में आयोजित सेमिनार/ सिम्पोजियम/ प्रशिक्षण/ कार्यशाला में भाग लेने सम्बन्धी कार्यवाही। (घ) शोध परिषद के वैज्ञानिकों/शोध सहायकों के संस्थान में समय-समय पर लेक्चर का आयोजन।</p>	<p>अध्यक्ष—डा. अरविन्द कुमार, वरि. वैज्ञा. अधिकारी सदस्य— डा. सुजीत प्रताप सिंह, वैज्ञानिक अधिकारी श्री संजीव कुमार पाठक, प्रसार अधिकारी डा. अनिल कुमार सिंह, प्र.प्रबन्ध अधिकारी सदस्य सचिव— डा. प्रियंका सिंह, वरि. वैज्ञानिक अधिकारी</p>
8—	पुस्तकालय समिति	
	<p>(क) पुस्तकालय हेतु जर्नल्स, पुस्तकें, मैगजीन आदि क्रय करने की कार्यवाही। (ख) पुस्तकालय में उपलब्ध जर्नल्स, पुस्तकों, न्यूजपेपर आदि का अनुरक्षण एवं वैज्ञानिकों एवं स्टाफ के वाचन सम्बन्धी व्यवस्था। (ग) पुस्तकालय के डिजीटलाइजेशन/कम्प्यूटरीकृत किये जाने की कार्यवाही।</p>	<p>अध्यक्ष—डा. श्रीप्रकाश यादव, वैज्ञानिक अधिकारी सदस्य— डा. अर्चना, वैज्ञानिक अधिकारी श्रीमती सोनिया यादव, वैज्ञानिक अधिकारी लेखाधिकारी अथवा उनके द्वारा नामित सदस्य सदस्य सचिव— डा. एन.एन. सक्सेना, वरि. पुस्तकालयाध्यक्ष</p>
9—	कार्य एवं अनुरक्षण समिति	
	<p>(क) कार्ययोजना तैयार करना। (ख) चल रहे कार्यों का पर्यवेक्षण। (ग) सिविल, मैकेनिकल एवं इलेक्ट्रिक कार्यों को समय से सम्पन्न कराना। (घ) जेनरेटर का अनुरक्षण एवं मरम्मत। (च) आडिटोरियम, सभाकक्ष, अतिथिगृह एवं कार्यालय तथा प्रयोगशालाओं का अनुरक्षण एवं मरम्मत। (छ) विद्युत आपूर्ति की निरन्तरता सुनिश्चित करना। (ज) कार्यालय एवं अनुभागों में कैमरों का आवंटन। (झ) वाहनों का अनुरक्षण एवं मरम्मत। (य) परिषद परिसर, प्रयोगशाला, अतिथिगृह की स्वच्छता की समीक्षा एवं सुधार हेतु कार्ययोजना एवं कार्य।</p>	<p>अध्यक्ष—श्री शिवपाल सिंह, वरि. वैज्ञा. अधिकारी सदस्य— डा. जी.एन. गुप्ता, वैज्ञानिक अधिकारी श्री संजीव कुमार पाठक, प्रसार अधिकारी डा. एन.एन. सक्सेना, वरि. पुस्तकालयाध्यक्ष लेखाधिकारी अथवा उनके द्वारा नामित सदस्य सदस्य सचिव— डा. अरविन्द कुमार, वरि. वैज्ञा. अधिकारी</p>
10—	सुरक्षा सलाहकार एवं अनुशासन समिति	
	<p>(क) प्रक्षेत्र, आवासीय भवनों, प्रयोगशाला भवनों तथा कार्यालय सहित सम्पूर्ण परिसर की सुरक्षा की समीक्षा तथा हेतु सुझाव। (ख) सुरक्षा कर्मियों के भुगतान की समीक्षा। (ग) अनुशासन सम्बन्धित शिकायत।</p>	<p>अध्यक्ष—डा. सुजीत प्रताप सिंह, वैज्ञानिक अधिकारी सदस्य— डा. एन.एन. सक्सेना, वरि. पुस्तकालयाध्यक्ष श्री संजीव कुमार पाठक, प्रसार अधिकारी लेखाधिकारी अथवा उनके द्वारा नामित सदस्य सदस्य सचिव— डा. एन.एन. सक्सेना, वरि. पुस्तकालयाध्यक्ष</p>

