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All India Coordinated Research Project on Sugarcane

Project Coordinator's Report

2016-17

Dr. S K Shukla
Project Coordinator

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ICAR-Indian Institute of Sugarcane Research,
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All India Coordinated Research Project on Sugarcane
(Indian Council of Agricultural Research)

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भाकृअनुप
ICAR

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Preface

Indian sugar industry has become pivot for gainful employment generation through rural based agro-industrialization. Sugarcane, being cash crop is more pertinent in the present context of increasing farmers' income. The net income in sugarcane cultivation relies on higher cane yield with high sucrose recovery and reduced cost of production. A sucrose rich variety is the choice of millers to harness maximum sugar recovery while farmer's prime interest lies to harvest high tonnage of cane from fields. Suitable variety compatible with remunerative inter-crops and stable cane yield is important for increasing farmers' income. During present crushing season, quick spread of improved sugarcane varieties developed under AICRP(S), released through CVRC and endorsed/recommended for commercial cultivation by different State Govt. Departments has sustained the cane and sugar yields, despite adverse agro-climatic conditions in few sugarcane producing region. In Uttar Pradesh, inclusion of the improved varieties significantly contributed to produce all time high production (85.72 lakh tonnes) of sugar. It could be beneficial to other states also.

Theoretical potential yield of sugarcane has been estimated to be 474 t/ha while actual yield of 335 t/ha has been realized in sub-tropical India. The gap can be cope up by developing improved varieties, suitable package of practices and crop protection measures. In order to develop location specific high yielding sugarcane varieties with high sugar, zonal varietal trials of early and mid-late maturing varieties, experiments have been conducted to screen the promising genotypes. Use of good ratooning varieties for different zones need to be popularized to improve ratoon cane yield. In view of developing abiotic stress tolerant varieties due to climate change, identification & evaluation of ISH & IGH programme is being executed at identified centres for both drought as well as waterlogging conditions. At present, four improved genotypes Co 09004 (Amritha), an early maturing for peninsular zone; CoLk 09204 (Ikshu-3) and Co 09022 (Karan 12) both mid-late maturing for north west zone and clone U.P 09453, an early maturing for north central and north east zone have been identified for release.

In order to fine tune the cost of sugarcane production and expenses on costly inputs like irrigation water, chemical fertilizers and pesticides, emphasis has been given on holistic approach covering soil health through sugarcane based carbon sequestration and encouraging use of biofertilizers and nutrient solubilizer with reduced doses of chemical fertilizer. Surface and sub-surface drip irrigation in sugarcane effectively saved water (up to 40%) and increased the crop yield by 20%. Fertigation with drip resulted in 25% saving of nitrogen compared with surface irrigation. Application of 20 t/ha FYM/ compost along with inorganic fertilizers applied on the basis of soil test crop response for targeted yield has shown positive effect on sugarcane growth and yield both in plant and ratoon crops. Use of organic sources of nutrients in plant-ratoon system brings about substantial enhancement of soil health parameters in most of the sugarcane growing soils. Efficacy of ethrel on accelerating and enhancing germination in sugarcane has been reported from almost all the centres and 50 ppm solution was found effective. Spray of GA_3 (35 ppm) during tillering enhanced cane yield effectively across the zones. Planting of sugarcane in paired rows (120: 30) with mulching of trash (6 t/ha) in the inter-row spaces out yielded the conventional flat method with or without mulch at all the centres in north western, north central and north eastern zones. Sugarcane crop responded up to 0.8 IW/CPE irrigation regime across the zones. Trash mulching could effectively save 20-26% irrigation water over no-mulching.

The plant protection which includes Plants Pathology and Entomology goes simultaneously with varietal breeding. Twelve centres gathered information on new isolates of red rot pathogen, showing pathogenic variability from the designated pathotypes. A total of 95 new isolates along with respective designated pathotypes of their zone were tested on host

differentials. More number of variants have been isolated from the popular varieties such as Co 89003, CoJ 64, CoS 8436, CoSe 92423, CoSe 95422 and Co0238. In evaluation of ZVT entries, 15 centres carried out red rot testing, 16 for smut and 6 have screened the clones for wilt resistance and identified number of entries as R/MR to red rot, smut and wilt from four zones and recorded YLD resistance among the entries. In survey of sugarcane diseases, 22 centres gathered information on diseases naturally occurring in their area. In north west zone, in Uttar Pradesh, 3-8% incidence of red rot was recorded in Co 0238, CoS 8436, CoS 92423, CoLk 08102, CoS 91269 and CoSe 95422, while 25% incidence was recorded in CoLk 8102, CoSe 95422 and CoS 8436. In North Central zone, the Pusa centre observed wilt in varieties CoLk 94184, CoSe 98231, Co 0118 and Co 0233 and smut in BO 141 and BO 136. The Seorahi centre reported red rot with 15 and 20% on cultivars CoSe 92423 and UP 9530 and wilt in varieties CoS 08279 (2%), Co 0238 (10%) and Co 98014 (15-20%). In East Coast zone, occurrence of 10-40 % red rot was observed on Co 62175, 81 A 99, 93 V 297, S-12 and 81 V 48 by Anakapalle centre. The centre also reported occurrence of smut from 10-45%, wilt 10-30% and 10-70% of YLD. In Peninsular Zone, Coimbatore centre reported occurrence of red rot in Co 86027 and TNAU Si8 and sudden outbreak of smut in Co 86032.

The egg parasitoid, *Trichogramma chilonis, Tetrastichus pyrillae*; larval parasitoid, *Isotima javensis, Rhaconotus scirpophagae, Stenobracon sp., Sturmiopsis inferens, Cotesia flavipes*; nymphal and adult parasitoid, *Epiricania melanoleuca* and fungus, *Beaveria bassiana* were observed on insect-pests. There was significant reduction in the incidence early stop borer and internode borer in lure treated plot in all the zones. The incidence of early shoot borer was significantly reduced through application of Chlorantraniliprole 18.5 SC @ 375 ml/ha. The soil application of chlorantraniliprole 0.4 G @ 22.5 kg /ha at the time of planting significantly reduced incidence in Peninsular Zone.

AICRP on Sugarcane is also the nodal agency for conducting a DUS Testing Programme under the Protection of Plant Variety and Farmers Rights Authority at its two cooperating centers – Indian Institute of Sugarcane Research, Lucknow and Sugarcane Breeding Institute, Coimbatore.

The salient research achievements of 2016-17 in Crop Improvement, Crop Production, Plant Pathology and Entomology disciplines are being presented in this report.

(S. K. Shukla)
Project Coordinator (Sugarcane)

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We wish to express my deep sense of gratitude to Dr. Trilochan Mohapatra, Secretary, DARE (Govt. of India) and Director General, ICAR for permitting us to organize the Group Meeting.

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I extend my heartfelt thanks to all the Principal Investigators, viz., Dr. Bakshi Ram, Director, ICAR-SBI, Coimbatore, Dr. T.K. Srivastava, Principal Scientist, ICAR-IISR, Lucknow, Dr. R. Viswanathan, Head, Crop Protection Division, ICAR-SBI, Coimbatore and Dr. G.G. Radadia, Professor & Head, Entomology Division, NAU, Navsari of Crop Improvement, Crop Production, Plant Pathology & Entomology disciplines, respectively for their cooperation in framing the technical programmes and painstaking task of preparing technical reports for the year 2016-2017. My thanks are also to the team leaders, members and member secretaries of the Monitoring Teams for assessing the performance of the AICRP programme implemented at various centres during 2017-18 crop season and compilation of reports.

I profusely thank Dr. M. Maheswaran, Director of Research, Tamil Nadu, Agricultural University, Coimbatore and the staff members of the University, Station Incharges of SRS, Cuddalore, SRS, Sirugamani and SRS, Melalathur and their staff for extending all necessary help in organizing the Group Meeting of AICRP on Sugarcane. I am very much grateful to Dr. K. Ganesamurthy, Director, Centre for Plant Breeding & Genetics, Dr C. R. Ananda Kumar, Registrar, TNAU, Coimbatore, Dr V. Ravi, Director, TNRRI, Aduthurai, Dr M. Jayachandran, Prof. & Head, SRS, Cuddalore and their colleagues for extending cooperation in various ways in organizing the Group Meeting. My sincere thanks are also to the Chairman, Co-Chairman and Rapporteurs of technical session of different disciplines.

Efforts made by the Station Incharges, scientists and staff members associated with the Coordinated projects at the regular as well as voluntary centres in conducting various trials, submission of data and reports are gratefully acknowledged.

I am thankful to my coleagues. Dr. V.K. Gupta, Principal Scientist (Plant Breeding), Dr. Arun Baitha, Principal Scientist (Entomology), Dr. Lalan Sharma, Scientist (Plant Pathology) and Dr. S.K. Yadav, Scientist (Agronomy), Dr. S.K. Awasthi, Dr. G.K. Singh, Chief Technical Officers and Shri Adil Zubair, Assistant Chief Technical Officer for their valuable assistance in compilation of the coordinator's report and preparations for Group Meeting. Help rendered by Shri R.S. Chaurasia and Shri Ambrish Kuamr Sahu in computer work is also duly acknowledged.

(S. K. Shukla)
Project Coordinator (Sugarcane)

Contents

ALL INDIA COORDINATED RESEARCH PROJECT ON SUGARCANE (IN BRIEF)

All India Coordinated Research Project on Sugarcane is serving to the Nation by coordinating research work since 1970 through a network of sugarcane research stations of ICAR, State Agricultural Universities, State Govt. Departments and Non-Government Organizations. At present, there are 22 regular centres and 14 voluntary centres for conducting research and multi-location testing of varieties/technologies for wider adoption. The Project also provides forum to the researchers for deliberations on new varieties and making recommendations on crop production and protection technologies.

In order to provide fluff to the breeders, a National Hybridization Garden was established in 1972 at the Sugarcane Breeding Institute wherein all the parents so far identified for their specific characters are planted in separate plots and the breeders of the centers make use of it for crossing and fluff production. SBI, Coimbatore also extends facility for crossing work at the National Distant Hybridization Facility established at Agali (District Palakkad, Kerala).

The research programmes of the project are decided according to the mandate and objectives of the AICRP (S) .

Mandate

Evaluation of locally adapted sugarcane varieties with improved yield and quality as well as resistance to biotic and abiotic stresses.

Development of package of practices for higher sugarcane production.

Development of low cost technologies for sugarcane production.

Intensifying and extending the networking facility and information generation for transfer of technology to the farmers and sugar industry.

Objectives

To coordinate multilocation testing of germplasm and advance breeding materials for evaluating appropriate region/location specific improved varieties.

To organize and conduct strategic and applied research of inter-disciplinary nature for evolving appropriate region/location specific package of practices for crop production.

To develop region or location specific strategies for integrated disease and pest management.

Enhancement and maintenance of disease free nucleus seed material for distribution to the cooperating organizations.

To disseminate generated information and technology.

As per the mandate, main emphasis is laid on the development of improved sugarcane varieties suitable for commercial cultivation under different agro-climatic conditions in the country. Under this programme, 115 sugarcane varieties have been developed and of these, 53 varieties have been released and notified by Central Varietal Release Committee (CVRC) for commercial cultivation. The improved sugarcane varieties are meant for high cane yield, sugar recovery and resistance against major insect- pest and diseases.

As regards to production technologies, optimization of planting geometry and suitable row spacing for mechanization (tropical zone), integrated nutrient management, economy in water use for irrigation by devising micro-irrigation technique (sub-surface drip), mulching in ratoon for water conservation and weed control, integrated weed management and integrated diseases and insect-pest management have been developed and tested under various locations. Introduction of FIRB method for wheat + sugarcane system has facilitated timely planting of sugarcane in the areas where wheat- sugarcane in sequential cropping was popular and due to delayed planting, yield of sugarcane was less. Evaluation of various intercrops for increasing farmers income, agro-techniques for multiple rationing played pivotal role in increasing productivity and sustainability.

For the conduct of zonal varietal trials, following five zones have been identified in the country. At present 22 regular and 14 voluntary centers located at different zones are working under this project.

Agro-climatic Zones and location of centers (Regular):

A. North West Zone

1. PAU Regional Station, Faridkot - 151 203 (Punjab)
2. PAU Regional Research Station, Kapurthala – 144 601(Punjab)
3. U.P. Council of Sugarcane Research, Shahjahanpur – 242 001
4. G.B. Pant University of Agriculture & Technology, Pantnagar – 263 145, Distt. U.S. Nagar

5. Agricultural Research Station (SKRAU), Sriganganagar – 335 001 (Rajasthan)
6. Agricultural Research Station (AU), Ummedganj, P.B. No. 7, GPO – Nayapura, Kaithoon Road, Kota – 324 001 (Rajasthan)
7. ICAR-Indian Institute of Sugarcane Research, Rae Bareli Road, Lucknow – 226 002
8. Regional Research Station, (CCSHAU), Uchani – 132 001, Karnal (Haryana)

B. North Central Zone

9. Sugarcane Research Institute (RAU), Pusa – 848 125, Distt. Samastipur (Bihar)
10. Sugarcane Research Station, Bethuadahari – 741 126 Distt. Nadia (W.B.)

C. North Eastern Zone

11. Sugarcane Research Station (A.A.U.), Buralikson, P.O. Baruabamungaon – 785 618 Distt. Golaghat (Assam)

D. Peninsular Zone

12. ICAR-Sugarcane Breeding Institute, Coimbatore – 641 007 (T.N.)
13. Sugarcane Research Station(KAU), Kallungal, Thiruvalla – 689 101 (Kerala)
14. Zonal Agricultural Research Station(UAS), V.C. Farm, Mandya – 571 405 (Karnataka)
15. Regional Sugarcane & Jaggery Research Station (MPKV)., Kolhapur – 416 005
16. Agricultural Research Station (UAS), Sankeshwar – 591 314, Tal. Hukkeri, Belgaum Distt. (Karnataka)
17. Main Sugarcane Research Station (NAU), Navsari – 396 450 (Gujarat)
18. Zonal Agricultural Research Station (JNKVV), Powarkheda – 461 110, Distt. Hoshangabad (M.P.)
19. Sugarcane Research Station (MPKV), P.O. Padegaon Farm – 415 521 Distt. Satara (M.S.)

E. East Coast Zone

20. Sugarcane Research Station (OUA&T), Panipoila, Distt. Nayagarh – 752 070 (Odisha)
21. Regional Agril. Research Station (ANGRAU), Anakapalle – 531 001 (A.P.)
22. Sugarcane Research Station (TNAU), Cuddalore – 607 001 (T.N.)

Future thrust

To develop suitable varieties for biotic and abiotic conditions.

Evaluation of more germplasm under different agro-ecological conditions for introgression genes contributing resistance to diseases and insect-pests, abiotic stresses and physiological efficiency of the genotype.

To develop sugarcane varieties having high productivity, photo insensitivity and resistance to pests and diseases using conventional breeding methods as well as bio-technological tools.

To develop low cost agro-techniques and economising water by micro-irrigation systems *viz.*, drip/sub-surface drip irrigation including fertigation.

Recently, a few minor diseases like rust, pokkah boeng and yellow leaf disease and insect pests like white grub and mealy bug are becoming economically important. Suitable protection technologies and their management is required.

Development of Eco-friendly management with bio-control technique to reduce use of hazours chemical.

There are four major disciplines *viz.*, Crop Improvement, Crop Production, Plant Pathology and Entomology. One Principal Investigator in each discipline leads the research activity and monitors the Technical Programme, under the derectives of Project Coordinator. The experimental results of different disciplines are given in seperate chapters.

Staff position

Sanctioned Strength	Sanctioned		Total (2+3)	No. of posts vacant		Total (5+6)
	At headquarters, Lucknow	At AICRP (S) centres		At headquarters, Lucknow	At AICRP (S) centres	
1	**2**	**3**	**4**	**5**	**6**	**7**
Scientific	04	62	66	-	-	-
Technical	04	92	96	01	-	01
Administrative	03	-	03	02	-	02
Skilled Supporting Staff	-	05	05	-	-	-
Total	**11**	**159**	**170**	**03**	**-**	**03**

1. CROP IMPROVEMENT

The growth of sugar industry and income of sugarcane growers is greatly facilitated by the improved varieties which largely decide the production and productivity of sugarcane and sugar. A sucrose rich variety is the choice of millers to harness maximum sugar recovery while farmer's prime interest lies to harvest high tonnage of cane from fields. A variety combining high sugar with stable moderate (>80 t/ha) cane yield and resistant to major sugarcane diseases is preferred for sustaining net income per unit of area and time. In addition, location specific requirement especially resistance / tolerance to various biotic and abiotic stresses are important to increase the sugarcane productivity in the problematic areas. Keeping these points in view, varieties are developed and identified for release. In recent past, the sugarcane varieties released through AICRP on Sugarcane and notified for commercial cultivation have been adopted by growers and area under traditional varieties has gone down.

During the crop season 2016-17, the technical programme for crop improvement included.

B.II- Zonal Varietal Trial

B.III- Evaluation & Identification of Climate Resilient ISH and IGH genetics stocks for both drought and water logging conditions.

Besides, seed multiplication of new varieties (early and midlate) was also carried out by the identified centers for quick dispersal of the seed cane.

The experiments were conducted by the concerned centres and the Progress Reports of Crop Improvement have been compiled by the Principal Investigator (Crop Improvement) containing detailed information. The highlights of the achievements received from various centres are being described in this chapter.

Crosses made by the participating centers and supply of fluff

The information is summarised in Table 1.Total two hundred station crosses, seventeen zonal crosses and sixty poly crosses were effected. Total 7.439 kg fluff was supplied to the centers situated in different zones. Maximum quantity of fluff (3198 g) was sent to north central and north eastern zone followed by east coast zone (1895 g) and peninsular zone (1515.99 g).

Trials conducted and the number of entries evaluated

A total of 25 Zonal Varietal Trials (14 in early and 11 in mid-late) were conducted during the year 2016-17. There were 8 IVT and 17 AVT trials. A total of 66 entries in early group and 73 entries in mid-late group were evaluated, of which 15 in early and 13 in mid-late were promising. Details of the trials conducted, number of entries evaluated and the promising clones identified are given in Table 2.

B.II Zonal Varietal Trial

North Central and North-Eastern Zone

The zonal varietal trial programme was assigned to all the six centers - Bethuadahari, Buralikson, Gorakhpur, Seorahi, Motipur and Pusa. Total 8 experiments in two categories – **IVT** (Early and mid-late) and **AVT** (Early- Plant I, Plant II and Ratoon; Mid-late – Plant I, Plant II and Ratoon) were conducted and observations were recorded on growth, yield and quality parameters. The better performing genotypes were compared with the best checks/standards in each group for cane yield, sucrose % juice & CCS (t/ha) etc Table 3 to 6.