11-	प्रकाशन समिति	
	गन्ना उत्पादन तकनीकी "गन्ना खेती" वार्षिक प्रतिवेदन तकनीकी प्रोग्राम, न्यूजलेटर, मिठास, प्रशिक्षण पुस्तिका, फोल्डर, पम्पलेट आदि का प्रकाशन।	अध्यक्ष —डा. अजय कुमार तिवारी, वरि. वैज्ञानिक अधिकारी सदस्य — डा. एन.एन. सक्सेना, वरि. पुस्तकालयाध्यक्ष डा. सुनील कुमार विश्वकर्मा, वैज्ञानिक अधिकारी सदस्य सचिव —श्री संजीव कुमार पाठक, प्रसार अधिकारी
12-	आवास आवंटन समिति	
	कार्मिकों आर्हता/वरिष्ठता के अनुसार उनके आवासों का आवंटन, अनाधिकृत रूप से काबिज आवासों को रिक्त कराना, आवासों में विद्यमान समस्याओं का निरीक्षण कर सुझाव देना।	अध्यक्ष —श्री शिवपाल सिंह, वरि.वैज्ञा.अधिकारी सदस्य — डा. एन.एन. सक्सेना, वरि. पुस्तकालयाध्यक्ष डा. जी.एन. गुप्ता, वैज्ञानिक अधिकारी श्री संजीव कुमार पाठक, प्रसार अधिकारी लेखाधिकारी अथवा उनके द्वारा नामित सदस्य सदस्य सचिव — डा. अरविन्द कुमार, वरि. वैज्ञानिक अधिकारी
13-	सेवा सम्बन्धी मामलों की समिति	
	स्थापन लेखा एवं अन्य लम्बित प्रकरण/शिकायत।	अध्यक्ष —डा. अरविन्द कुमार, वरि. वैज्ञानिक अधिकारी सदस्य — श्री संजीव कुमार पाठक, प्रसार अधिकारी लेखाधिकारी अथवा उनके द्वारा नामित सदस्य सदस्य सचिव —श्री अविनेश कुमार, प्रधान सहायक
14-	विशाखा समिति	
	कार्यस्थल पर महिला लैंगिक उत्पीड़न (निवारण, प्रतिषेध और प्रतिरोध) अधिनियम-2013 के क्रियान्वयन हेतु।	अध्यक्ष —श्रीमती नीलम कुरील, वैज्ञा. अधिकारी सदस्य —डा. सुजीत प्रताप सिंह, वैज्ञानिक अधिकारी श्री जितेन्द्र कुमार मिश्र, जिला गन्ना अधिकारी श्री सुधीर दीक्षित, सांख्यिकी अधिकारी श्रीमती विमला बहन, समाजसेवी, विनोबा सेवा आश्रम, बरतारा, शाहजहाँपुर। सदस्य सचिव —श्रीमती सोनिया यादव, वैज्ञानिक अधिकारी
15-	कृषक पंजीकरण समिति	
	बीज गन्ना उत्पादक कृषक पंजीकरण एवं प्राप्त प्रार्थना पत्रों के त्वरित परीक्षण तथा पंजीयन प्रमाण पत्र निर्गत संबंधी संस्तुति हेतु।	अध्यक्ष —डा. अर्चना, वैज्ञा. अधिकारी सदस्य —डा. अनिल कुमार सिंह, प्र. प्रबन्ध अधिकारी डा. सुनील कुमार विश्वकर्मा, वैज्ञानिक अधिकारी श्री सुधीर दीक्षित, सांख्यिकी अधिकारी सदस्य सचिव —श्रीमती सोनिया यादव, वैज्ञानिक अधिकारी
16-	प्रशिक्षण समिति	
	प्रशिक्षण एवं संसाधन आयोजन समिति	अध्यक्ष —श्री शिवपाल सिंह, वरि.वैज्ञा. अधिकारी सदस्य —डा. एन.एन. सक्सेना, वरि.पुस्तकालयाध्यक्ष श्री मौजीलाल यादव, लेखाकार डा. सुनील कुमार विश्वकर्मा, वैज्ञानिक अधिकारी सदस्य सचिव —श्री एस.के. पाठक, प्रसार अधिकारी
17-	आनलाइन मिनी सीड किट वितरण समिति	
	नवीन गन्ना किस्मों के मिनी सीड किट की बुकिंग एवं वितरण व्यवस्था हेतु।	अध्यक्ष —डा. अजय कुमार तिवारी, वरि.वैज्ञा. अधिकारी सदस्य — श्रीमती सोनिया यादव, वैज्ञानिक अधिकारी डा. सुजीत प्रताप सिंह, वैज्ञानिक अधिकारी डा. अनिल कुमार सिंह, प्र.प्रबन्ध अधिकारी डा. सी.एस.पोसवाल, वरि. प्रक्षेत्र प्रबंध सहायक सदस्य सचिव —डा. जी.एन. गुप्ता, वैज्ञानिक अधिकारी

18—	इन्टर्नशिप/अप्रैन्टिसशिप समिति (क)इन्टर्नशिप की आवश्यकता निर्धारण, इन्टर्नशिप हेतु प्राप्त आवेदन पत्रों की स्क्रीनिंग कर पात्र प्रशिक्षुओं की चयन की संस्तुति देने, अभिलेखों का सत्यापन व गोपनीयता संबंधी घोषणा पत्र प्राप्त करना आदि। (ख)अप्रैन्टिसशिप संबंधी विविध कार्य।	अध्यक्ष —डा. प्रियंका सिंह, वरि.वैज्ञा.अधिकारी सदस्य —श्रीमती सोनिया यादव, वैज्ञानिक अधिकारी श्रीमती नीलम कुरील, वैज्ञानिक अधिकारी श्री सुधीर दीक्षित, सांख्यिकी अधिकारी सदस्य सचिव —डा. सुजीत प्रताप सिंह, वैज्ञानिक अधिकारी
19—	फार्म/परिषदीय उत्पाद मूल्य निर्धारण समिति 1. वाह्य संस्थाओं के रासायनिक उत्पादों के लैब/प्रक्षेत्र पर परीक्षण हेतु परीक्षण शुल्क। 2. निजी चीनी मिल द्वारा जातीय पहचान/रोग एवं कीट की पहचान तथा सुझाव तथा चीनी परता जाँच हेतु भुल्क। 3. टिशू कल्चर द्वारा उत्पादित पौधों एवं स्थापित कल्चर का प्रति पौधा/प्रति कल्चर का मूल्य। 4. परिशद पर उत्पादित विभिन्न जैवउत्पाद/वायोपेस्टीसाइड/ट्राइकोकार्ड का मूल्य। 5. अतिथि गृह के श्रेणीवार कमरों का रुम रेन्ट निर्धारण भुल्क, परिषदीय कर्मचारी/अन्य राजकीय कर्मचारी/व्यक्तिगत/सेवानिवृत्त परिषदीय कर्मचारी। 6. गुड़ का मूल्य निर्धारण प्रति किग्रा.।	अध्यक्ष —निदेशक डा. अजय कुमार तिवारी, वरि.वैज्ञा. अधिकारी डा. सुनील कुमार विश्वकर्मा, वैज्ञानिक अधिकारी डा. अनिल कुमार सिंह, प्र. प्रबन्धअधिकारी डा. सुजीत प्रताप सिंह, वैज्ञानिक अधिकारी सदस्य सचिव — लेखाधिकारी



22. Revenue Generation Status

S.N.	Particulars	Revenue (INR)
1	Farm Receipt	7,31,18,556.00
2	Bio-Product	45,09,222.00
3	Trichocard	4,14,250.00
4	Soil Analysis	4,72,400.00
5	Training	61,77,000.00
6	Registered Farmers	11,34,000.00
7	Logistics	5,66,850.00
8	Contract Field Trail	30,00,000.00
9	Others	2,01,34,417.00
	Total	10,95,26,695.00

Memories at Glance



Visit of Cane Commissioner at SRI, Shahjahanpur



MITHAS 2023-24 (Kisan Mela)

Inaguration and participation by Principal Secretary, Sugar Industry and Cane Development U.P.



Visit of AICRP(S) Monitoring Team





U.P. COUNCIL OF SUGARCANE RESEARCH
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