Table 1: Crosses made by the participating centres and the fluff (g) despatched from NHG during 2016-17

Zone	Station crosses and selfs*		Zonal crosses		Poly-crosses		General collections		Total quantity of fluff (g)
	No.	Fluff weight	No.	Fluff weight	No.	Fluff weight	No.	Fluff weight	
Peninzular	67	985.91	9	54.00	27	236.14	15	239.94	1515.99
East Coast	53	312.00	8	113.50	20	89.50	28	174.50	1895.00
North West	-	-	-	-	-	-	-	-	-
North Central & North East	73	1660.00	-	-	13	120.5	33	1417.60	3198.10
Grand total	193	2957.91	17	167.5	60	446.14	76	1832.04	6609.09
Agali	7	134.5	-	-	-	-	29	695.5	830.00
Coimbatore and Agali	200	3092.41	17	167.5	60	446.14	105	2527.54	7439.09

Table 2: Trials conducted and the number of entries evaluated

Zone / Trials	No. of clones + standards		Promising clones	
	Early	Midlate	Early	Midlate
Peninsular Zone				
AVT II Plant	8+3	11+2	Co 10005, Co 10026, Co 10027, CoT 10367	Co 10033, CoT 10369, CoT 10369
AVT Ratoon	8+3	11+2	CoT 10367	CoT 10369
AVT I Plant	5+3	6+2	CoM 11082, Co 11004	-
IVT	8+3	20+2	Co 13004, Co 13002	Co 13008, Co 13018, Co 13020, CoSnk 13106
Total entries	**21**	**37**	**8**	**7**
East Coast Zone				
AVT II Plant	5+3	-	CoA 12323, CoV 12356	-
AVT Ratoon	5+3	-	CoA 12323, CoV 12356	-
AVT I Plant	5+2	4+2	CoC 13336, CoV 13356	CoC 13339, CoA 13326, CoA 13324
IVT	7+2	12+2	CoC 14336, CoV14356, CoA 14321	PI 14377, Co 13031
Total entries	**17**	**14**	**5**	**5**
North West Zone				
AVT II Plant	6+3	6+3	CoLk 11202, CoLk 11203	CoLk 11206
AVT Ratoon	6+3	6+3	CoLk 11202, CoLk 11203	CoLk 11206
AVT I Plant	4+2	6+3	Co 12027	Co Pant 12226
IVT	9+2	13+3	Co 13034, Co 13033	CoPb 13183
Total entries	**19**	**25**	**5**	**3**
North Central & North East Zone				
AVT II Plant	4+2	4+3	CoSe 11451	CoSe 11453, CoSe 11454
AVT Ratoon	4+2	4+3	CoSe 11451	CoSe 11454, CoSe 11453
AVT I Plant	3+2	4+2	-	CoSe 12453, CoLk 12209
IVT	4+2	4+2	-	CoSe 13433
Total Entries	**11**	**12**	**1**	**5**
Grand total (Entries)	**68**	**88**	**19**	**20**

IVT Early (NC & NEZ)

In IVT early group, four genotypes *viz*. CoP 13436, CoP 13437, CoSe 13451 and CoSe 13452 were evaluated at all the centers against the standard/checks BO 130 and CoSe 95422. The data on cane yield and sucrose % in juice at 10 month crop stage revealed that CoSe 13451 recorded the highest sucrose in juice (17.97%) which was significantly superior over the best check BO 130 (16.57%). However, none of the entries could excel to the checks for mean cane and CCS yields.

AVT Early Plant I (NC & NEZ)

In this, three genotypes *viz* CoLk 12207, CoP 12436 and CoSe 12451 were evaluated and compared against BO 130 and CoSe 95422. The genotype CoLk 12207 recorded significantly increased cane yield at three locations with highest at Pusa (102.6 t/ha) while sucrose % in juice was on par. At Bethuadahari, sucrose % in juice at 10 month stage recorded low values ranged from 12.82 (CoLk 12207) to 13.29 (CoSe 12451). The highest CCS (t/ha) was recorded in CoP 12436 but none of the genotypes could excel compared to the standard (BO 130) for sucrose content. Overall, CoLk 12207 and CoP 12436 performed better for CCS yield, recorded 9.38 and 9.4 t/ha, respectively.

AVT Early Plant II (NC & NEZ)

Four entries *viz* CoP 11436, CoP 11437, CoP 11438 and CoSe 11451 were evaluated with two standards BO 130 and CoSe 95422. The mean values of the data on sucrose % in juice and cane yield revealed that all the entries except CoP 11437 recorded higher sucrose percent than the checks by the tune of 0.16 to 0.54 unit. Overall CoSe 11451 recorded the highest cane yield (79.41 t/ha) with sucrose (17.52 %) in juice. However, data were found at par with best check CoSe 95422 (77.13 t/ha cane yield and 16.98% sucrose % in juice).

AVT Early Ratoon (NC & NEZ)

All the genotypes tested in AVT early plant II were also evaluated for their performance in ratoon crop. At three centers, namely Pusa, Bethuadahari & Buralikson, none of the genotypes could excel to the checks. Overall, CoSe 11451 recorded the highest mean cane yield (72.45 t/ha) with sucrose (16.98 %) juice and CCS (9.12 t/ha).

IVT Mid-late (NC & NEZ)

Among the four genotypes CoP 13438, CoP 13439, CoSe 13453 and CoSe 13454, the latter two recorded significantly higher cane yield and higher numeric values for sucrose percent at Searohi and Motipur. While at Buralikson, none were found superior than checks. CoP 13439 recorded the higher sucrose percent at Bethuadahari. Overall CoSe 13453 recorded the highest mean cane yield (75.13 t/ha) with higher sucrose percent (17.99) in juice and CCS (9.07 t/ha) against the best check (CoP 9301- 17.44 % sucrose and 8.22 t/ha CCS).

AVT Mid-late Plant I (NC & NEZ)

Four entries *viz* CoLk 09204, CoLk 12209, CoP 12438 and CoSe 12453 were evaluated with two standards BO 91 and CoP 9301. Genotype, CoLk 12209 recorded the highest sucrose (17.48 %) in juice but cane yield (64.93 t/ha) was lower than other entries. It recorded the highest CCS (9.95 t/ha). Overall, CoSe 12453 produced the cane yield (77.71 t/ha), sucrose (17.39 %) in juice and CCS (9.29 t/ha) followed by CoLk 12209 and performed better with regards to CCS yields over checks. CoLk 12209 recorded the lower cane yield (64.93 t/ha) but higher sucrose content (17.48 %) in juice and gave a push to record CCS to the tune of 9.95 t/ha.

AVT Mid-late Plant II (NC & NEZ)

Four entries *viz.*, Bo 155, CoSe 11453, CoSe 11454 and CoSe 11455 were evaluated with three checks BO 91, CoP 0301 and CoSe 92423. The data on overall performance revealed that CoSe 11453 recorded the highest cane yield (85 t/ha). It recorded sucrose (17.31%) in juice and the highest CCS (11.01 t/ha) against the best check (CoP 9301) 75.93 t/ha cane yield and 17.02 % sucrose in juice). The cumulative results indicated that the genotypes CoSe 11453 and CoSe 11454 performed better being higher in cane yield and on par with sucrose content.

AVT Mid-late Ratoon (NC & NEZ)

All the entries evaluated in AVT mid-late II were screened for their performance in ratoon crop. At some locations, BO 155 performed better. But overall CoSe 11454 and CoSe 11453 found better with respect to cane yield (74.28 and 71.76 t/ha), sucrose percent in juice (17.45 and 17.3) and CCS yields (9.0 and 8.62 t/ha), respectively.

Peninsular zone

The climate of this zone is mainly tropical in nature where long sunny days with cool nights and clear sky favour sugar accumulation. The crushing season is also long. In view of developing high yielding and high sucrose varieties, following experiments were conducted at 18 centres of the zone situated at Akola, Basmathnagar, Coimbatore, Kolhapur, Mandya, Navasri, Padegaon, Perumalapalle, Powarkheda, Pravaranagar, Pune, Pugalur, Kawardha (Raipur), Rudrur, Sameerwadi, Sankeshwar, Sirugamani, Thiruvalla. The results are summarized here under in Table to 11.

Table 3: Performance of genotypes under IVT (Early) and AVT (Early) - I Plant, (NC & NEZ, Mean of 6 centers)

Genotype	IVT (Early)			Genotype	AVT (Early) – I Plant		
	Cane Yield (t/ha)	Sucrose (%) juice	CCS (t/ha)		Cane Yield (t/ha)	Sucrose (%) juice	CCS (t/ha)
CoP 13436	69.9	16.88	8.25	CoLK 12207	80.11	16.56	9.38
CoP 13437	56.9	17.66	7.39	CoP 12436	82.27	16.33	9.40
CoSe 13451	76.4	17.97	9.19	CoSe 12451	79.48	16.29	9.04
CoSe 13452	71.3	17.53	7.86	-	-	-	-
Standards							
Bo 130	88.3	16.57	12.21	BO 130	75.77	17.09	8.97
CoSe 95422	73.4	17.12	9.72	CoSe 95422	72.76	16.73	8.51
CV (%)	9.6	0.42	0.81	CV (%)	10.93	4.54	13.17
SE(d)	NS	0.87	2.25	SE(d)	4.927	0.436	0.688
LSD at 5%	23.1	4.22	15.38	LSD at 5%	NS	NS	NS

Table 4: Performance of genotypes under AVT (Early) - II Plant and AVT (Early)-Ratoon (NC & NEZ, Mean of 6 centers)

Genotype	AVT (Early) -II Plant			AVT Early- Ratoon		
	Cane Yield (t/ha)	Sucrose (%) juice	CCS (t/ha)	Cane Yield (t/ha)	Sucrose (%) juice	CCS (t/ha)
CoP-11436	76.87	16.46	8.70	72.63	16.08	8.58
CoP-11437	76.73	17.14	9.10	70.55	17.14	8.93
CoP-11438	78.18	17.30	9.44	70.41	16.89	8.78
CoSe 11451	79.41	17.52	9.73	72.45	16.98	9.12
Standards						
BO 130	76.55	16.93	9.08	69.70	17.22	8.98
CoSe 95422	77.13	16.98	9.19	66.99	16.43	8.19
CV(%)	11.46	4.13	12.92	12.15	4.30	12.47
SE(d)	5.128	0.407	0.687	4.941	0.417	0.631
LSD at 5%	NS	NS	NS	NS	NS	NS

Table 5: Performance of genotypes under IVT (Midlate) and AVT (Midlate)- I Plant (NC & NEZ, Mean of 6 centers)

Genotype	IVT (Midlate)			Genotype	AVT (Midlate) I-Plant		
	Cane Yield (T/ha)	Sucrose (%) juice	CCS (t/ha)		Cane Yield (T/ha)	Sucrose (%) juice	CCS (t/ha)
CoP 13438	72.73	16.52	8.22	CoLk 09204	76.59	16.58	8.82
CoP 13439	73.31	16.89	8.33	CoLk 12209	64.93	17.48	9.95
CoSe 13453	75.13	17.99	9.07	CoP 12438	78.35	17.00	9.29
CoSe 13454	72.99	15.81	7.82	CoSe 12453	77.71	17.39	9.39
Standards							
BO 91	64.64	16.70	7.43	BO 91	69.48	17.42	8.51
CoP 9301	68.20	17.44	8.22	CoP 9301	73.82	17.29	8.92
CV(%)	8.54	4.36	9.23	CV(%)	17.56	3.22	11.35
SE(d)	4.298	0.520	0.534	SE(d)	7.49	0.32	0.60
LSD at 5%	NS	1.1087	NS	LSD at 5%	NS	NS	NS

Table 6: Performance of genotypes under AVT (Midlate)-II Plant and AVT (Midlate) - Ratoon (NC & NEZ, Mean of 6 centers)

Genotype	IVT (Midlate)-II Plant			AVT (Midlate) Ratoon		
	Cane Yield (T/ha)	Sucrose (%) juice	CCS (t/ha)	Cane Yield (T/ha)	Sucrose (%) juice	CCS (t/ha)
BO 155	77.75	16.19	9.33	68.08	16.20	7.56
CoSe 11453	85.03	17.31	11.01	71.76	17.30	8.62
CoSe 11454	76.66	17.65	10.03	74.28	17.45	9.00
CoSe 11455	74.68	16.91	9.40	70.29	16.85	8.25
Standards						
BO 91	63.84	17.02	8.04	63.22	16.29	7.08
CoP 9301	75.93	17.55	9.83	69.62	17.51	8.39
CoSe 92423	74.68	16.84	9.18	69.48	16.71	8.07
CV(%)	13.20	4.33	13.85	12.13	3.93	13.40
SE(d)	5.754	0.427	0.763	4.869	0.384	0.630
LSD at 5%	NS	0.8711	1.5589	NS	0.7837	NS

IVT Early (PZ)

Eight genotypes were evaluated in which CoSnk 13101 recorded the highest sucrose percentage (17.57) in juice and cane yield (84.93 t/ha) on par to the best standard CoC 671. Co 13004, Co13002 & MS 13081 also recorded higher cane yield and sucrose percent juice on par to that of standard. However, CCS t/ha of the tested genotypes was recorded higher. Cane yield and sucrose of MS 13081was found consistent and higher at more than three centres. Co 13004 recorded the highest sucrose (20.11%) in juice with moderate cane yield (118.9 t/ha) at Pravaranagar.

AVT Early Plant I (PZ)

Among the tested genotypes, CoM 11082 recorded significantly higher cane yield (95 t/ha) alongwith sucrose content in juice (19 %) on par to the check and recorded the highest CCS (13.4 t/ha). Entry Co 11004 with sucrose percent in juice (19.17) and cane yield (84.2 t/ha) recorded 2nd in CCS (12.46 t/ha). Over all CoM 11082 and Co 11004 appeared to be promising clones.

AVT Early Plant II (PZ)

The analysis of pooled data indicated that Co 10005, Co 10026, Co 10027 & CoT 10367 recorded the significantly higher cane yields over the best check Co 85004. The sucrose content of these genotypes was on par ranging from 18.1% to 18.55% . Yield and sucrose content of these genotypes were higher at more than four locations. The higher sucrose percent (18.55) in juice was recorded with CoT 10367. However, numerically none of genotypes could excel the best check Co 85004 which recorded 18.56 % sucrose in juice.

AVT Early Ratoon (PZ)

All the genotypes evaluated for their second plant crop were also evaluated for their performance of ratoon crop. The pooled data on cane yield, sucrose content and CCS indicated that CoT 10367 with higher sucrose percent (18.84) in juice and moderate cane yield (78.31 t/ha) recorded the highest CCS (10.42 t/ha) over the best check Co 85004 which recorded cane yield, sucrose and CCS in the tune of 76.82 t/ha, 18.43 % and 10.10 t/ha, respectively. However, at

different locations, one or the other genotypes performed better with regards to cane yield/sucrose.

IVT Mid-late (PZ)

Twenty genotypes were tested in IVT midlate experiments against two standards Co 86032 and Co 99004. The later check recorded higher sucrose (19.13%) in juice than former (18.74%) while Co 86032 with higher cane yield (104.36 t/ha) recorded higher CCS (13.57 t/ha) and was considered best check. Genotypes Co 13008, Co 13018, Co 13020 and CoSnk 13106 showed promising results with numerically higher sucrose content and on par cane yields. Pooled results of different centres indicated that these genotypes were more consistent.

AVT Mid late Plant I (PZ)

Total six entries were short listed in IVT (2014-15) based on cane yield, juice quality and resistance to red rot pathogen and advanced to AVT and evaluated against two checks Co 86032 and Co 99004. A cumulative data on cane yield and sucrose content indicated that none of the genotypes recorded significant improvement on yield and quality. However, Co 11019, CoM 11085 and CoM 11086 recorded cane yields and sucrose content in juice on par to the check. CoM 11086 with 20.3 % sucrose content in juice and Co 11012 with 20.19% recorded higher sucrose content at Mandya.

AVT Midlate II Plant (PZ)

Among the genotypes, Co 10033 recorded the highest cane yield (112.85 t/ha) which was significantly superior over the check (Co 86032- 57.28 t/ha). The sucrose content (18.54%) in juice was also higher. CoT 10369 also recorded higher cane yield (107.38 t/ha) and sucrose (19.37%) in juice.

AVT Midlate ratoon (PZ)

All the 11 entries were tested in midlate trial for II plant crop and ratoon crop during 2016-17. Genotype, CoT 10369 recorded the highest sucrose (19.74 %) content in juice with cane yield (86.95 t/ha) on par to the best check Co 86032 (86.88 t/ha). Genotypes, Co 1015, PI 10131 & PI 10132 also recorded higher sucrose percent in juice than the best check but the values were on par. Overall, above four genotypes recorded consistently higher values of cane yield and sucrose content at various locations.

North-west zone

This zone comprises ten centers *viz.* Faridkot, Karnal, Kota, Lucknow, Kapurthala, Mujaffarnagar, Pantnagar, Shahjahanpur, Sriganganagar and Uchani. Results of zonal varietal trials as assigned to these centers during 2016-17 on pooled analysis of data obtained from various centres are summarized here as under (Table 12 to 17).

IVT Early (NWZ)

For IVT, 9 genotypes of early group *viz* .Co 13033, Co 13034, CoLk 13201, CoLk 13202, CoLk 13203, CoPant 13221, CoPant 13222, CoPb 13181 and CoS 13231 were evaluated with two standards CoJ 64 and Co 0238. Among the genotypes, Co 13034 & Co 13033 recorded the highest sucrose (18.21 & 18.16 %) in juice with cane yield on par to the best check Co 0238. The highest CCS yield (11.5 t/ha) was recorded in genotype Co 13034.

Table 7: Performance of genotypes under IVT (Early) and AVT (Early) - I Plant (PZ, Mean of 11 centers)

IVT-Early				AVT (Early) – I Plant			
Genotype	**Cane yield (t/ha)**	**Sucrose (%) juice**	**CCS (t/ha)**	**Genotype**	**Cane yield (t/ha)**	**Sucrose (%) juice**	**CCS (t/ha)**
Co 13002	88.54	17.99	12.12	Co 11001	90.63	17.83	12.29
Co 13003	95.13	17.07	12.01	Co 11004	84.20	19.17	12.46
Co 13004	90.39	16.93	11.69	CoM 11081	71.42	18.81	10.32
CoN 13071	91.62	16.46	11.54	CoM 11082	95.03	19.00	13.40
CoN 13072	97.70	16.69	12.30	CoM 11084	82.96	18.48	11.61
CoSnk 13101	84.73	17.57	11.39				
CoSnk 13102	87.43	16.18	10.81				
MS 13081	114.02	17.08	14.08				
Stds							
CoC 671	84.08	17.44	11.42	CoC 671	83.59	19.27	12.62
Co 94008	87.37	16.28	10.70	Co 94008	79.40	17.72	11.58
Co 85004	87.99	16.52	11.15	Co 85004	77.56	18.81	11.69
CV(%)	14.52	5.94	16.36	CV(%)	15.25	4.28	13.94
SE(d)	5.68	0.43	0.82	SE(d)	5.40	0.34	0.71
LSD at 5%	11.26	0.85	1.62	LSD at 5%	10.77	0.68	1.42

Table 8: Performance of genotypes under IVT (Early) II Plant and AVT (Early) - Ratoon (PZ, Mean of 11 centers)

	AVT (Early) – II Plant			AVT (Early) - Ratoon		
Genotype	Cane yield (t/ha)	Sucrose (%) juice	CCS (t/ha)	Cane yield (t/ha)	Sucrose (%) juice	CCS (t/ha)
Co 10004	90.91	18.06	11.88	75.84	18.05	9.53
Co 10005	100.36	18.10	12.65	77.13	17.90	9.79
Co 10006	79.19	18.06	10.22	60.92	17.26	7.54
Co 10024	99.48	17.86	12.51	81.97	17.28	9.90
Co 10026	107.79	18.09	13.71	93.86	17.54	11.50
Co 10027	99.44	18.35	12.83	79.99	18.30	10.31
CoT 10366	99.03	16.90	11.67	79.11	16.64	8.89
CoT 10367	99.25	18.55	12.73	78.31	18.84	10.42
Stds						
Co 85004	82.25	18.56	11.48	69.50	18.60	9.13
Co 94008	77.18	17.33	10.59	72.77	17.13	8.74
CoC 671	82.76	18.37	11.44	76.82	18.43	10.10
CV(%)	20.92	4.28	14.97	18.87	5.00	21.27
SE(d)	8.25	0.33	0.76	6.84	0.42	0.96
LSD at 5%	16.38	0.65	1.52	13.62	0.83	1.92

Table 9: Performance of genotypes under IVT (Mid-late) (PZ, Mean of 11 centers)

Genotype	Cane yield (t/ha)	Sucrose (%) juice	CCS (t/ha)
Co 13005	95.53	17.33	11.40
Co 13006	99.60	18.74	13.01
Co 13008	114.40	19.03	15.26
Co 13009	108.91	18.79	14.48
Co 13011	101.00	18.20	12.73
Co 13013	111.13	18.81	14.59
Co 13014	105.44	18.60	13.63
Co 13016	77.82	19.00	10.24
Co 13018	108.69	19.12	14.65
Co 13020	103.18	19.10	13.64
CoM 13082	109.13	16.43	12.21
CoN 13073	103.29	17.70	12.66
CoN 13074	99.53	17.18	11.84
CoSnk 13103	98.43	18.69	12.70
CoSnk 13104	93.54	18.37	12.07
CoSnk 13105	81.06	17.65	9.87
CoSnk 13106	104.12	18.62	13.48
CoT 13366	94.77	17.34	11.09
PI 13131	75.86	18.60	9.74
PI 13132	97.25	17.97	11.82
Stds			
Co 86032	104.36	18.74	13.57
Co 99004	95.20	19.13	12.74
CV(%)	17.86	5.09	19.91
SE(d)	7.23	0.38	1.02
LSD at 5%	14.25	0.75	2.02

AVT Early Plant I (NWZ)

Genotype Co 12027 recorded the highest sucrose (18.92 %) in juice and cane yield (80.16 t/ha), on par to that (84.94 t/ha) obtained with the best check CoPant 12221.

Table 10: Performance of genotypes under AVT (Mid-late)-1 Plant (PZ, Mean of 11 centers)

Genotype	Cane yield (t/ha)	Sucrose (%) juice	CCS (t/ha)
Co 11005	97.86	18.25	12.65
Co 11007	104.78	17.72	13.14
Co 11012	103.63	18.61	13.65
Co 11019	107.66	18.23	13.76
CoM 11085	102.54	18.58	13.37
CoM 11086	107.20	18.17	13.79
Stds			
Co 86032	103.39	18.66	13.60
Co 99004	94.16	18.54	12.23
CV(%)	12.44	5.02	13.89
SE(d)	5.44	0.39	0.79
LSD at 5%	NS	NS	NS

AVT Early II Plant (NWZ)

Four genotypes viz., CoH 11262, CoLk 11201, CoLk 11202 and CoLk 11203 were evaluated with two standards CoJ 64 and Co 0238. CoLk 11202 and CoLk 11203 recorded higher cane yields (106.11 t/ha and 84.56 t/ha) with sucrose content in juice (17.56 and 18.89%) than the best performing check (Co 0238-86.32 t/ha and 17.98 %), respectively.

AVT Early Ratoon (NWZ)

All the genotypes tested under plant crop were evaluated for their performance in ratoon crop. CoLk 11202 and CoLk 11203 recorded cane yield 77.87 and 73.81 t/ha, respectively against the best check Co 0238 (70 t/ha). The sucrose content in juice of these entries ranges from 16.95 to 18.19%. Overall, CoLk 11202 and CoLk 11203 appear to have performed better than check.

Table 11: Performance of genotypes under AVT (Mid-late) -II Plant and AVT (Mid-late) - Ratoon (PZ, Mean of 11 centers)

Genotype	Cane yield (t/ha)	Sucrose (%) juice	CCS (t/ha)	Cane yield (t/ha)	Sucrose (%) juice	CCS (t/ha)
Co 09009	98.60	18.54	12.73	83.03	18.57	10.82
Co 10015	100.20	18.93	13.15	78.59	19.04	10.38
Co 10017	84.80	18.58	11.19	75.22	18.65	10.09
Co 10031	87.62	19.12	11.69	70.14	18.88	9.26
Co 10033	112.85	18.52	14.87	96.11	17.92	12.65
CoM 10083	92.43	18.25	11.31	65.98	18.47	8.71
CoT 10368	89.48	18.26	11.32	77.94	18.15	9.95
CoT 10369	107.38	19.37	14.99	86.95	19.74	12.30
CoVC 10061	96.96	18.56	12.57	83.75	18.49	10.86
PI 10131	97.07	19.09	12.91	78.24	19.61	10.84
PI 10132	95.69	19.02	12.76	81.74	19.46	11.27
Stds						
Co 86032	97.28	18.34	12.46	86.88	18.68	11.36
Co 99004	92.09	18.82	12.05	75.92	18.91	9.96
CV(%)	19.26	5.10	21.81	19.78	5.03	21.84
SE(d)	7.91	0.41	1.17	7.46	0.45	1.10
LSD at 5%	15.66	NS	2.32	14.82	0.88	2.18

IVT Midlate (NWZ)

Thirteen genotypes were tested against three standards checks. The genotype, CoPb 13183 recorded significantly higher cane yield (96.14 t/ha) over the best check (CoPant 972022 - 81.21 t /ha). However, the sucrose content in juice (17.69 %) was 0.35 unit lowered by the best check (18.16. Among other genotypes, CoS 13232, CoH 13263& Co 13036 recorded higher sucrose percent in juice (18.48) with moderate cane yield ranged from 75 to 90 t/ha.

AVT Midlate Plant I (NWZ)

Among six genotypes CoPant 12226 recorded the significantly higher cane yield (99.07 t/ha) over the best check CoPant 97222 (82.27 t/ha). It also recorded the highest sucrose percent in juice (18.51). Co 12029 with respect to cane yield (94.21 t/ha) and sucrose percent in juice (18.08) was ranked second best.

AVT Midlate Plant II (NWZ)

CoLk 11206 recorded the significantly superior cane yield (94.85 t/ha) than the best check CoPant 97222 (83.32 t/ha). As regards to sucrose content in juice, it was 18.03% which was on par to the best check (18.56%). Among other entries, Co 11027 recorded 78.33 t/ha cane yield and 18.67 % sucrose content in juice.

AVT Midlate ratoon (NWZ)

CoLk 11206 and Co 11027, recorded higher sucrose percent in juice (17.02 and 17.11), respectively over the best check CoS 767 (16.85%). The highest cane yield (86.61 t/ha) was recorded with CoLk 11206 which was on par to the best check (78.2 t/ha).

Table 12: Performance of genotypes under IVT (Early) (NWZ Mean of 7 centers)

Genotype	Cane yield (t/ha)	Sucrose (%) juice	CCS (t/ha)
Co 13033	72.99	18.16	9.41
Co 13034	88.22	18.21	11.5
CoLk 13201	78.84	17.03	9.49
CoLk 13202	82.02	16.05	9.06
CoLk 13203	84.84	16.59	9.98
CoPant 13221	90.57	15.51	9.9
CoPant 13222	86.37	16.01	9.56
CoPb 13181	89.97	16.99	10.89
CoS 13231	73.68	16.10	9.28
Stds			
CoJ 64	79.32	17.83	10.04
Co 0238	86.73	17.64	10.8
CV(%)	18.39	12.50	22.04
SE(d)	7.20	0.99	1.04
LSD at 5%	NS	NS	NS

Table 13: Performance of genotypes under AVT (Early)-I Plant (NWZ Mean of 7 centers)

Genotype	Cane yield (t/ha)	Sucrose (%) juice	CCS (t/ha)
Co12026	75.1	18.20	9.41
Co 12027	80.16	18.92	10.58
CoLk12203	86.21	16.30	9.63
CoPant 12221	86.41	16.95	10.09
Stds.			
Co J64	74.27	18.08	9.42
CoPant 12221	84.94	18.18	10.97
CV(%)	12.31	3.88	13.36
SE(d)	4.71	0.32	0.63
LSD at 5%	9.52	0.66	NS

Table 14: Performance of genotypes under AVT (Early)-II Plant & AVT (Early) - Ratoon (NWZ Mean of 7 centers)

Genotype	Cane yield (t/ha)	Sucrouse (%) juice	Cane yield (t/ha)	Sucrouse (%) juice
CoH 11262	60.93	17.45	16.62	16.28
CoLk 11201	60.37	18.09	18.82	14.34
CoLk 11202	77.87	17.56	16.5	17.57
CoLk 11203	73.8	18.89	18.19	17.31
Stds				
CoJ 64	61.18	18.22	18.21	17.5
Co 0238	70.43	17.98	17.82	16.7

Table 15: Performance of genotypes under IVT (Mid-late) (NWZ Mean of 7 centers)

Genotype	Cane yield (t/ha)	Sucrose (%) juice	CCS (t/ha)
Co 13035	88.97	18.33	11.1
Co 13036	75.16	18.42	9.39
CoH 13261	81.24	18.7	10.32
CoH 13262	84.04	18.51	10.29
CoH 13263	93.7	18.48	11.65
CoLk 13204	87.46	17.24	9.92
CoLk 13205	94.46	17.34	11.06
CoPant 13223	85.09	17.07	9.73
CoPant 13224	90.11	18.04	11.17
CoPb 13182	91.62	17.76	11.2
CoPb 13183	96.14	17.69	11.8
CoS 13232	82.1	18.16	10.25
CoS 13233	86.69	17.52	10.38
Stds.			
CoS 767	79.98	17.5	9.61
CoS 8436	71.09	18.24	8.95
CoPant 97222	81.21	18.04	10.19
CV(%)	12.85	-	14.42
SE(d)	5.18	0.44	0.71
LSD at 5%	10.26	0.87	1.40

Table 16: Performance of genotypes under AVT (Mid-late)-I Plant (NWZ Mean of 7 centers)

Genotype	Cane yield (t/ha)	Sucrose (%) juice	CCS (t/ha)
Co 12029	94.21	18.08	12.39
CoH 12263	79.01	18.07	10.04
CoLk 12205	88.46	17.89	11.15
CoPant 12226	99.07	18.51	13.03
CoPb 12211	76.51	17.74	9.34
CoS 12232	86.65	18.33	11.23
Stds.			
CoS 767	79.84	18.09	10.16
CoS 8436	71.9	18.75	9.66
CoPant 97222	82.27	18.16	10.83
CV(%)	13.3	2.69	15.04
SE(d)	5.28	0.231	0.77
LSD at 5%	10.55	0.46	1.54

EAST COAST ZONE

Total six experiments (except AVT midlate Plant II & Ratoon) were assigned to all the five centres of East Coast zone *viz.*,- Anakapalle, Cuddalore, Nayagarh, Nellikuppam and Vuyyuru, located in the coastal region of Odisha, A.P and Tamil Nadu (Table 18-22).

IVT Early (ECZ)

Seven genotypes viz., Co 07013 , Co 13023, Co13024, CoA14321, CoA 14322, CoC 14336 &CoV 14356 alongwith two standards CoC 01061 and CoA 92081 were tested. CoC 14336 recorded the highest sucrose (18.17% in juice) with cane yield (117.81 t/ha) on par to the best check (CoA 92081-104.24 t/ha,17.48% in juice). CoV 14356 also performed better by recording cane yield (110.2 t/ha) and sucrose (17.48% in juice). The highest CCS yield (15.32 t/ha) was recorded with genotype CoC 14336 followed by CoA 14321 (15.19 t/ha). Overall, CoC 14336, CoV 14356 and CoA 14321 performed better over the best check.

Table 17: Performance of genotypes under AVT (Mid-late)-II Plant and AVT (Mid-late) - Ratoon (NWZ Mean of 7 centers)

	AVT (Mid-late)-II Plant			AVT (Mid-late) - Ratoon		
Genotype	Cane yield (t/ha)	Sucrose (%) juice	CCS (t/ha)	Cane yield (t/ha)	Sucrose (%) juice	CCS (t/ha)
Co 11027	78.33	18.67	10.25	74.29	17.11	8.78
CoH 11263	70.16	18.53	9.12	63.33	16.5	7.28
CoLk 11204	78.67	18.07	9.94	83.88	16.64	9.77
CoLk 11206	94.85	18.03	11.93	86.61	17.02	10.3
CoPb 11214	77.43	17.96	9.55	78.72	16.35	9.04
CoS 11232	78.59	17.67	9.88	74.07	16.73	8.84
Stds.						
CoS 767	77.41	17.64	9.43	78.19	16.85	9.18
CoS 8436	70.55	18.28	9.04	66.16	17.48	8.24
CoPant 97222	83.32	18.56	10.79	77.22	16.83	9.05
CV(%)	13.52	3.03	14.79	15.99	3.51	17.39
SE(d)	5.33	0.27	0.74	6.10	0.34	0.90
LSD at 5%	10.67	0.55	1.48	14.14	NS	NS

AVT Early I Plant (ECZ)

Five genotypes were tested against two standards CoC 01061& CoA 92081. The entry CoC 13336 with cane yield 120.37 t/ha and sucrose 17.8% in juice recorded the highest CCS (15.07 t/ha). Though, the results were on par to the best check CoC 01061-108.5 t/ha with 17.15%), cane yield and sucrose content in juice respectively but the entry CoC 13336 contained 0.6 unit higher unit sucrose value over the best check. Another entry CoV 13356 with the highest sucrose (17.93%) in juice and cane yield (113.92 t/ha) yielded 14.27 CCS t/ha. Both entries performed better with respect to cane yield and sucrose content.

AVT Early Plant II (ECZ)

Among five genotypes, CoA 12323 having highest sucrose (17.28%) in juice and higher cane yield (121.38 t/ha) recorded the highest CCS (14.63 t/ha). Another entry CoV 12356 with cane yield (111.37 t/ha) and sucrose (17.21%) in juice also performed better than the best check. These entries performed better over the best check CoA 92081.

AVT Early Ratoon (ECZ)

Genotypes CoA 12323 & CoV 12356 recorded higher cane yield, sucrose percent in juice and CCS (t/ha) than the best check (CoC 01061). CoA 12323 recorded 102.96 t/ha cane yield and sucrose content 17.74% in juice. CoV 12356 recorded cane yield 99.5 t/ha and sucrose 17.37% in juice also performed better than the check. Both the genotypes performed better over the best check and recorded higher CCS (CoA 12323-12.43 t/ha and CoV 12356- 11.96 t/ha).

IVT Mid late (ECZ)

Among 14 genotypes, PI 14377 recorded cane yield 121.94 t/ha, sucrose content 17.8 % in juice, CCS 15.26 t/ha followed by PI 14377 and Co13031. These entries performed better with respect to cane yield, sucrose content in juice and commercial cane sugar than the best check CoV 92102.

Table 18: Performance of genotypes under IVT (Early), (ECZ, Mean of 5 Centers)

Genotype	Cane yield (t/ha)	Sucrose (%) juice	CCS (t/ha)
Co07013	101.25	16.09	11.45
Co13023	104.83	16.83	12.37
Co13024	99.41	17.11	12.01
CoA14321	124.77	17.16	15.19
CoA14322	100.62	16.64	11.73
CoC14336	117.81	18.17	15.32
CoV14356	110.2	17.48	13.55
Stds			
CoC 01061	96.46	17.3	11.78
CoA 92081	104.24	17.26	12.76
CV(%)	10.18	5.30	12.84
SE(d)	7.67	0.64	1.17
LSD at 5%	15.84	NS	2.42

Table 19: Performance of genotypes under AVT (Early)-I Plant (ECZ, Mean of 5 Centers)

Genotype	Cane yield (t/ha)	Sucrose (%) juice	CCS (t/ha)
CoA13322	119.63	16.52	13.82
CoA13323	111.45	16.48	13.01
CoC13336	120.37	17.8	15.07
CoC13337	122.4	16.43	14.02
CoV13356	113.29	17.93	14.27
Stds.			
CoC 01061	108.49	17.15	13.32
CoA 92081	108.52	16.71	12.81
CV(%)	12.39	6.08	13.84
SE(d)	9.00	0.65	1.20
LSD at 5%	NS	NS	NS

AVT Mid late plant I (ECZ)

Four genotypes *viz.*, CoA 11326, CoA 12324, CoC 13339 and CoOr 13346 were evaluated against two standards CoV 92102 and Co 86249. The data were recorded on sucrose, cane yield and CCS revealed that genotype CoC 13339 produced significantly higher cane yield (123.1 t/ha) and on par sucrose

Table 20: Performance of genotypes under AVT (Early)-II Plant and AVT (Early) - Ratoon (ECZ, Mean of 5 Centers)

	AVT (Early)-II Plant			AVT (Early) - Ratoon		
Genotype	**Cane yield (t/ha)**	**Sucrose (%) juice**	**CCS (t/ha)**	**Cane yield (t/ha)**	**Sucrose (%) juice**	**CCS (t/ha)**
CoA12321	119.64	16.36	13.53	103.67	16.57	11.81
CoA12322	121.57	16.5	14.06	106.61	16.35	11.81
CoA12323	121.38	17.28	14.63	102.96	17.74	12.43
CoOr12346	101.96	17.1	12.28	83.80	16.99	8.97
CoV12356	111.37	17.21	13.51	99.50	17.37	11.96
Stds						
Co 6907	102.35	16.25	11.53	87.46	16.83	10.22
CoC 01061	109.44	16.95	12.9	94.78	17.20	11.23
CoA 92081	113.92	16.91	13.41	93.22	16.88	10.88
CV(%)	13.56	3.39	13.94	10.35	11.12	4.53
SE(d)	9.66	0.36	1.17	6.32	0.79	0.49
LSD at 5%	NS	0.74	NS	12.94	1.62	NS

(18%) in juice to the best check(CoV 92102- 112.01 t/ha and 17.21%) cane yield and sucrose content, respectively. Other entries CoA 11326 and CoA 12324 also performed better over the check for sucrose percent in juice (17.42 and 17.37 %) and cane yield (102.94 and 107.22 t/ha), respectively.

Table 21: Performance of genotypes under IVT (Mid-late) (ECZ, Mean of 5 Centers)

Genotype	Cane yield (t/ha)	Sucrose (%) juice	CCS (t/ha)
Co13025	110.41	16.37	12.49
Co13027	109.56	15.83	11.85
Co13028	105.62	16.54	12.12
Co13029	110.02	16.04	12.3
Co13030	102.07	16.35	11.66
Co13031	113.22	17.48	14.01
Co13032	103.27	16.80	12.2
CoA14323	115.73	18.11	14.71
CoA14324	107.94	16.10	12.18
CoC14337	121.94	17.80	15.26
PI14376	104.94	18.27	13.15
PI14377	120.47	17.63	14.73
Stds.			
CoV 92102	105.78	17.45	12.92
Co 86249	104.6	16.53	12.20
CV(%)	9.22	3.87	9.49
SE(d)	7.15	0.46	0.87
LSD at 5%	NS	0.94	1.76

Table 22: Performance of genotypes under AVT (Mid-late)-I Plant (ECZ, Mean of 5 Centers)

Genotype	Cane yield (t/ha)	Sucrose (%) juice	CCS (t/ha)
CoA11326	102.94	17.42	12.42
CoA12324	107.22	17.37	13
CoC13339	123.1	18	15.66
CoOr13346	108.52	16.64	12.61
Stds.			
CoV 92102	112.01	17.21	13.45
Co 86249	98.32	16.65	11.48
CV(%)	7.47	4.19	9.67
SE(d)	5.13	0.46	0.80
LSD at 5%	10.71	NS	1.67

B. III Evaluation and identification of climate resilient ISH and IGH genetic stocks

(i) Evaluation for drought

The programme was assigned to four centers *viz.*, Padegaon, Anakapalle, Faridkot and Karnal. Twenty seven clones with three standards were evaluated for the first plant crop under drought condition by withdrawing irrigation between 60 and 150 days after planting. The observations on various growth and yield and quality attributes were recorded at various growth stages and compared with the best check assigned for the respective centre. In general, it was observed that Juice quality traits *viz.*, sucrose % in juice, cane fibre %, juice extraction % at 360 days showed less deviation from normal due to drought.

At Anakapalle center, twenty seven clones alongwith three standards were evaluated in normal and drought conditions. The data showed differences among the clones for all the characters studied. The clone BM1010168 showed superior performance in normal (cane yield of 83.33 t/ha and sucrose percent in juice19.29) and drought (cane yield of 82.93 t/ha and sucrose of 18.4) when compared to superior standard clone CoA 06321 in normal (cane yield of 79.49 t/ha and sucrose percent in juice18.51) as well as drought (cane yield of 70.08 t/ha, sucrose percent in juice 18.49) conditions. The clone BM1010168 showed superior performance in normal as well as in drought conditions when compared to superior standard clone CoA06321 for cane yield/ha and sucrose percent tin juice.

Among the fourteen clones evaluated along with three standards in ratoon crop, the clone SA04-496 showed on par performance in normal (cane yield of 60.25 t/ha and sucrose percent in juice 17.21) and drought (cane yield of 85.81 t/ha and sucrose in juice 16.41%) when compared to superior standard clone CoA92081(87A298) in normal (cane yield of 83.95 t/ha and sucrose in juice 18.28%) as well as drought (cane yield of 70.10 t/ha and sucrose in juice 18.23%) conditions. The clone SA04-496 showed on par performance in normal as well as in drought conditions when compared to superior standard clone CoA92081 for NMC/ha, cane yield/ha and juice sucrose per cent.

At Padegaon, fifteen clones and two standards for ratoon crop were evaluated under drought condition by withdrawing irrigation between 60 and 150 days after ratoon initiation. The mean cane and CCS yields were significantly reduced due to drought. The mean reduction in cane yield due to drought was 28.82 % and it ranged from 13.17 % (AS 04 - 2097) to 46.22 % (SA 04-472). Among the standards, CoM 0265 recorded the highest cane yield under normal and drought condition (96.86, 71.97 t/ha), respectively. The entry SA 04- 409 (72.82 t/ha) recorded numerically higher cane yield than the best check CoM 0265 under drought condition.

(ii) Evaluation for water logging:

The programme was assigned to four centers *viz,*. Kolhapur, Vuyyuru, Motipur and Pusa. At Kolhapur center, twenty seven clones with three standards were evaluated. In most of the clones including the standards the data on sucrose percent in juice, was least affected due to water logging.

However, in general, cane yield due to water logging during grand growth period was adversely affected. Among the tested clones, BM 1003143, BM 1009163, PG 9869137, SA 04-4792 and SA 04-409 recorded higher cane yield and sucrose percent in juice than the best check (CoM 0265 – 27.36 t/ha and 19.19). There was noticeable reduction in cane yield in the best check from 87.2 t/ha to 27.36 t/ha. However, sucrose content in juice was less affected (19.86% to 19.19%).

Sugarcane varieties - identified for release

The Varietal Identification Committee identified four sugarcane varieties *viz.*, CoLk 09204, Co 09022, Co 09004 and UP 09453for release. Salient features of the varieties are as under-

(i) CoLK 09204 (Ikshu-3) : Moderately resistant to red rot and resistant to smut & wilt and less susceptible to early shoot borer, top borer and stalk borer, midlate maturing variety. At 12 months stage, sucrose content (16.96%) and sugarcane yield level (83.22 t/ha). This variety has been developed by ICAR-IISR, Lucknow under North West Zone.

(ii) Co 09022 (Karan-12): Moderately resistant to red rot, resistant to wilt, moderately susceptible to smut and less susceptible to early shoot borer, top borer and moderately susceptible to stalk borer, midlate maturing variety. At 12 months stage, sucrose content (17.49%) and sugarcane yield level (83.59 t/ha). This variety has been developed by ICAR-SBI, Coimbatore. under North West Zone.

(iii) Co 09004 (Amritha): Moderately resistant to red rot, resistant to wilt & YLD, less susceptible to top borer and less susceptible to early shoot borer & internode borer, early maturing variety. At 10 months stage, sucrose content (18.94%) and sugarcane yield level (109.85 t/ha). This variety has been developed by ICAR-SBI, Coimbatore under Peninsular Zone.

(iv) UP 09453 : Moderately resistant to red rot & wilt, resistant to smut, less susceptible to early shoot borer, stalk borer & root borer and moderately resistant to top borer, early maturing variety. At 10 months stage, sucrose content (17.07%) and sugarcane yield level (74.74 t/ha). This variety has been developed by SRS (UPCSR), Gorkahpur under North Central & North Eastern Zones.

Summary

Twenty five Zonal Varietal Trials (14 in early and 11 in midlate) were conducted during the year 2016-17.

A total of 68 entries in early group and 88 entries in midlate group were evaluated of which 19 in early and 20 in mid-late were found to be promising.

Promising entries were identified based on the pooled analysis of the data on important characteristics such as cane yield and sucrose percent in juice as reported by different centers. The performance of the entries under test was compared to the best standard.

In peninsular zone, Co 10005, Co 10026, Co 10027, CoT 10367 were identified as the promising entries under early maturing group, while Co 10033, CoT 10369, CoT 10369 out performed under midlate group of plant crop II. Genotypes CoT 10367 and CoT 10369 also performed better as ratoon crop in their respective groups.

CoA 12323 and CoV 12356 were identified as promising entries which showed numerically superior to the best standard under early maturing group in East Coast Zone. CoLk 11202 and CoLk 11203 performed better in North-West Zone.

Under fluff supply programme, Total two hundred station crosses, seventeen zonal crosses and sixty poly crosses were effected. Total 7.439 kg fluff was supplied to the centers situated at different zones. Maximum quantity of fluff (3198 g) was sent to North central and North eastern zone followed by East coast zone (1895 g) and Peninsular zone (1515.99 g).

Under the project "Evaluation and identification of climate resilient ISH and IGH genetic stocks" 27 entries were evaluated for tolerance to drought at four locations (Padegaon, Anakalappe, Farikot and Karnal). Twenty seven clones were also assigned to screen for tolerance against waterlogging at Kolhapur, Vuyyuru, Motipur and Pusa.

Results indicated that juice quality parameters were less affected by drought. At Anakapalle center, the clone BM1010168 showed superior performance in normal (cane yield of 83.33 t/ha and sucrose percent in juice19.29) and drought (cane yield of 82.93 t/ha and sucrose percent juice-18.4).

Clone SA04-496 showed on par performance in normal (cane yield of 60.25 t/ha and sucrose percent in juice 17.21) and drought (cane yield of 85.81 t/ha and sucrose in juice 16.41%) in ratoon crop. The clone SA04-496 showed on par performance in normal as well as in drought conditions when compared to superior standard clone CoA92081 for NMC/ha, cane yield/ha and juice sucrose per cent.

At Kolhapur, BM 1003143, BM 1009163, PG 9869137, SA 04-4792 and SA 04-409 clones recorded higher cane yield and sucrose percent in juice than the best check (CoM 0265 – 27.36 t/ha and 19.19). There was noticeable reduction in cane yield in the best check from 87.2 t/ha to 27.36 t/ha. However, sucrose content in juice was less affected (19.86% to 19.19%).

2. CROP PRODUCTION

In India sugarcane cultivation is facing continual challenges like escalating cost of cultivation, plateaued productivity of the crop, scarcity of labour, depleting soil fertility and productivity in major sugarcane producing regions. Climate change induced weather aberrations mainly rainfall deficit with erratic distribution along with rising minimum temperature have rendered farming of this crop further challenging. Such a scenario has severely dented the profitability of sugar mills which in turn has resulted in their tapered interest for sugarcane development work in their factory command areas. Farmers on the other hand are not getting timely remuneration for the crop and hence often are not in a position to arrange inputs in time. The situation therefore warrants for development of technologies to effectively address the issues mentioned above. In order to provide user-friendly technology to the growers the Crop Production discipline encompassing Agronomy and Soil Science continues to play important role in devising and testing of such technologies for sugarcane cultivation. During the crop season 2016-17 six trials (experiments) were conducted through length and breadth of the country. These were concentrated on aspects such as agronomic evaluation of promising genotypes for their performance potential under varying fertility levels, efficacy of sub-surface drip method of irrigation in saving of water and raising of crop yield, integrated nutrient management schedule for sugarcane production system to ensure soil health and crop productivity, carbon sequestration potential of sugarcane based cropping systems impacting soil health, raising water productivity in sugarcane system through mulching and water application regimes and also to assess the effect of plant growth regulators on germination, growth and cane and sugar productivity. Most of the centres carried out these trials in the true research spirit and reported the results as per the prescribed format. However, Akola faced the constraints like scarcity of irrigation water and could not conduct the trials. A summary table showing no. of centres allotted, conducted and not conducted the stipulated experiments during 2016-17 is given in Appendix I.

A list of experiments conducted and summary of the results are presented below:

1. **AS 67:** Optimization of fertigation schedule for sugarcane through micro-irrigation technique under different agro-climatic conditions.
2. **AS 68:** Impact of integrated application of organics and inorganics in improving soil health and sugarcane productivity.
3. **AS 69:** Use of plant growth regulators (PGRs) for enhanced yield and quality of sugarcane.
4. **AS 70:** Scheduling irrigation with mulch under different sugarcane planting methods.
5. **AS 71:** Carbon sequestration assessment in sugarcane based cropping system.
6. **AS-72:** Agronomic performance of elite sugarcane genotypes.

AS 67: Optimization of fertigation schedule for sugarcane through micro-irrigation technique under different agro-climatic conditions

1. FARIDKOT

Surface drip irrigation applied at 80% IW/CPE yielded at par with surface irrigation. Irrigation water applied was about 40% less with drip irrigation (100% CPE) than flood irrigated plots. Cane yield with 100% recommended dose of nitrogen (RDN) applied to flood irrigated crop was at par with Fertigation 60% and 80% RDN in drip irrigated crop. Apparent water productivity and total water productivity with drip was higher than surface irrigation. Surface drip irrigation for paired row trench planted sugarcane (120:30 cm) resulted in saving of 40% irrigation water and 20 % of recommended N.

2. LUCKNOW

Sugarcane (fourth ratoon) yield was significantly influenced by irrigation and nitrogen treatments both. The highest ratoon yield of 94.43 t/ha was observed in drip fertigation treatment with irrigation water equal to 1.25 times pan evaporation and nitrogen equal to 100 % of recommended dose. Drip fertigation influenced irrigation water use efficiency (IWUE) significantly. The highest IWUE of 2090.7 Kg/ha-cm was recorded when sugarcane was irrigated with irrigation water equal to 0.75 times pan evaporation and nitrogen equal to 75 % of recommended dose. However, surface irrigation resulted in the lowest IWUE (585.5 Kg/ha-cm) when sugarcane was irrigated with surface irrigation method and nitrogen was equal to 50 % of recommended dose.

3. CUDDALORE

Among the methods of irrigation at Cuddalore, the sub surface drip irrigation at 125 per cent Pan Evaporation, irrigation once in two days recorded the maximum sprouting (138200/ha), tiller population (176560/ha), millable canes population (176560/ha), root dry weight at 120 (132.50 kg/

Table 1: Effect of irrigation methods and nitrogen level on cane yield (t/ha) and Irrigation water use efficiency

Treatments	Cuddalore		Lucknow	
Irrigation	**Cane yield (t/ha)**	**IWUE (kg/ha-cm)**	**Cane yield (t/ha)**	**IWUE (kg/ha-cm)**
I_1-SSDI at 75 % PE	119.4	**1488**	80.18	**1994.6**
I_2-SSDI at 100 % PE	131.3	1240	84.46	1575.7
I_3-SSDI at 125 % PE	**136.4**	1036	**91.36**	1363.5
I_4-Flood irrigation	116.6	825	61.97	704.23
CD(P=0.05)	5.32	-	9.01	139.75
Nitrogen level				
N_1-50 % RDN	119.6	1126	72.50	1286.5
N_2-75 % RDN	126.3	1148	81.53	1458.8
N_3-100 % RDN	132.6	1166	84.45	1483.3
CD(P=0.05)	6.42	-	10.56	163.72

RDN used at Cuddalore (300 kg N/ha) and Lucknow (200 kg N/ha).

Table 2: Effect of irrigation methods and nitrogen level on cane yield (t/ha) and Irrigation water use efficiency (Modified treatment)

Treatments	Faridkot	
Irrigation	**Cane yield (t/ha)**	**IWUE (kg/ha-cm)**
Surface drip irrigation at 60% CPE	77.0	**982.1**
Surface drip irrigation at 80% CPE	83.5	944.6
Surface drip irrigation at 100% PE	**88.7**	901.4
CD(P=0.05)	7.3	0.0
Nitrogen level		
60% RDN	74.9	847.3
80% RDN	84.6	957.0
100% RDN	**91.2**	**1031.7**
CD(P=0.05)	5.3	-
Absolute control	80.3	-
LSD (P=0.05) Drip vs Flood	6.6	

RDN used at Faridkot (225 kg N/ha).

ha) and 150 (134.26 kg/ha) DAP in the second ratoon.

Important Observations: The trial stands concluded with the following major recommendations:

Surface and sub-surface drip irrigation in sugarcane effectively saved water (up to 40%) and raised the crop productivity up to 20%.

Fertigation with drip resulted in 25% saving of nitrogen compared with surface irrigation. However, with the application of 100% RDN in drip irrigation cane productivity could further be raised.

Drip irrigation system once installed can effectively be used for 5 years (up to fourth ratoon).

AS 68: Impact of integrated application of organics and inorganics in improving soil health and sugarcane productivity

The trial was initiated during the year 20104-15 with allotment to all the centres. However, during the year 2016-17, 21 centres carried out the trial.

NORTH WEST ZONE

1. FARIDKOT

On the basis of one plant and two ratoon crops it can be concluded that application of FYM/ Compost (20 t/ha) + inorganic nutrient based on soil test (T6) is the best for getting higher mean cane yield followed by T5, T9 and T8. The Gross and net returns are also having same trend.

2. LUCKNOW

Significantly the highest rate of ratoon stubble sprouts (83.6%) was observed under 20 t FYM + STRC nutrient application followed by the treatment of only organic application. The highest number of tillers (217.3 thousand/ha at 150 days after initiation), shoot count (235.7 thousand/ha at 210 DAI), number of millable canes (156.8 thousand/ha), cane yield (89.4 t/ha) and sugar yield (9.87 t/ha) were recorded under the treatment where application of FYM @ 20 t/ha was done along with soil test (rating chart) based inorganic fertilizer recommendations.

3. PANTNAGAR

In Ratoon II the highest cane yield (54.69 t/ha) was recorded in T6- FYM@20t/ha + inorganic fertilizer on soil test based. Millable cane, cane girth, cane length and weight of individual cane were also higher in T6. Commercial cane sugar was higher in T5 which was significantly higher over rest of the treatments.

4. UCHANI

Significantly highest number of tillers (137.9, 136.0 thousands/ha), NMC (114.9, 113.2 thousands/ha) and cane yield (93.6, 91.9 t/ha) and sugar yield were recorded under treatment of FYM @ 20 t/ha with soil test based fertilizer application or 100 % RDF. However, these treatments were found at par with application of FYM @ 10 t/ha+ bio fertilizers along with fertilizers on soil test basis or 100 % RDF. So continuous application of FYM @ 10 t/ha + bio fertilizers in sugarcane plant-ratoon-I and ratoon-II will be equally effective in comparison to FYM @ 20 t/ha.

5. KAPURTHALA

On the basis of three year (one plant and two ratoons) data it can be concluded that the application of FYM/Compost @ 20 tonnes / ha + in-organic nutrient based on soil test (T6) is the best for getting higher cane yield followed by T9 and T5.

6. SHAHJAHANPUR

Application of FYM @ 10 tonnes/ha + bio-fertilizers (*Azotobacter* + PSB) + soil test basis NPK (T9) gave

significantly higher second ratoon cane yield (82.16 t/ha) followed by application FYM @ 20 tones/ha + inorganic nutrient application based on soil test (T6). Maximum benefit cost ratio (1.64) was also obtained in T9 treatment.

7. SRIGANGANAGAR

The result 3 indicated that number of tillers, NMC, single cane weight and cane yield were influenced significantly due to different nutrient treatments while, the effect on CCS % was non-significant. Cane yield (68.4 t/ha) was the highest with the application of FYM @ 20 t/ha + inorganic nutrient based on soil test (T6) which was significantly higher over other treatments except T5 – application of FYM @ 10 t/ha + bio fertilizers + soil test basis inorganic nutrients (64.3 t/ha).

8. KOTA

Among the nutrient management practices, application of 150:50:30 kg N, P_2O_5, K_2O/ha based on soil test through inorganic sources and enriched with FYM (10 t/ha) +12.5 + 12.5kg/ha (*Azotobacter* + PSB) was found best for increasing cane yield, CCS yield and net returns during three years. Whereas, application of 150:50:30 kg N, P_2O_5, K_2O/ha through inorganic source enriched with FYM (20 t/ha) (T6) was found the significantly superior and next best treatment in respect of cane quality and improving the status of soil during three years.

PENINSULAR ZONE

9. THIRUVALLA

In plant crop, among the various treatments, T8 (FYM/ compost @ 10 t/ha + bio fertilizer (Azotobacter/Acetobacter + PSB) + 100% RDF) recorded significantly higher values for cane length (255.61 cm), MCC (91000/ha) and resulted in highest yield (108.50 t/ha). Brix and sugar yield also followed the same trend with significantly higher values for sugar yield (12.42 t/ha) for the very same treatment. It was followed by T6 (FYM/ Compost @ 20 t/ha + inorganic nutrient application based on soil test (rating chart). With regard to ratoon crop also, the same trend was visible where T8 itself recorded the highest values for cane length (262.07 cm), MCC (93240/ha), cane yield (111.10 t/ha) and sugar yield (12.74 t/ha).

10. MANDYA

The data on cane and ratoon I and II yield indicated that, application of FYM (20 t/ha) + inorganic nutrient application based on soil test results recorded significantly higher cane, ratoon I and ratoon II yield (96.58, 90.33 and 74.84 t/ha, respectively) compared to all other treatments. However, it was on par with application of FYM (20 t/ha) + 100% RDF (93.12, 88.07 and 65.71 t/ha, respectively), application of FYM (10 t/ha) + bio fertilizer (*Azotobacter* + PSB) + 100% RDF (90.63, 85.50 and 67.54 t/ha, respectively) and application of FYM (10 t/ha) + bio fertilizer (*Azotobacter* + PSB) + soil test basis fertilizer application (88.73, 84.72 and 68.42 t/ha, respectively).

11. SANKESHWAR

The treatment differences did not exist due to severe drought for the last 3 years. Hence, most of the parameters recorded in the experiment did not show any variation due to moisture stress.

12. PADEGAON

The data in respect of yield and yield contributing parameters revealed that the treatment T6 receiving RDF as per soil test along with 20 t/ha FYM recorded significantly the higher number of millable canes and cane yield (92.76 '000/ha and 119.10 t/ha, respectively) and it was found at par with treatment T9, T5, T8 and T4 for cane yield. However, as far CCS yield the treatment T6 (15.35 t/ha) was found at par with the treatments T9, T5, T8, T4, T7 and T3. Significantly higher number of internodes (27), cane girth (7.31cm), millable cane height (230 cm) was recorded in treatment T6 which was found at par with T9, T8, T5 and T4.

13. NAVSARI

Cane yield (117.59 t/ha) was recorded significantly higher with T9 over T1 and remained at par with T3, T6 and T8. CCS yield was significantly influenced due to various nutrient management treatments. Various quality parameters were not significantly influenced due to different nutrient management treatments except purity % at 10 month. Almost, all the treatment round equally effective over T5. While at 12 month, quality parameters were not significantly influenced due to different treatments. There was no significant difference observed due to various inorganic and organic treatments on soil pH, EC (1:2.5 dS/m), and available K_2O and BD.

14. COIMBATORE

In first ratoon sugarcane crop, 20 t FYM + 150 STCR based fertilizer application was found beneficial in improving cane yield over rest of the nutrient management treatments. The treatment 20 t FYM + 150 STCR based fertilizer application recorded the highest NMC (119753 NMC/ha) and cane yield (137.74 t/ha) and was closely followed by the treatments 10 t FYM+ bio fertilizers + 150 STCR (127.27 t/ha). Sugarcane juice analysis done at 12 months revealed that Brix, Sucrose %, Purity % and CCS % were not influenced significantly

by application of organics and inorganics.

15. PUNE

The treatment of soil test based fertilizer application without organic fertilizer was found numerically superior over 100 % RDF. All the treatments were found at par to each other. Compost application @ 20 t/ha and 10 t/ha with 100 % RDF, 50% RDF and soil test based fertilizer with bio fertilizer were at par to each other and superior over 100% RDF without organics. With respect to cane yield, application of 100% RDF with organic fertilizers was showed significant results over 50% RDF without organics.

EAST COAST ZONE

16. CUDDALORE

Application of FYM/Compost @ 10 tones/ha + bio fertilizers (*Acetobacter* + PSB) + soil test based NPK fertilizer recorded significantly the maximum cane yield (137.26 t/ha), CCS (12.26%) and sugar yield (16.83) with B:C ratio of 3.40 and it was comparable with treatment (T8) application of FYM/ Compost @ 10 tonnes ha^{-1} + bio fertilizer (*Azotobacter* + PSB) + 100 % RDF.

17. ANAKAPALLE

Studies on impact of integrated application of organics and in-organics in improving soil health and ratoon sugarcane productivity indicated that application of FYM (10 t/ha) + bio fertilizer + 100% RDF (89.9 t/ha) or application of FYM (10 t/ha) + bio fertilizer + inorganic nutrient application based on soil test (89.6 t/ha) registered significantly higher cane yield as compared to the other treatments. Application of trash at 10 t/ha + 50% RDF registered the lowest cane yield of 76.4 t/ha.

18. NAYAGARH

The NMC and cane yield were 68.42 '000 & 75.03 t/ha in T8 and 69.85'000 & 75.93 t/ha in T9, respectively. This exhibits the positive effect of organic manures and bio fertilizers on cane yield. The soil physico-chemical parameters like BD, pH, EC, organic carbon content as well as available N, P and K content exhibited marked improvement upon application of organic source of plant nutrients.

NORTH CENTRAL ZONE

19. SEORAHI

Application of FYM (10 t/ha) + bio-fertilizer (*Azotobacter* + PSB) + soil test basis (NPK Application) produced significantly higher cane yield. Sucrose percent was recorded significantly higher in application of FYM (20 t/ ha) + inorganic nutrient application based on soil test.

20. PUSA

Integrated application of nutrients was found effective in improving soil fertility and second ratoon cane yield. The application of fertilizers on soil test i.e. 170 kg N, 50 kg P_2O_5 and 80 kg K_2O along with organics (20 t/ha) was found suitable for boosting ratoon cane yield and maintaining soil fertility in calcareous soil of Bihar.

NORTH EASTERN ZONE

21. BURALIKSON

In the second year ratoon crop, application of FYM (10 t/ ha) along with bio-fertilizer and inorganic fertilizer based on

Table 1.1/AS 68: Effect of integrated application of organics and inorganics on cane yield (t/ha).

Treatment	North West Zone (8)	Peninsular Zone (7)	North Central Zone (1)	North East Zone (2)	East Coast Zone (3)
T1: Trash @ 10 tonnes/ha + 50% RDF	59.05	71.33	37.3	42.30	66.63
T2: Trash @ 10 tonnes/ha + 100% RDF	73.36	83.24	61.8	46.50	87.40
T3: Trash @ 10 tonnes/ha + soil test based recommendation	75.10	87.07	64.2	48.00	89.83
T4: FYM/Compost @ 20tonnes/ha +50% RDF (inorganic source)	68.73	87.50	61.9	49.75	81.10
T5: FYM/Compost @ 20 tonnes / ha +100% RDF (inorganic source).	80.69	89.86	79	53.70	94.73
T6: FYM/Compost @ 20 tonnes / ha + inorganic nutrient based on STRC	**85.21**	**99.27**	**80.2**	55.35	96.23
T7: FYM/Compost @ 10 tonnes / ha + biofertilizer + 50% RDF.	66.56	84.06	54.8	51.55	87.47
T8: FYM/Compost @ 10 tonnes / ha + biofertilizer + 100% RDF.	78.80	93.23	72.2	58.65	100.30
T9: FYM/Compost @ 10 tonnes / ha + biofertilizer + soil test basis.	82.81	92.57	71.4	**60.35**	**100.83**
CV(%)	8.02	7.98	14.9	3.81	11.65
SE(d)	2.99	3.76	5.6	1.974	8.50
LSD at 5%	5.99	7.51	16.8	4.5525	18.03

Table 1.2/AS 68: Effect of integrated application of organics and inorganics on CCS yield (t/ha).

Treatment	North West Zone (7)	Peninsular Zone (7)	North Central Zone (1)	North East Zone (2)	East Coast Zone (2)
T1: Trash @ 10 tonnes/ha + 50% RDF	6.43	8.97	4.13	6.57	8.25
T2: Trash @ 10 tonnes/ha + 100% RDF	8.33	10.68	6.71	7.15	11.55
T3: Trash @ 10 tonnes/ha + soil test based recommendation	8.53	10.99	6.95	7.47	11.85
T4: FYM/Compost @ 20tonnes/ha +50% RDF (inorganic source)	7.34	10.98	6.93	7.68	10.25
T5: FYM/Compost @ 20 tonnes / ha +100% RDF (inorganic source).	9.73	11.39	8.62	8.52	12.30
T6: FYM/Compost @ 20 tonnes / ha + inorganic nutrient based on STRC	**10.25**	**12.59**	**8.91**	8.88	12.70
T7: FYM/Compost @ 10 tonnes / ha + biofertilizer + 50% RDF.	7.81	10.60	5.92	7.88	11.20
T8: FYM/Compost @ 10 tonnes / ha + biofertilizer + 100% RDF.	9.49	11.89	7.94	8.99	13.95
T9: FYM/Compost @ 10 tonnes / ha + biofertilizer + soil test basis.	9.89	11.75	7.84	**9.48**	**14.35**
CV (%)	10.41	8.47	6.33	7.04	13.22
SE(d)	0.48	0.50	0.26	0.57	1.563
LSD at 5%	0.97	1.01	0.79	1.31	NS

soil test recorded significantly the higher cane yield (44.79 t/ha) which is statistically at par with application of FYM (10 t/ha) along with bio-fertilizer (*Azotobacter* + PSB) and 100% RDF (44.09 t/ha) and the yield recorded by application of FYM (20 t/ha) along with soil test based fertilizer (40.39 t/ha) respectively.

SALIENT FINDINGS

Results of 21 AICRP (S) centres allocated in five different zones revealed that application of FYM /Compost @ 20 tonnes/ha + inorganic nutrient application based on soil test (rating chart) recorded the highest cane yield and CCS yield at North West zone, Peninsular zone and North central zone while application of FYM/Compost @ 10 tonnes / ha + biofertilizer + soil test basis recorded the highest cane yield and CCS yield in remaining two zones i.e. North East zone and East coast zone but both the treatments were found at par to each other and significantly superior over majority of treatments especially trash application (Table 1.1 & 1.2).

IMPORTANT OBSERVATIONS

Combined application of organic and inorganic sources of nutrients was found conspicuously better over the use of fertilizers alone across the centres located in different agro-climatic conditions.

Sugarcane trash used as mulch in ratoon crops has little contribution as a source of nutrients as organic amendments like FYM or compost recorded significant improvement in cane and sugar yield over that with trash mulching under the use of recommended dose of fertilizers across the locations.

- Use of organic sources of nutrients in plant-ratoon system brings about substantial enhancement of soil health parameters in most of the sugarcane growing soils.

AS 69: Use of plant growth regulators (PGRs) for enhanced yield and quality of sugarcane

The trial was initiated during 2015-16 with an objective to assess the response of sugarcane crop to plant growth regulators for improvement in germination, growth and yield of the crop. The trial was allocated to all the centres. However, only 21 centres conducted the trial. Centre wise summary is given below.

NORTH WEST ZONE

1. FARIDKOT

Germination of sugarcane (Co 118) was better with treating the seed by 50 and 100 ppm ethrel solution than control. Ethrel helped in advancing the germination process helping in higher germination at early stage. The highest cane yield (107.6 t/ha) was observed in T8 (planting of setts after overnight soaking in 100 ppm ethrel solution and GA3 (35 ppm) spray at 90, 120 and 150 DAP) which was significantly better than T1, T2 and T5.

2. KOTA

Among treatment combination of PGR, planting of setts after

overnight soaking in 100 ppm ethrel solution + GA3 spray at 90,120,150 DAP treatment was found excellent for increasing DMA, leaf area, root dry weight, NMC, cane weight, cane yield, Brix, sucrose, CCS%, CCS yield and purity, GR and NR which was significantly superior over T1 and T2 treatments and at par with rest of treatments. Whereas, significant enhancement in germination at 10, 30, 40, and 50 DAP, recorded with the planting of setts after overnight soaking in 50 ppm ethrel solution over T1, T2, T5 and T6 and at par with the rest of treatments during both the years.

3. KAPURTHALA

Germination of sugarcane under the treatments, where setts were soaked in water and ethrel solution, was significantly better than the treatment where no soaking was done. There was improvement in germination when soaked in ethrel solution than soaking water but the differences were non-significant. The highest cane yield (97.8 t/ha) was observed in T8 (planting of setts after overnight soaking in 100 ppm ethrel solution and GA3 (35 ppm) spray at 90, 120 and 150 DAP) which was significantly better thanT1, T2 & T5 and was at par with others). The number of shoots (121.5 thousands/ha), millable canes (95.8 thousand /ha) and single cane wt. (1467 g) was also higher in T8 than other treatments.

4. LUCKNOW

The findings during 2016-17 revealed that planting of three budded cane setts after overnight soaking in 100 ppm ethrel solution and three GA3 (35 ppm) spay at 90, 120 and 150 DAP resulted early cane setts germination and enhanced the cane yield to 98.17 t/ha over the conventional planting treatment cane yield 80.67 t/ha without affecting the cane juice quality.

5. PANTNAGAR

Higher germination, higher shoot population, higher NMC, higher cane weight and longer canes were recorded in the treatment T4 (soaking of setts in ethrel 100 ppm solution) and T8 (T4 + GA3 35 ppm spray at 90, 120 and 150 DAP). Germination also improved through overnight sett soaking with water.

6. SHAHJAHANPUR

Germination (%) recorded under overnight soaking in 100 ppm ethrel solution was at par with overnight soaking in 50 ppm ethrel solution and it was significantly superior to conventional and overnight soaking in water. Planting of setts after overnight soaking in 100 ppm ethrel solution + GA3 (35 ppm) resulted significantly higher number of shoots, millable canes and cane yield than those of other treatments.

7. UCHANI

Overnight soaking of setts in 50 ppm and 100 ppm ethrel being at par recorded significantly higher germination at 20, 30, 40 and 50 DAP as compared to control and water soaked treatments. Soaking of setts in 50 ppm ethrel+ GA3 spray (T7) and 100 ppm ethrel+GA3 (T8) being at par recorded significantly higher number of tillers, NMC, cane yield and sugar yield as compared to soaking of setts in ethrel at 50 and 100 ppm ethrel alone, conventional practices with and without GA3 and water soaking treatments with and without GA3 spray at 90, 120 and 150 Days after planting.

8. SRIGANGANAGAR

Soaking of sugarcane setts in water or 50 ppm or 100 ppm ethrel solutions resulted in significant increase in sugarcane germination. Overnight soaking of setts in 50 ppm or 100 ppm ethrel being at par resulted significantly improvement in sugarcane germination as compared to farmers' practice and water soaked treatments. The highest cane yield (98.4 t/ha) was recorded in T8 (planting of setts after overnight soaking in 100 ppm ethrel solution + GA3 (35 ppm) spray at 90, 120 and 150 DAP) which was significantly better than T1, T2 and T5 but at par with T3, T4, T6 & T7.

PENINSULAR ZONE

9. PADEGAON

Germination was found significantly higher with planting of setts after overnight soaking in 50 ppm ethrel solution while it was found at par with treatments T7, T4, T8 and T6 at 30, 40, and 50 DAP. The planting of setts after overnight soaking in 50 ppm ethrel solution with GA3 spray (35 ppm) at 90, 120 and 150 DAP recorded significantly the highest cane while CCS yield was not affected significantly by different treatments. However, it was at par with planting of setts after overnight soaking in 100 ppm ethrel solution and GA3 spray (35 ppm) at 90, 120 and 180 DAP. Planting of setts after overnight soaking in water with GA3 spray (35 ppm) at 90, 120 and 150 DAP, planting of setts after overnight soaking in 50 ppm ethrel solution and planting of setts after overnight soaking in 100 ppm ethrel solution. All quality parameters like, brix (c), sucrose (%), purity (%) and CCS% were not affected by different treatments.

10. NAVSARI

Germination (%) at 20, 40 and 50 DAP were recorded significantly highest with T3 (planting of setts after overnight soaking in 50 ppm ethrel solution) over other treatments and remained at par with T4, T7 and T8. Significantly highest cane yield (127.27 t/ha) was noticed with treatment T8 (planting of setts after overnight soaking in 100 ppm ethrel solution + GA3 (35 ppm) spray at 90, 120 and 150 DAP) but remained at par with T3, T4, and T7 over

T1. CCS yield was not significantly influenced due to various treatments. Various quality parameters were not significantly influenced.

11. MANDYA

Overnight soaking of setts in 50 or 100% ethereal solution followed by 35ppm GA3 spray at 90, 120 and 150 DAP found to enhance the germination percentage and cane yield.

12. POWARKHEDA

The cane yield increased significantly due to planting of setts after overnight soaking in 50 ppm ethrel solution (125.93 t/ha) as compared to T2 + GA3 (35 ppm) spray at 90, 120 and 150 DAP (117.08 t/ha), planting of setts after overnight soaking in water (117.80 t/ha), T1 + GA3 (35 ppm) spray at 90, 120 and 150 DAP (118.11 t/ha) and conventional planting/Farmers practice (3- bud setts) (118.83 t/ha). The cane yield obtained at par in between T7 (T3 + GA3 (35 ppm) spray), T3 (planting of setts after overnight soaking in 50 ppm ethrel solution), T4 (planting of setts after overnight soaking in 100 ppm ethrel solution) and T8 (T4 + GA3 (35 ppm) spray).

13. PUNE

The results of the second year trial indicated that the highest germination (70.40%) at 30 DAP, tillering (1.41 lac/ha) at 120 DAP, NMC (0.76 lac/ha),cane girth (11.25 cm), cane yield (158.67 t/ha) and B:C ratio (2.71) was recorded when the setts were overnight soaked in 50 ppm ethrel before planting and foliar spray of GA3 (35ppm) at 90,120 and 150 DAP followed by cane yield of 155.67 t/ha in overnight soaking of setts in 100 ppm ethrel and spraying of GA3 (35ppm).

14. THIRUVALLA

The highest germination percentage and tiller population were recorded by T8 (T4 +GA3 spray (35ppm) at 90,120 and 150 DAP) and the lowest value for the above parameters were recorded by T2 (planting of setts after overnight soaking in water). The highest cane length (261.76 cm), MCC (93180/ ha), cane yield (118.11 t/ha) were recorded under T8. Sugar yield also showed same trend and recorded significantly higher value (13.24 t/ha) for the very same treatment (T8). The highest BC ratio of 1.32 was also recorded by T8.

15. SANKESHWAR

The treatment variation due to use of growth regulators was not conspicuous owing to occurrence of drought during both years. However, T3 (Planting of setts after overnight soaking in 50 ppm ethrel solution) recorded few of the growth (germination and tiller number). Yield (NMC) and quality parameters (juice purity) significantly higher.

EAST COAST ZONE

16. ANAKAPALLE

The experimental results indicated that significantly higher cane yield was recorded in planting of setts after overnight soaking in 100 ppm (88.1 t/ha) or 50 ppm ethrel solution (85.8 t/ha) followed by spraying of GA3 at 90,120 and 150 days after planting. Conventional 3 budded sett planting recorded significantly lower cane yield of 73.3 t/ha.

17. CUDDALORE

Among the treatments, the setts treated with ethrel 100 ppm with foliar spray of GA3 (35 ppm) on 90, 120 and 150 DAS was recorded significantly the highest millable cane (172650/ ha), cane yield (145.36 t/ha), CCS (12.75) and sugar yield (18.53).

18. NAYAGARH

Planting of setts after soaking in 100 ppm ethrel solution along with GA3 spray at 90, 120 and 150 DAP proved to be the best with highest number of millable canes (81200/ha), cane (121.4 t/ha) and CCS yield (12.82.t/ha. Planting of setts after overnight soaking in water along with GA3 spray at 90, 120 & 150 DAP produced NMC of 74330/ha, cane and CCS yield of 115.5 and 12.18 t/ha, respectively.

NORTH CENTRAL ZONE

19. PUSA

Planting of setts after overnight soaking in 50 ppm ethrel solution + GA3 spray (35 ppm) at 90, 120 and 150 DAP (T7) produced higher cane yield (98.6 t/ha) followed in order by planting of setts after overnight soaking in 100 ppm ethrel solution + GA3 spray (35 ppm) at 90, 120 and 150 DAP (T8).

20. BETHUADHARI

The trial was initiated during the year with sugarcane planting on 03.02.2016 (CoB 99161). There was significant improvement in germination at 40 and 50 DAP under soaking of setts in ethrel solution (50 or 100 ppm). Significant increase in cane yield was also recorded under these treatments. Spray of GA3 registered increase in cane yield but that was not significant over T4.

NORTH EASTERN ZONE

21. BURALIKSON

Planting of setts after overnight soaking in water (T2), Planting of setts after overnight soaking in 50 ppm ethrel solution (T3), planting of setts after overnight soaking in 100 ppm ethrel solution (T4) significantly increased the germination over conventional planting (T1). Likewise, in terms of cane yield planting of setts after overnight soaking

in 100 ppm ethrel solution followed by spraying of GA3 (35ppm) at 90,120 and 150 DAP i.e. T8 recorded significantly the highest cane yield (57.75t/ha) which is statistically at par with the cane yield recorded by the treatments T6 (54.80 t/ha), T7 (53.21 t/ha), respectively.

Salient Findings

Results of 22 AICRP (S) centres assigned in five different agro-climatic zones revealed that planting of setts after overnight soaking in 100 ppm ethrel solution followed by spray of GA_3 @ 35 ppm at 90,120 and 150 DAP recorded the highest cane yield at all the zones (North West, East coast, Peninsular and North East) except North Central zone (Planting of Setts after overnight soaking in 50 ppm ethrel solution). However both treatments were significantly superior over the convention planting/farmers practices (Table 1.1). Similar trend was also recorded in respect to commercial cane sugar yield in all the zones (Table1.2). Hence, planting of setts after overnight soaking in either 50/100 ppm ethrel solution followed by spraying of GA_3 @ 35 ppm at 90,120 and 150 DAP proved effective at most of the zones in increasing sugarcane yield and quality.

Important Observations

There was significant improvement in the rate and extent of germination of sugarcane due to overnight soaking of setts in ethrel solution.

The effective concentration of ethrel solution for germination improvement was found to be 100 ppm in north western zone and east coast zone and 50 ppm in peninsular, north central, north eastern zones.

Foliar spray of GA_3 during tillering phase could not improve the cane yield significantly over sett soaking in ethrel solution at most of the centres.

AS 70: Scheduling irrigation with mulch under different sugarcane planting methods

The trial was initiated during 2016-17 and was allocated to all the centres. In all 18 centres carried out the trial as per common technical programme for the year. Centre wise summary of findings are given below.

Table 1.1/AS 69: Effect of plant growth regulators (PGRs) on yield (t/ha) of sugarcane.

Treatment	North West Zone (8)	Peninsular Zone (8)	North Central Zone (2)	North East Zone (1)	East Coast Zone (3)
T1: Conventional planting/farmers Practice (3 Bud Setts)	76.90	93.58	67.00	39.6	98.17
T2: Planting of Setts after overnight soaking in water.	82.73	96.99	71.95	44.9	100.40
T3: Planting of Setts after overnight soaking in 50 ppm ethrel solution.	91.69	102.85	81.75	46.6	105.67
T4: Planting of Setts after overnight soaking in 100 ppm ethrel solution	95.91	104.56	81.55	48.8	111.50
T1 + GA_3 spray (35 ppm) at 90, 120 and 150 DAP	82.75	97.04	80.40	42.4	109.17
T2 + GA_3 spray (35 ppm) at 90, 120 and 150 DAP	89.24	103.61	85.00	54.8	111.47
T3 + GA_3 spray (35 ppm) at 90, 120 and 150 DAP	96.88	110.35	**93.20**	53.2	114.93
T4 + GA_3 spray (35 ppm) at 90, 120 and 150 DAP	**100.26**	**111.48**	92.90	**57.8**	**118.03**
CV (%)	3.87	5.95	10.11	-	3.35
SE(d)	1.73	3.05	8.26	-	2.97
LSD at 5%	3.48	6.13	NS	7.82	6.37

Table 1.2/AS 69: Effect of plant growth regulators (PGRs) on sugar /CCS yield (t/ha).

Treatment	North West Zone (6)	Peninsular Zone (7)	North Central Zone (1)	North East Zone (1)	East Coast Zone (3)
T1: Conventional planting/farmers Practice (3 Bud Setts)	8.79	11.61	6.70	4.91	12.03
T2: Planting of Setts after overnight soaking in water.	9.64	11.78	7.08	5.66	12.27
T3: Planting of Setts after overnight soaking in 50 ppm ethrel solution.	10.87	13.02	7.64	5.83	12.53
T4: Planting of Setts after overnight soaking in 100 ppm ethrel solution	11.45	13.32	7.98	6.24	13.07
T1 + GA_3 spray (35 ppm) at 90, 120 and 150 DAP	9.77	12.52	9.60	5.21	12.77
T2 + GA_3 spray (35 ppm) at 90, 120 and 150 DAP	10.75	13.13	9.79	7.07	12.83
T3 + GA_3 spray (35 ppm) at 90, 120 and 150 DAP	11.67	13.92	10.2	6.76	13.30
T4 + GA_3 spray (35 ppm) at 90, 120 and 150 DAP	**11.85**	**14.27**	**10.4**	**7.45**	**13.83**
CV (%)	3.98	6.58	-	-	3.21
SE(d)	0.24	0.46	-	-	0.34
LSD at 5%	0.50	0.92	2.45	-	0.72

NORTH WEST ZONE

1. FARIDKOT

Cane yield increased successively and significantly with increase in irrigation water application from 0.6 to 1.0 IW/CPE. Interaction effects between method of planting and irrigation schedules revealed the highest cane productivity was obtained from paired row planting with mulching and irrigation at 1.0 IW/CPE, which was statistically at par with paired row planting with mulching and irrigation at 0.8 IW/CPE and paired row planting without mulching and irrigation at 1.0 IW/CPE but significantly higher than all other combinations. Thus, data manifested that trash mulching resulted in saving of 20 % evaporation equivalent and 26.6 % irrigation water input than no mulching in paired row trench planting.

2. KOTA

Based on the one year of study, it can be concluded that paired row trench planting (30:120 cm row spacing) with mulching (sugarcane trash 6 t/ha) was found better with respect to millable canes, cane yield and water use efficiency. It resulted in significantly higher net return over P1 and P2 planting methods. However, irrigation at IW: CPE ratio of 0.80 was found economical in sugarcane yield when compared with 0.60 and 1.00 IW: CPE ratios and also noted significant enhancement in economics with each successive increase in irrigation regimes from 0.60 to 0.80 IW: CPE ratio.

3. KAPURTHALA

Among the planting methods the highest cane yield was obtained under the paired row trench planting with trash mulching (100.1 t/ha) and significantly higher cane yield than other methods of planting. The cane yield increased significantly with trash mulching over that of without trash mulching irrespective of planting methods. The significant increase in cane yield was obtained with increase in irrigation water application from 0.6 to 1.0 IW/CPE. Interaction effects between methods of planting and irrigation schedules revealed the maximum cane productivity was obtained from paired row planting with mulching and irrigation at 1.0 IW/CPE, which was statistically at par with paired row planting with mulching and irrigation at 0.8 IW/CPE and paired row planting without mulching and irrigation at 1.0 IW/CPE but significantly higher than all other combinations.

4. LUCKNOW

Paired-row trench planting with trash mulching (120.97 t/ha) being at par with conventional flat method of planting along with trash mulching (115.19 t/ha) resulted in significantly higher cane yield than that of conventional flat method of planting (109.86 t/ha). The higher cane yield under paired row trench planting was attributed to more number of millable cane (1.38 and 1.34 lakh / ha) than paired-row trench planting and conventional flat method of planting with no trash mulching. The trash application led to higher sugarcane yields irrespective of irrigation scheduling. The irrigation schedules though did not influence the cane yield significantly but the irrigation at IW: CPE 0.8 recorded 2.3 and 3.9 per cent higher cane yield compared to 0.6 and 1.0 IW: CPE ratio, respectively.

5. PANTNAGAR

On the basis of present study it was observed that cane yield and NMC were significantly higher in the treatment of paired row planting (30: 120) + trash mulching and at 1.0 IW/CPE ratio. Sucrose (%) was not influenced due to planting method or trash management and irrigation methods, though the CCS yield was highest in the treatment of paired row planting + mulch and was significantly higher over rest of the treatments. Cane yield was statistically similar in treatment 0.8 or 1.0 IW/CPE but were significantly higher over 0.6 IW/CPE.

6. SHAHJAHANPUR

Paired row trench planting (120: 30 cm row spacing) with organic mulch @ 6 t/ha produced higher cane yield (88.77 t/ha) and maximum water use efficiency (1138.08 kg/ha-cm) than those of other planting methods and mulch practices. Irrigation schedule at 1.00 IW/CPE ratio (I3) resulted in significantly higher cane yield (89.57 t/ha) than that of rest irrigation schedule while, maximum water use efficiency (1806.89 kg/ha-cm) was obtained at 0.60 IW/CPE ratio (I1) followed by 0.80 IW/CPE ratio (I2) with water use efficiency of 1396.17 kg/ha-cm.

7. UCHANI

Significantly higher germination, tillers, NMC, cane weight, cane yield and sugar yield were recorded in paired row trench planting (30:120 cm) as compared to conventional planting at 75 cm row spacing. Trash mulching resulted in significantly higher cane and sugar yield as compared to without mulching treatments. CCS percent was not affected due to different planting methods and irrigation levels. Interaction between method of planting and irrigation levels was found non-significant. Total (Irrigation+ rainfall) water was calculated as 177.1, 192.1 and 207.1 cm in conventional and 152.1, 161.1 and 170.1 in paired row trench planting at 0.6, 0.8 and 1.0 IW/CPE irrigation schedule, respectively. The highest yield of cane produced/1000 litres of irrigation (11.23 kg) water was recorded in trench planting at 0.8 IW/CPE irrigation schedule.

PENINSULAR ZONE

8. PADEGAON

The furrow planting (120 cm row spacing) with green manure (sun hemp) sowing at 30 DAP, mulching at 75 DAP and earthing-up at 110 DAP (P2) and irrigation schedule with 1.00 IW/CPE was found significantly superior for cane yields. While CCS yield was not affected by different planting methods and irrigation schedules. The higher water use efficiency was recorded in furrow planting (120 cm row spacing) with alternate skip furrow irrigation after earthing –up with green manure/brown mulching and irrigation schedule with 0.60 IW/CPE. All quality parameters were found to be non-significant.

9. POWARKHEDA

Results revealed that the cane yield was influenced significantly due to different planting methods. Furrow planting (120 cm row spacing) with green manure (cowpea) sowing at 30 DAP, mulching at 75 DAP and earthing -up at 110 DAP recorded higher cane yield of (105.83 t/ha) than furrow planting (120 cm row spacing) with alternate skip furrow irrigation, after earthing- up without mulching (98.45), but the cane yield recorded at par in between P4 (100.64), P1 (99.61) and P3 (98.45). Among irrigation schedules significantly higher cane yield was obtained at I3 1.00 (103.50) as compared to cane yield recorded with I1 0.60 (98.24) but the cane yield recorded at par in between I3 1.00 (103.50) and I2 0.80 (101.36) and I2 0.80 (101.36) and I1 0.60 (98.24) irrigation schedules.

10. MANDYA

Furrow planting (120 cm row space) with alternate skip furrow irrigation after earthing up + *dhaincha* green manure mulching found to enhance the water use efficiency and gave at par yield as that of 120 cm row spaced furrow planting with *dhaincha* green manure with irrigation at IW/CPE ratio 1.0.

11. NAVSARI

Significantly highest cane (117.26 t/ha) and CCS (16.28 t/ha) yield was noticed with planting method P4 but remained at par with P2 over other methods. Significantly highest cane (122.12 t/ha) and CCS (16.68 t/ha) yield was observed with irrigation level I3 over I1 and I2. Among various quality parameters only CCS % and pol % cane were significantly influenced due to planting methods. Significantly highest CCS % and pol % cane were observed with planting method P4 and remained at par with P2 and P3 over P1. Quality parameters were not significantly influenced due to irrigation levels. Field water use efficiency was recorded the highest (129.15 kg ha-1 mm-1) with irrigation level I1 followed by I2 (105.81 kg ha-1 mm-1) and I3 (101.77 kg ha-1 mm-1).

12. THIRUVALLA

The growth and yield attributes recorded in P4 (furrow planting at 120 cm spacing with alternate skip furrow irrigation after earthing up + green manure/ brown mulching was significantly superior to other planting methods and mulch practices tried. The maximum cane length (251.44 cm), cane girth (10.00 cm), single cane weight (1.60 kg), MCC (85000/ha), cane yield (105.42 t/ha), and sugar yield (11.59 t/ha) were recorded by P4. With regard to irrigation schedule, the highest value for cane length (253.15 cm), cane girth (10.10 cm), MCC (8702/ha), cane yield (108.50 t/ha), and sugar yield (11.94 t/ha) were recorded by I3 (IW/CPE ratio -1.00).

EAST COAST ZONE

13. ANAKAPALLE

Significantly higher cane yield (87.7 t/ha) was recorded in scheduling more number of irrigations at 1.0 IW/CPE (I3) as compared to scheduling irrigations at I1 (78.1 t/ha) and I2 (81.3 t/ha) treatments. Significant differences in cane yield were not observed due to different mulching treatments. However furrow irrigation with mulching recorded higher cane yield of 84.80t/ha. Scheduling irrigations at 0.6 IW/CPE registered the highest water productivity of 1.38.

14. CUDDALORE

Among the methods of planting, the furrow planting of sugarcane setts at 120 cm spacing with green manure sowing at 30 DAP, mulch at 75 DAP and earthing up 120 DAP recorded significantly the maximum cane yield (139.65 t/ha), sugar yield (17.72 t/ha) and B:C ratio of 3.78 and adopting the IW/CPE ratio of 1.0 recorded significantly the maximum cane yield (131.87 t/ha), sugar yield (16.43 t/ha) and B:C ratio 3.58.

15. NAYAGARH

Furrow planting (120 cm row spacing) with alternate skip furrow irrigation after earthing-up + brown mulching method produced significantly higher NMC (92930/ha) and cane yield (103.93 t/ha) which is closely followed by furrow planting (120 cm row spacing) with brown mulching (NMC and cane yield 92.68 '000/ha and 103.36 t/ha, respectively). Irrigating the crop at IW/CPE ratio of 1.0 produced highest NMC and sugarcane yield of 96.22 '000/ha and 106.17 t/ha, respectively which is significantly different from irrigating the crop at IW/CPE ratio of 0.6 (NMC and cane yield 82.62'000/ha and 98.94 t/ha, respectively).

NORTH CENTRAL ZONE

16. PUSA

Paired row trench planting (30: 120 cm row spacing) with or without trash mulching is more productive and efficient water

user compared to conventional flat planting (75 cm row spacing) with or without trash mulching. Application of irrigation water at 1.00 IW: CPE ratio is most effective for realizing higher productivity from sugarcane cultivation in Bihar.

17. SEORAHI

Among planting methods, paired row trench planting (120:30 cm row spacing) with organic mulch @6t/ha (P3) treatment produced significantly higher shoot population, NMC and cane yield over conventional flat planting (75 cm row spacing) with organic mulch @6t/ha (P1) and conventional flat planting (75 cm row spacing) without mulch (P2) treatments but among the irrigation scheduling, IW/CPE 1.0 ratio was best. Cane yield increased with increase the IW/CPE ratio.

NORTH EASTERN ZONE

18. BURALIKSON

The highest cane yield was recorded by paired row trench planting (30:120 cm row spacing) with organic mulching @ 6 t/ha (53.72 t/ha) which is statistically at par with paired row trench planting (30:120 cm row spacing without mulch (50.22 t/ha) but superior over other two planting methods. Moreover, no significant differences were recorded in case of quality of sugarcane.

Salient Findings

The highest cane yield was recorded by paired row trench planting (30:120 cm row spacing) with organic mulching sugarcane trash @ 6 t/ha in North West zone (97.69 t/ha), North central zone (106 t/ha) and North East zone (83.85 t/ha) of the country (Table 1.1). The highest water productivity was also recorded by this treatment in these zones. In Peninsular zone, furrow planting (120 cm row spacing) with alternate skip furrow irrigation after earthing was recorded the highest cane yield (103.50 t/ha) which was closely at par to furrow planting (120 cm row spacing) with green manure (*dhaincha*) sowing at 30 DAP, mulching at 75 DAP and earthing up. In contrast to peninsular zone furrow planting (120 cm row spacing) with green manure (*dhaincha*) sowing at 30 DAP, mulching at 75 DAP and earthing in East Coast Zone recorded the significantly the highest cane yield (109.27 t/ha) over other methods of planting. Irrigation scheduling at IW/CPE ratio of 1.0 produced the highest cane yield over other treatments in all the zones (Table 1.2).

Important Observations: The experiment was initiated during the year (2016-17) and was allotted to all the centres, however only 18 centres carried out the trial as per the technical programme. Salient findings are given below:

Planting of sugarcane in paired rows (120: 30) with mulching of trash (6 t/ha) in the inter-row spaces out

Table 1.1/AS 70: Effect of scheduling irrigation with mulch under different sugarcane planting methods on productivity (t/ha) of sugarcane

Planting methods and mulching practices	North West Zone (7)		North Central Zone (1)		North East Zone (2)
	Yield (t/ha)	Water productivity (kg/ha-cm)	Yield (t/ha)	Water productivity (kg/ha-cm)	Yield (t/ha)
Conventional flat planting (75 cm row spacing) with organic mulching sugarcane trash @ 6 t /ha	90.13	671.14	90.9	691	70.00
Conventional flat planting (75 cm row spacing) without mulch.	86.70	646.57	85.1	647	60.95
Paired row trench planting (30:120 cm row spacing) with organic mulching sugarcane trash @ 6 t/ha.	**97.69**	**926.57**	**106**	**805**	**83.85**
Paired row trench planting (30:120 cm row spacing) without mulch.	93.91	869.14	102	775	79.10
CV (%)	4.32	20.37	-	-	12.54
SE(d)	2.13	84.730	-	-	9.217
LSD at 5%	4.47	178.01	9.5	-	NS
Irrigation schedule (IW/CPE)					
I_1: 0.60	85.76	**877.71**	82.1	666	69.35
I_2: 0.80	93.95	830.57	98.7	750	71.55
I_3: 1.0	**96.58**	765.29	**108**	**776**	**79.65**
CV (%)	4.99	14.91	-	-	10.20
SE(d)	2.46	65.71	-	-	7.496
LSD at 5%	5.35	NS	5.1	-	NS

Table 1.2/AS 70: Effect of scheduling irrigation with mulch under different sugarcane planting methods on cane yield (t/ha) and water productivity (kg/ha-cm) of sugarcane.

Planting methods and mulching practices	Peninsular Zone (5/4)		East Coast Zone (3)	
	Yield (t/ha)	Water productivity (kg/ha-cm)	Yield (t/ha)	Water productivity (kg/ha-cm)
Furrow planting (120 cm row spacing) without mulching	98.02	518.25	102.60	619.67
Furrow planting (120 cm row spacing) with green manure (*dhaincha*) sowing at 30 DAP, mulching at 75 DAP and earthing	102.94	568.00	**109.27**	721.00
Furrow planting (120 cm row spacing) with alternate skip furrow irrigation after earthing	96.44	590.25	100.97	688.67
Furrow planting (120 cm row spacing) with alternate skip furrow irrigation after earthing	**103.50**	**635.25**	105.63	**723.33**
CV(%)	5.34	13.19	4.31	7.70
SE(d)	3.38	53.900	3.68	43.26
LSD at 5%	NS	NS	NS	NS
Irrigation schedule (IW/CPE)				
I_1: 0.60	95.14	**687.75**	100.33	**705.00**
I_2: 0.80	100.35	315.00	104.10	681.67
I_3: 1.0	**107.54**	496.75	**108.57**	659.67
CV (%)	4.34	72.11	0.87	5.26
SE(d)	2.77	254.85	0.74	29.28
LSD at 5%	6.39	NS	2.05	NS

yielded the conventional flat method with or without mulch at all the centres in north western, north central and north eastern zones. Being in the climatic region of high evaporative demand sugarcane crop responded up to 1.0 IW/CPE irrigation regime in the zones. However, statistically at par were recorded with 0.8 IW/CPE ratio at many centres. Trash mulching could effectively save 20-26% irrigation water over no-mulching.

Sugarcane crop in peninsular and east coast zones responded to furrow planting (120 cm) and skip furrow irrigation combined with the use of leguminous crop as green manure till 75 DAP, as mulch during tillering and thereafter residue incorporation. Among irrigation regimes, IW/CPE ratio 1.0 resulted in higher cane productivity, however, it can be restricted to 0.8 for getting higher water use efficiency in these zones.

Use of mulch in sub-tropical zones and green manuring followed by mulching and residue incorporation resulted in higher net return in tropical zones.

AS 71: Carbon sequestration assessment in sugarcane based cropping system.

The trial was initiated during 2016-17 with allocation to all the centres. In all 15 centres conducted the trial in accordance with the approved technical programme. Being the initial year sugarcane plant crop was raised for adoption of treatment in the subsequent ratoon crop and effect of different treatments on cane productivity and soil health would be available during the next crop season. However, effect of residue incorporation in the rice-wheat crop rotation in north western and north central zones and soybean-maize rotation in other zones have been found to be positive on productivity of succeeding crops and soil health.

AS-72: Agronomic performance of elite sugarcane genotypes

The trial was initiated during 2016-17 and was allotted to all the centres. Centre wise summary of findings are given below:

NORTH WEST ZONE

1. FARIDKOT

The highest cane yield in early group was obtained for CoH 11262 (83.6 t/ha) which was at par with other genotypes except CoLk 11201 and CoLk 11202. Same was the case in sugar yield. CoH 11262 was found promising in cane and sugar yield. Among mid-late test entries the highest cane yield was of CoPb 11214 (98.3 t/ha) which was at par with CoLk 11206 (91.7 t/ha). Sugar yield was higher in CoLk 11206 but was at par with CoPb 11214.

2. KOTA

Among early genotypes, CoH 11262 recorded significantly higher germination (48.20 %), tiller count (139000/ha), number of millable cane (86800 thousand/ha) and cane yield (85.63 t/ha) over CoJ 64 and Co 0238 and at par with CoLK 11201, CoL11202 and CoLK 11203. Similarly CoH 11262 recorded significantly higher CCS yield (11.13 t/ha) over CoLK 11201, CoLK 11202 and CoJ 64 and on par with rest of the genotypes. Among mid-late entries cane yield (88.15 t/

ha) was recorded significantly higher in genotype CoLK 11206 over CoPb 11214, CoS 11232 and CoS 767 and at par with rest of genotypes. Similarly CoLK 11206 recorded significantly the highest CCS yield (11.41 t/ha) over CoLK 11204, CoS 11232 and CoS 767 and at par with rest of genotypes.

3. KAPURTHALA

The highest cane yield among early entries was of CoLk 11203 (82.9t/ha) & CoLk 11202 (81.9 t/ha) that was significantly higher over other genotypes. CoLk 11202 & CoLk 11203 were found promising in cane and sugar yield. Among mid late genotypes the highest cane yield was of CoS 11232 (85.2 t/ha) which was at par with CoPb 11214 & CoLk 11206 and significantly superior to all other genotypes. Sugar yield was highest in CoPb 11214 which was at par with CoS 11232 & CoLk 11206.

4. LUCKNOW

In the early genotypes CoLk 11203 was superior over CoLk 11201 and CoLk 11202 in respect to all the parameters. The performance of genotype CoH 11262 was significantly inferior over rest of the genotypes and gave the lowest cane yield (18.84 t/ha). The highest brix, sucrose and purity % measured at 10-month stage was recorded with Co 0238, which was at par with CoLk 11203. While genotype CoLk 11201 showed the lowest value of all these parameters at the same growth stage. Among mid-late entries with the yield level of 80.76 t/ ha, the genotype CoLK 11206 proved to be the highest yielder but was at par with genotypes CoPb 11214 and CoLk 11204. The genotype CoLk 11206 gave the highest sugar yield at both the stages (viz. 10 and 12 months stage) but was at par with genotypes Co Pb 11214 and CoLk11204.

5. PANTNAGAR

Among early entries CoH 11262 performed better with regard to cane yield, NMC, germination %, individual cane weight, sucrose % and commercial cane yield. Sucrose % was on par to Co Pant 3220. Mid-late entries were not evaluated.

6. SHAHJAHANPUR

In early genotypes CoLk 11202 and mid–late genotype CoLk 11206 produced significantly higher cane yield than standards and other entries with cane yield of 105.50 t/ha and 97.60 t/ha, respectively. Row spacing of 90 cm was found superior to 120 cm spacing in cane yield under both early and mid – late genotypes with cane yield of 99.30/ha and 91.52 t/ha, respectively. CCS percent was not affected significantly due to various genotypes and spacing treatments.

7. UCHANI

In early group, genotypes CoH 11262, CoLk 11202 and Co 0238 being at par recorded significantly the highest cane weight (986, 952, 978 g), cane yield (101.2, 103.1, 107.5 t/ha) and sugar yield (12.63, 12.85, 13.59 t/ha) as compared to CoLk 11201, CoLk 11203 and CoJ 64. In mid late group, entries CoH 11263 (102.9 t/ha), CoLk 11206 (100.3 t/ha) and CoPb 11214 (97.1 t/ha) being at par produced significantly higher cane yield as compared to checks and rest of the varieties. Varieties did not differ significantly for CCS % at harvest. Varieties CoH 11263 (12.99 t/ha) and CoLk 11206 (12.35 t/ha) being at par produced significantly highest sugar yield among all the varieties.

PENINSULAR ZONE

8. PADEGAON

The genotype Co 10006 was found significantly superior for cane and CCS yields than the other genotypes. Genotype Co 10027 recorded significantly the highest sucrose %, CCS and purity as compared to the other early maturing genotypes. For mid-late group genotypes CoT 10369 was found significantly superior for cane and CCS yields than the other genotypes. Genotype PI 10132 recorded significantly the highest brix (c), sucrose % and CCS% as compared to the other genotypes.

9. POWARKHEDA

Results revealed that among early genotypes Co 10004 recorded significantly higher cane yield (99.17 t/ha) than Co 85004 (93.43 t/ha), Co 94008 (93.15 t/ha) and Co C 671 (93.15 t/ha) but the cane yield obtained at par in between Co 85004 (93.43 t/ha) Co 94008 (93.15 t/ha), Co C 671 (93.15 t/ha) and CoT 10367 (93.06 t/ha). Among mid-late genotypes Co10031 recorded significantly higher cane yield (106.48 t/ha) than Co 86032 (100.00 t/ha) and Co 99004 (97.87 t/ha).

10. PUNE

The results indicated that, the early genotype Co 10004 found better with maximum germination (70.20 %), tillering (0.74 lac/ha), single cane weight (2.22 kg), cane girth (11.08 cm), cane yield (119.81 t/ha), CCS yield (16.47 t/ha) and B:C ratio (1:2.22), but inferior in juice quality than check variety CoC 671.The mid-late genotype Co 10033 was found better with tillering (1.14 lac/ha), NMC (0.86 lac/ha), cane yield (134.41 t/ha), CCS yield (20.18t/ha), B:C ratio (2.68) and juice quality than the check variety Co 86032.

11. MANDYA

Among early genotypes, Co 10005 recorded significantly higher cane yield (104.3 t/ha). For mid-late genotypes, Co 10033 was found superior with respect to cane yield (113.7

t/ha). But, was on par with PI 10131 (106.3 t/ha), PI 10132 (110.0 t/ha), CoVC 10061 (113.4 t/ha), CoT 10369 (103.4 t/ha) and Co 09009 (103.8 t/ha).

12. NAVSARI

In early group significantly the highest cane yield (120.18 t/ha) was recorded with variety C0 10024 over checks and remained at par with all the varieties except V3. Co10024 recorded significantly the highest CCS yield (16.49 t/ha) over checks and at par with V1, V2, V5 and V8. Whereas, for mid-late genotypes significantly the highest cane yield (127.78 t/ha) was recorded with variety V2 (C0 10015) over checks and remained at par with the varieties V5, V6 and V8. CCS yield was not significantly influenced due to different varieties.

13. KOLHAPUR

In early group Co10027 recorded significantly the highest cane and CCS yield (95.34 and 14.05 t/ha) over standard checks, however, it was found at par with the genotype Co 10004 (92.97 and 13.03 t/ha) followed by Co10026 (89.36 and 12.66 t/ha). For mid-late group CoT10369 recorded significantly highest cane and CCS yield (t/ha) (88.07 and 12.75) over check varieties and was at par with genotypes CoM 10083 (85.35 and 11.95) and PI 10131 (84.08 and 11.46).

14. SANKESHWAR

Among the early genotypes tested significantly higher cane yield was recorded in Co 94008 (68.20 t/ha) and was on par with Co 85004 (64.96 t/ha). The lowest cane yield was recorded in CoC 671 (49.95 t/ha). In mid-late group PI 10132 and Co 86032 performed better among the varieties tested for agronomic performance for most of the growth, yield and quality parameters.

15. THIRUVALLA

The treatment variation due to various early genotypes were significant for cane length, cane girth, single cane weight, NMC, cane yield and sugar yield and COC 671 recorded the highest value for the said parameters (255.52 cm, 9.33cm, 1.62kg, 74750/ha, 85.21 t/ha, 11.40 t/ha, respectively) followed by Co 10005 (244.70cm, 9.14 cm, 1.53 Kg, 60750/ha, 72.0 t/ha, respectively). The highest BC ratio of 1.33 was also recorded by CoC 671. With regard to mid-late varieties, the highest values for cane length, cane girth, single cane weight, NMC, cane yield and sugar yield were recorded by Co10015 (250.90 cm, 9.75 cm, 1.59 Kg, 70120/ha, 87.64 t/ha and11.74 t/ha) followed by Co 99004 (248.61cm, 9.50 cm, 1.57 kg, 69350/ha, 62.25 t/ha and 9.97t/ha, respectively). The highest BC ratio of 1.35 was also recorded by Co10015.

EAST COAST ZONE

16. ANAKAPALLE

Among the five new early genotypes under test CoA12322 proved superior (89.8 t/ha) as compared to other genotypes but found on par with Co V 12356 (87.1 t/ha) and Co A 12323 (86.9 t/ha).

17. CUDDALORE

The genotype CoA 12321 significantly recorded higher cane yield (139.2 t/ha) and sugar yield (16.81 t/ha) resulted higher B: C ratio (3.18) with 125 % recommended dose of nitrogen per hectare.

18. NAYAGARH

The genotype CoOr 12346 produced the highest average cane yield of 102.34 t/ha with application of 125 % RD of fertilizer and was closely followed by CoA 12322 (100.45 t/ha) and CoA 12323 (98.64 t/ha).

NORTH CENTRAL ZONE

19. PUSA

Among early genotypes higher cane yield of 88.2 t/ha was recorded with CoP 11436 followed by CoSe 11451 (87.0 t/ha), BO 130 (81.1 t/ha), CoSe 95422 (78.0 t/ha), CoP 11437 (76.5 t/ha), BO 153 (74.1 t/ha) and the lowest cane yield of 62.6 t/ha was recorded by CoP 11438. The maximum sucrose content (18.39%) was obtained with CoP 11438 which was significantly superior to CoSe 95422 and statistically comparable to rest of the genotypes. Among mid-late genotype BO 155 recorded higher germination percentage (46.2%) plant population (152100/ha) and millable canes (107800/ha) followed by CoSe 95423. Genotype CoSe 11455 (103.4 t/ha), being on a par with BO 155 (91.4 t/ha) produced the highest cane yield and BO 91 (55.4 t/ha), the lowest. The higher sucrose content (18.71%) juice was noticed by the genotype CoP 9301 which was significantly superior to BO 155 (16.53%) and statistically comparable to rest of genotypes.

20. SEORAHI

Among test genotype, maximum sucrose per cent value produced in CoSe 11453 in mid-late and CoSe 11451 in early group genotype. CoSe 11455 in mid-late and CoP 11438 in early genotype recorded significantly higher cane yield over check varieties and remaining test genotypes. Cane yield increased up to 125 per cent recommended dose of fertilizer. 90 cm spacing treatment produced significantly higher yield as compared to 120 cm row spacing treatment. Sucrose per cent was not affected significantly with different treatments of fertility levels and spacing in mid-late and early genotype experiments.

NORTH EASTERN ZONE

21. BURALIKSON

None of genotypes was found superior than the check. However, significant difference was observed in case of quality of sugarcane. The low yield recorded by genotypes might be due to high rainfall received throughout the growth period.

Important Observations

Best performing genotypes across the centres located in different zones are listed herewith:

Sl. No.	Zone	Early genotypes	Mid-late genotypes
1	**North Western**	CoH 11262, CoLk 11202, CoLk 11203, CoLk 11201	CoLk 11206, CoPb 11214, CoH 11263, CoS 11232, CoLk 11204
2	**Peninsular**	Co 10006, Co 10004, Co 10005, Co 10024, Co 10027, CoT 10367, Co 10026	CoT 10369, Co 10031, Co 10033, PI 10131, Co 10015, CoM 10083, PI 10132, Co 09009
3	**East Coast**	CoA 12322, CoV 12356, CoA 12321, CoOr 12346	---
4	**North Central**	CoP 11436, CoSe 11451, CoP 11438	CoSe 11455, BO 155
5	**North Eastern**	All genotypes performed similar and below the performance of check varieties.	All genotypes performed similar and below the performance of check varieties.

Summary

Surface and sub-surface drip irrigation in sugarcane effectively saved water (up to 40%) and increased the crop productivity by 20%. Fertigation with drip resulted in 25% saving of nitrogen compared with surface irrigation. However, with the application of 100% RDN in drip irrigation cane productivity could be increased. Drip irrigation system once installed can effectively be used for 5 years (up to fourth ratoon).

Application of 20 t/ha FYM/compost along with inorganic fertilizers applied on the basis of soil test, soil test crop response for targeted yield or on the basis of general recommendation for the region has shown positive effect on sugarcane growth and yield both in plant and ratoon crops. Response of bio-fertilizers (*Azotobacter*/*Acetobacter*/*Azospirillum*/PSB) was more pronounced in peninsular zone. Use of organic sources of nutrients in plant-ratoon system brings about substantial enhancement of soil health parameters in most of the sugarcane growing soils.

Efficacy of ethrel on accelerating and enhancing germination in sugarcane has been reported from almost all the centres and 50 ppm solution was found equally effective as 100 ppm. Spray of GA_3 (35 ppm) during tillering enhanced cane yield effectively across the zones, however, for north west zone sett soaking in ethrel performed equally well and there was no additional yield increment with GA_3 spray during tillering phase.

Planting of sugarcane in paired rows (120: 30) with mulching of trash (6 t/ha) in the inter-row spaces out yielded the conventional flat method with or without mulch at all the centres in north western, north central and north eastern zones. Being in the climatic region of high evaporative demand, sugarcane crop responded up to 1.0 IW/CPE irrigation regime in the zones, however, similar yields have been recorded with 0.8 IW/CPE ratio at many centres. Trash mulching could effectively save 20-26% irrigation water over no-mulching.

Sugarcane crop in peninsular and east coast zones responded to furrow planting (120 cm) and skip furrow irrigation combined with the use of leguminous crop as green manure till 75 DAP, as mulch during tillering and thereafter residue incorporation. As far irrigation regimes, IW/CPE ratio 1.0 was resulted in higher cane productivity. However, it can be restricted to 0.8 for getting higher water use efficiency in these zones. Use of mulch in sub-tropical zones and green manuring followed by mulching and residue incorporation resulted in tropical zones resulted in higher net return.

Use of mulch in sub-tropical zones and green manuring followed by mulching and residue incorporation resulted in tropical zones resulted in higher net return.

Zone wise the best performing **early genotypes** are given *viz.* North Western zones (CoH 11262, CoLk 11202, CoLk 11203, CoLk 11201); Peninsular (Co 10006, Co 10004, Co 10005, Co 10024, Co 10027, CoT 10367, Co 10026); East Coast (CoA 12322, CoV 12356, CoA 12321, CoOr 12346); North Central (CoP 11436, CoSe 11451, CoP 11438) while in **midlate genotypes** North Western zones (CoLk 11206, CoPb 11214, CoH 11263, CoS 11232, CoLk 11204); Peninsular (CoT 10369, Co 10031, Co 10033, PI 10131, Co 10015, CoM 10083, PI 10132, Co 09009); North Central (CoSe 11455, BO 155). In north eastern zone both early and midlate genotypes performed similar and below the performance of check varieties.

3. PLANT PATHOLOGY

In Plant Pathology program about 21centres participated in 11 different projects,the summary of achievements (2016-17) of these projects is given below.

List of project implemented during 2016-17:

PP 14: Identification of Pathotypes in red rot pathogen

PP17: Evaluation of Zonal Varieties for red rot, Smut, Wilt and Yellow Leaf Disease

PP 22: Survey of Sugarcane Diseases Naturally Occurring in the area on important varieties

PP 23: Assessment of elite and ISH genotypes for resistance to red rot

PP 28: B. Methodology for screening sugarcane genotypes for resistance to brown rust (*Puccinia Melanocephala*)

PP 31: Screening, epidemiology and management of pokkah boeng in sugarcane

PP 32: Management of brown spot disease of sugarcane

PP 14: Identification of Pathotypes in red rot pathogen

Objective

To gather information on the major pathotypes of red rot from different areas/zones.

Location:

i) **North Western Zone:** Lucknow, Shahjahanpur, Kapurthala, Uchani and Karnal (SBI)

ii) **North Central Zone:** Pusa, Seorahi

iii) **East Coast Zone:** Anakapalle and Cuddalore\

iv) **Peninsular Zone:** Navsari, Coimbatore, Thiruvalla

Year of Start: 1983-84 (continuing project)

New isolates showing pathogenic variability from the previously reported pathotypes at different centers will be confirmed at the following centres, Lucknow and Uchani (North West Zone), Anakapalle (East Coast zone) and SBI, Coimbatore (Peninsular zone). The participating centres will deposit such working isolates at the above mentioned centres latest by June 15 of each year. The zonal centers will also maintain the type cultures.

Sugarcane differentials (14 + 5): 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*). Five new differentials – Co 7805, Co 86002, Co 86032, CoS 95422 and CoV 92102.

No. of isolates: Virulent isolates collected from red rot affected canes of commercially cultivated varieties in the zone.

In this program, 12 centres gathered information on new isolates showing pathogenic variability from the designated pathotypes. A total of 95 new isolates along with respective designated pathotypes of their zone were tested on host differentials.Among the 12 centres 10centres used 19 differentials (including new differentials), while Lucknow used 14 differentials, Pusa used 16 differentials to assess pathogen variation. More number of variants have been isolated from the popular varieties such as Co 89003, CoJ 64, CoS 8436, CoSe 92423, CoSe 95422 and Co0238. The centreShahjahanpur reported possibleemergence of 2 new pathotypes i.e. R 1102 and R 1304 in Uttar Pradesh. Kapurthalacentre reported that new isolates RI 303 and RI 305 are as virulent as designated pathotype CF08. The centreUchani reported that the isolates RR XXI, RR XXII and RR XXVI arenot only more virulent as CF08 but also showed similarity with CF08. Karnal centre reported that a new isolate Cf89003 exhibited more virulence with I to S reactions on 14 differentials, suggesting the possible emergence of new pathotype in the subtropics In Peninsular zone, the study at Coimbatore clearly indicated occurrence of new pathotype CF12 and the same has been confirmed by the host differential experiments conducted at Thiruvalla.

RESULTS

NORTH WEST ZONE

LUCKNOW

Nineteen new isolates *i.e.* three isolates from CoS 8436, three isolates from CoS 92423, three isolates from unknown variety, five isolates from Co 0238, two isolates from CoLk 8102, and three isolates from CoSe 95422 were evaluated on 14 differentials by plug method of inoculation. Except Co 0238 isolates, the virulence pattern of other isolates more or less matched with the existing pathotypes of this zone. It was observed that Co 0238 isolates giving intermediate reaction to BO 91; susceptible reaction to Co 62399, CoS 767, Khakai, Co 419 and CoJ 64 and resistance to SES 594, Baragua, Co 997, Co 975 and CoC 671. The resulsts indicate the existence of gained virulence for BO 91 and loss of virulence for Co 997 and CoC 671.

SHAHJAHANPUR

Four *C. falcatum* isolates namely R 1102 (CoS 8436), R 1304 (CoS 07250), R 1501 (CoJ 88) and R 1502 (UP 9530) were tested for variability along with existing pathotypes *viz.*,

CF01, CF02, CF03, CF07, CF08, CF09 and CF11 on 19 host differentials. The observations of disease behaviour revealed that two isolates R 1501 (CoJ 88) and R 1502 (UP 9530) exhibited reactions parallel to CF09 and CF08 pathotypes, respectively. Other two isolates R 1102 (CoS 8436) and R 1304 (CoS 07250) were found to be new emerging pathotypes on the basis of their reaction on 19host differentials.

KAPURTHALA

Nineteen differentials were inoculated with 7 designated pathotypes and 6 isolates *viz.*, RI-298 (CoJ 88), RI-302 (Co 89003), RI-303 (CoJ 64), RI-304 (CoJ 85), RI-305 (CoJ 83) and RI-306 (CoPb 91) collected from Punjab state. The data revealed that all the pathotypes and tested isolates were avirulent on CoS 767, CoS 8436, BO 91, SES 594, Baragua, CoV 92102 and CoSe 95422 except pathotypes CF09 and CF11. Pathotype CF09 caused S reaction on CoS 767, whereas CF11 showed I on differentials CoS 767, BO 91 and Baragua. Among the pathotypes, CF08 from CoJ 84 was found most virulent than others by showing S reaction on 10 diffentials. In recent yearsthe isolate RI-304 from CoJ 85 was found most virulent than other isolates and pathotypes because it showed S reaction on 11 differentials. New isolates RI 303 and RI 305 were found as virulent as pathotype CF08.

UCHANI

Pathogenic variability was studied on 18 differentials with all the designated pathotypes *viz.*, CF01, CF02, CF03, CF07, CF08, CF09 and CF11 along with six new isolates RR XX (Co 89003), RR XXI (CoJ 64), RR XXII (CoJ 85) and RR XXIII (CoS 8436) and RR XXIV(CoS 89003), RR XXVI (CoJ 85) collected from different mill zone area of Haryana. The observations indicated that all the pathotypes/isolates exhibited S reaction on Co 997, CoC 671 and Khakai, whereas R reaction on SES 594, Baragua, CoSe 95422 and CoV 92102. The observations also indicated thatthe clones Co 7717, Co 1148, Co 975, Co 419, Co 62399, Co 86002 and Co 86032 exhibited a clear cut differential reaction. The isolates RR XXI,RR XXII and RR XXVI were more virulent as CF08 and showed similarity with CF08. Isolate RR XX and RR XXIV showed pathogenic variation on host differentials.

KARNAL

Seven pathotypes along with 13isolates collected from CoJ 64 (6), CoS 8436 (3), BO 138 (1), CoSe 95422 (1), CoBln 05221(1) and Co 89903 (1) were inoculated independently on a set of 19sugarcane differentials by plug method of inoculation. The overall disease reaction indicated that there was a clear pathogenic variation on the host differentials. None of the pathotype /isolate resembled another pathotype /isolate in pathogenic behaviour. The differential CoS 8436 succumbed only to isolate Cf8436 (Karnal) for the fourth consecutive years whereas, differential Baragua showed intermediate reaction to CfSe95422 and Cf89003 isolates. A new isolate Cf89003 collected from variety Co 89003 exhibited more virulence with intermediate to susceptible reactions on 14 host differentials, suggests the possible emergence of new pathotype in the subtropics.

NORTH CENTRAL ZONE

PUSA

Seventeensugarcane differentials were inoculated with two pathotypes CF07 and CF08 and eight isolates collected from different cane growing areas of Bihar. The resulst indicated that differentials BO 91, Baragua and SES-594 showed R reaction while, Co 1148, Co 997, CoJ 64, CoC 671 and Khakai showedS reaction against allthe test isolates. The differentials Co 419, CoS 767, Co 7717, CoS 8436, Co 62399, Co975, CoV 92102, Co 86032 and CoSe 95422 showed differential reaction against all the test isolates.It is clear from the data that pathotype CF07 and isolates RR_1, RR_3, RR_4, RR_5 and RR_7 produced R reaction on differentials the Co 419, CoS 767, Co 7717, Co 975, CoV 92102 and Co 86032 and I reaction on CoSe 8436 and Co 62399. The pathotype CF07 and the isolates RR_1, RR_3, RR_4, RR_5 and RR_7 showed similar pathological reaction on differentials. Similarly, pathotype CF08 and isolates RR_2, RR_6 and RR_8 produced I reaction on Co 419, CoS 767, Co 7717, Co 975, CoV 92102, Co 86032 and CoSe 95422 and S reaction on CoS 8436 and Co 92399.

SEORAHI

Seven pathotypes *viz.* CF01, CF02, CF03, CF07, CF08, CF09 and CF11 along with 2 isolates, isolate-1 (CoLk 8102) and isolate-2 (CoSe 92423) were inoculated on 18 differentials. The reaction of isolate-1 resembled with CF07 and isolate-2 resembled with CF08.

EAST COAST ZONE

ANAKAPALLE

Testing of eight isolates obtained from Co 419, CoC 671, Co 997, CoA 89085, Co 62175, 81 V 48, CoOr 12346 and CoA 09321 on 19 host differentials revealed no variation/deviation in reaction. This indicates that all the tested eight isolates have not exhibited any apparent variability.

CUDDALORE

Nineteen sugarcane differentials were inoculated with *C. falcatum* isolated from CoC 23, CoC 24, Co 91017, CoA 92081 and designated pathotype CF06. Among the differentials BO 91showed I reactionforthe isolate collected from CoC 24 while all other isolates registered R reaction. Similarly in Co

1148, the isolate from CoC 24 showed S reaction, while it was R to CF06. With regard to reaction in CoS 767, the isolate from CoC 24 showed I reaction which indicated itsvariation from thedesignated pathotype.

PENINSULAR ZONE

NAVSARI

At Navsari, three isolates collected from CoC 671 (CF06), Co 86032(Cf86032) and Co 86002 (Cf86002) were inoculated on 19 differentials. The results revealed that CoJ 64, CoS 8436, BO 91, Baragua and SES 594 showed R reaction for all the isolates.Entries Co 7717 and Khakai and CoV 92102 exhibited I reaction to all the isolates. While entries Co 1148 and Co 62399 showed R reaction on Cf 86032 but I reaction on CF06 and Cf 86002 and also entries CoS 767 and CoSe 95422 showedR reaction on CF06 and Cf 86002 but I reaction on Cf86032. Only one entry Co 7805 showedR reaction for Cf86002 and I reaction on CF06 and Cf86032. Entries Co 975 and Co 86032 showed I reaction for Cf86002 and S reaction for CF06 and Cf 86032. Entries Co 975 showed I reaction for Cf86032 and Co 86002 showed I reaction for CF06.

COIMBATORE

Two new isolates (Cfv09356-Keerangudi and CfPI1110-Nathakadu) along with five old isolates (Cf0323-Pettavaithalai, Cf92012-Kanjanur, Cf91017-Nellikuppam, CfPI1110-Kothangudi and CfPI1401- Kadaganur)and 2 standard isolates (CF06 and CF12) were inoculated by plug method on 19 sugarcane differentials. The red rot development on differential hosts indicated that all the isolates except CF12 exhibited more or less similar reactions of the designated pathotype CF06 and among the tested isolates, CF12 exhibited more virulence followed by CfPI1401- Kadaganur and CfV09356-Keerangudi.

THIRUVALLA

Eight isolates *viz*., Cf92012 (Kanjanur), CfPI1110 (Nathakadu), CfPI1401 (Kadanganur), Cfv09356, CfPI1110 (Kothangudi), Cf0323 (Pettavaithalai), Cf91017 (Nellikuppam), CoTl 88322 (New isolate -Madhuri) along with 2 designated pathotypes CF06 and CF12 were inoculated by plug method. The disease development on different differentials indicated that, the isolates Cf92012 (Kanjanur), CfPI 1110 (Mathakadi) and CfPI1110 (Kothangudi) exhibited a variable reaction from the standard isolate CF06 with respect to Co7805, CoS 767 and Co 7717, respectively. These isolates were found to be more virulent than the standard isolate CF06, during the current year. Other isolates *viz*., CfPI1401, Cfv09356, Cf0323, Cf91017 and CoTl 88322 (New isolate) exhibited more or less similar reaction to standard isolates.

PP17 : Evaluation of Zonal Varieties for red rot, Smut, Wilt and Yellow Leaf Disease

In evaluation of ZVT entries a total of 15centres have carried out red rot testing, 16 for smut and 6 have screened the clones for wilt resistance and identified many numbers of entries as R/MR to red rot, smut and wilt from all the four zones and they also recorded YLD resistance among the entries. The reaction of entries to red rot, smut and wilt in each zone is presented in the combined.

PP 17 A. Red rot

Objective: To gather information on the relative resistance to red rot in entries of Pre-zonal varietal trial/zonal trials of the respective zones

Locations:

North West Zone	:	Lucknow, Kapurthala, Uchani, Shahjahanpur, Karnal, Pantnagar
North Central Zone	:	Pusa, Motipur, Seorahi and Bethuadahari
East Coast Zone	:	Anakapalle and Cuddalore
Peninsular zone	:	Thiruvalla, Navsari, Coimbatore
Year of start	:	1986-87 (Continuing project)

Varieties: All the centres will test all the entries of early and midlate groups under IVT and AVT of the respective zones. Entries of Inter zonal varietal trial (IZVT) are also to be tested, if listed. The seed material for this programme is to be obtained from the respective breeders of the centres. One 6 metre row of at least 20 clumps for inoculation with each pathotype by plug/nodal method. Any red rot susceptible variety of the same maturity group may be used as standard (check).

Inoculum: (Pathotypes to be used):

North West Zone : CF08 &CF09 (To be inoculated separately)

North Central Zone: CF07 &CF08 (To be inoculated separately)

East Coast Zone : CF04 &CF06 (To be inoculated separately)

Other Zones : Two widely occurring isolates on commercial varieties in the area.

(Note: If pathotypes are not available, CF07, CF08 and CF09 may be obtained from IISR, Lucknow and CF04 &CF06 from RARS, Anakapalle)

Freshly sporulating 7 day old culture in Petri dishes will be taken. The spore mass will be washed with 100 ml of sterile water and collected in a flask. Conidial suspension at a spore concentration of one million spores per ml will be prepared for inoculation. Fresh inoculum should always be used for inoculation.

RESULTS

The entries showing R or MR to red rot by various methods of evaluation are listed below:

NORTH WEST ZONE : (Table 1-page 57)

LUCKNOW- plugand nodal cotton swab

IVT (Early)	:	CoLk 13201, CoLk 13202, CoLk 13203, CoPant 13221, CoPb 13181
IVT (Midlate)	:	Co 13035, CoH 13261, CoH 13262, CoH 13263, CoLk 13204, CoLk 13205, CoPant 13224, CoPb 13182, CoS 13232
AVT (Early)-I	:	Co 12027, CoLk 12203
AVT (Early)-II	:	CoLk 11201, CoLk 11202, CoLk 11203
AVT (Midlate)-I	:	Co 12029, CoLk 12205, CoS 12232
AVT (Midlate)-II	:	CoH 11263, CoLk 11206, CoS 11232

SHAHJAHANPUR–Plug&Nodal cotton swabmethod

AVT (Early) Plant I	:	Co 12027, CoLk 12203
AVT (Early) Plant II	:	CoLk 11201, CoLk 11202
AVT (Midlate) Plant I	:	Co 12029, CoPant 12226, CoS 12232
AVT (Midlate) Plant II	:	Co 11027, CoH 11263, CoLk 11206, CoLk 11214, CoS 11232
IVT (E)	:	Co 13033, Co 13034, CoLK 13202, CoPant 13221, CoS13231
IVT (Midlate)	:	Co 13035, Co 13036, CoH 13262, CoLk 13204, CoPant 13223, CoPant 13224, CoPb 13182, CoS 13232

KAPURTHALA – Plug method& Nodal cotton swab

AVT (Early) Plant I	:	Co 12026, Co 12027, CoPant 12221
AVT (Early) Plant II	:	CoLk 11202
AVT (Midlate) Plant I	:	Co 12029, CoH 12263, CoPant 12226, CoPb 12211
AVT (Midlate) Plant II	:	Co11027, CoH 11263, CoLk 11204, CoLk 11206, CoPb 11214, CoS 11232
IVT (Early)	:	Co 13033, CoLk 13202, CoPant 13221, CoS 13231
IVT (Midlate)	:	Co 13036, CoH 13262, CoPant 13223, CoPant 13224, CoPb 13182

UCHANI – Plug&Nodal cotton swabmethod

AVT (E) Plant I	:	Co 12026, CoLk 12203, CoPant 12221
AVT (E) Plant II	:	CoH 11262, Co LK 11202
AVT (Midlate) Plant I	:	Co 12029, CoH 12263
AVT(Midlate) Plant II	:	Co 11027, CoH 11263, CoLk 11204, CoPb 11214, CoS 11232
IVT (Early)	:	Co 13033, Co 13034, CoLk 13202, CoPant 13221, CoS13231
IVT (Midlate)	:	Co 13035, Co 13036, CoH 13261, CoH 13262, CoH 13263, CoLk 13204, CoPant 13223, CoPant 13224, CoPb 13182

KARNAL – Plug& nodal cotton swabmethod

IVT (Early)	:	Co 13033, Co 13034, CoLk 13202, CoPant 13221, CoS 13231
IVT (Midlate)	:	Co 13035, Co 13036, CoH 13262, CoLk 13204, CoPant 13223, CoPant 13224, CoPb 13182
AVT (E) Plant I	:	Co 12026, Co 12027, CoLk 12203
AVT (E) Plant II	:	CoLk 11202
AVT (Midlate) Plant I	:	Co 12029, CoPant 12226, CoS 12232
AVT (Midlate) Plant II	:	Co 11027, CoH 11263, CoLk 11204, CoPb 11214, CoS 11232

PANT NAGAR- Plug& nodal cotton swab method

IVT (Early)	:	Co 13033, Co 13034, CoLk 13201, CoLk 13203, CoPant 13222, CoS 13231
IVT (Midlate)	:	CoS 13231, CoS 13236, CoH 13261, CoH 13262, CoH 13263, CoLk 13204, CoLk 13205, CoPant 13223, CoPant 13224, CoPb 13182, CoPb 13183, CoS 13233
AVT (E) Plant I	:	Co 12026, CoLk 12203
AVT (E) Plant II	:	CoH 11262, CoLk 11201, CoLk 11202, CoLk 11203
AVT (Midlate) Plant I	:	CoH 12029, CoH 12263, CoLk 12205, CoPant 12226, CoPb 12211, CoS 12232
AVT (Midlate) Plant II	:	CoH 11263, CoLk 11204, CoLk 11206, CoPb 11214, CoS 11232
NORTH CENTRAL ZONE	:	(Table 2 - page 59)

PUSA- Plug& Cotton swab method

	:	CoLk 09204, CoP 11437, CoP 11438, CoP 11451, CoP 13436, CoP 13437, CoP 13438, CoP 13439, CoSe 13451, CoSe 13452, CoSe 13453, CoSe 13454, BO 130, BO 155

MOTIPUR - Plug and cotton swabmethod

IVT (Early)	:	CoP 13436, CoSe 13451, CoSe 13452
IVT (Mid late)	:	CoP 13439, CoSe 13454
AVT (Early) I Plant	:	CoLk 12207, CoP 12436
AVT (Early) II Plant	:	CoP 11436, CoP 11437, CoP 11438, CoSe 11451
AVT (Mid late)- I Plant	:	CoLk 09204, CoLk 12209, CoSe 12453
AVT (Mid late)-II Plant	:	BO 155, CoSe 11453, CoSe 11454

SEORAHI – Plug and nodal cotton swab method

IVT (Early)	:	CoSe 13452
IVT (Mid late)	:	CoP 13439, CoSe 13453
AVT (Early) I Plant	:	CoP 12436, CoSe 12451
AVT (Early) II Plant	:	CoP 11437, CoSe 11451
AVT (Mid late)- I Plant	:	CoLk 09204, CoP 12438, CoSe 12453
AVT (Mid late)-II Plant	:	CoSe 11453, CoSe 11454, CoSe 11455

NORTH EAST ZONE : (Table 3 - page 60)

BURALIKSON – Plug & nodal cotton swab method

IVT (Early)	:	CoP 13436, CoP 13437
IVT (Midlate)	:	CoP 13438
AVT (Early)- I Plant	:	CoLk 12207, CoP 12436, CoSe 12451
AVT (Early)- II Plant	:	CoP 11436, CoP 11437, CoP 11438, CoSe 11451
AVT (Midlate)- I Plant	:	CoLk 09204, CoLk 12209, CoP 12438, CoSe 12453
AVT (Midlate)- II Plant	:	BO 155, CoSe 11453, CoSe 11454, CoSe 11455

EAST COAST ZONE : (Table 4 - page 61)

ANAKAPALLE

IVT Early	:	Co 13023, Co 13024, CoA 12321, CoA 12322, CoA 14321
IVT Midlate	:	Co 13025, Co 13027, Co 13028, Co 13029, Co 13030, Co 13031, CoA 14323, CoC 14337, PI 14377

CUDDALORE- Plug and nodal method

IVT (Early)	:	Co 13023, Co 13024, CoA 14321, CoC 14336
IVT (Midlate)	:	Co 13025, Co 13027, Co 13028, Co 13029, Co 13030, Co 13031, Co 13032, CoA 14323, CoC 14 337, PI 14377
AVT- Early (I Plant)	:	CoA 13322, CoC 13336, CoC 13337
AVT- Early (II Plant)	:	CoA 12322, CoV 12356
AVT-Mid late (I Plant)	:	CoA 11326, CoC 13339, CoOr 13346

PENINSULAR ZONE : (Table 5 - page 62)

NAVSARI – Plug method

IVT (Early)	:	Co 13002, Co 13003, Co 13004, CoN 13071, CoN 13072, MS 13081
IVT (Midlate)	:	Co 13006, Co 13011, Co 13013, Co 13014, Co 13016, Co 13018, Co 13020, CoM 13082, CoN 13073, CoN 13074, CoSnk 13103, CoSnk 13106, PI 13131, PI 13132
AVT (Early) Plant I	:	Co 11001, Co 11004, CoM 11082, CoM 11084
AVT (Early) Plant II	:	Co 10005, Co 10006, Co 10026, Co 10027, CoT 10367
AVT (Midlate) Plant I	:	Co 11005, Co 11007, Co 11019, CoM 11085
AVT (Midlate) Plant II	:	Co 09009, Co 10015, Co 10031, CoM 10083, CoT 10368, CoT 10369, CoVc 10061, PI 10131

THIRUVALLA – Plug & nodal method

IVT (Early)	:	Co13002, Co13003, Co13004, CoN 13072, CoSnk13101, CoSnk13102, MS 13081, Co 85004, Co 94008
IVT (Midlate)	:	Co 13005, Co 13008, Co 13009, Co 13011, Co 13013, Co 13014, Co 13020, CoM 13082, CoN 13073, CoN 13074, CoSnk13104, CoSnk13105, CoSnk13106, CoT 13366, PI 13132
AVT (Early) Plant I	:	Co 11004, Co 85004, Co 94008
AVT (Early) Plant II	:	Co 10004, Co 10005, Co 10006, Co 10024, Co 10027, CoT 10366, CoT 10367

AVT (Midlate) Plant I	:	Co 11005, Co 11007, Co 11012, CoM 11086
AVT (Midlate) Plant II	:	Co 09009, Co 10015, Co 10033, CoT 10368, CoVC10061, PI 10131
COIMBATORE	:	(Table 6 - page 64)
Plug and nodal method (Table 6)	:	CoM 13082, CoSnk 13105, MS 13081

PP 17 B: Smut

Objective	:	To gather information on the relative resistance of the entries to smut inoculation in zonal trials of the respective zones
Locations:		
North West Zone	:	Lucknow, Kapurthala, Shahjahanapur, Pantnagar
North Central Zone	:	Pusa, Seorahi
East Coast Zone	:	Anakapalle, Cuddalore
Peninsular Zone	:	Coimbatore, Powarkheda, Thiruvalla, Padegaon, Navsari, Kolhapur, Sankeshwar and Pune
Year of Start	:	1994-95 (continuous project)
Varieties	:	All the entries of early and midlate group under IVT and AVT of the respective zones. The seed material is to be obtained from the respective breeders of the centre.
Inoculum	:	*Sporisorium scitamineum* (Syn. *Ustilago scitaminea*) teliospores freshly collected from smut susceptible sugarcane varieties will serve as source of inoculum.
Storage	:	Freshly collected whips are air dried by keeping under shade and teliospores are collected in butter paper bags and are stored in desiccators under anhydrous calcium chloride. Spore viability is to be ensured before inoculation.
		Three budded setts of the test clones/entries to be pre-soaked in smut teliospore suspension (spore load @ 10^6 spores ml^{-1}) for a period of 30 min along with the respective checks/standards for R and S categories and planted in 6m/20' rows. Field observations to be made from the time of whip emergence (around 45 days) at fortnightly intervals and the number of smut infected clumps to be recorded. Evaluation is based on the percentage of clumps infected (No. of affected clumps/ total clumps 100). It is required to maintain at least 15 to 20 clumps in each genotype before arriving at the percentage infection.

The following grading was followed for calculating the disease reaction.

0 %	:	Resistant (R)
>0 to 10 %	:	Moderately Resistant (MR)
>10 to 20 %	:	Moderately Susceptible (MS)
>20 to 30 per cent	:	Susceptible (S)
Above 30%	:	Highly susceptible (HS)

RESULTS

Entries showing R and MR against smut are as follows:

NORTH WEST ZONE : (Table 1 - page 57)

KAPURTHALA

AVT (Early) Plant I	:	Co 12026
AVT (Early) Plant II	:	CoH 11262
AVT (Midlate) Plant I	:	CoH 12263, CoPant 12226, CoPb 12211
AVT (Midlate) Plant II	:	CoH 11263, CoPb 11214
IVT (Early)	:	Co 13033, CoLk 13201, CoLk 13203, CoPant 13221, CoPb 13181, CoS 13231
IVT (Midlate)	:	CoH 13261, CoH 13262, CoPant 13223, CoPant 13224, CoPb 13183, CoS 13232

PANTNAGAR

AVT (Early) Plant I	:	Co 12026, Co 12027, CoLk 12203, CoPant 12221
AVT (Early) Plant II	:	CoH 11262, CoLk 11201, CoLk 11202
AVT (Midlate) Plant I	:	CoH 12263, CoLk 12205, CoPant 12226, CoPb 12211, CoS 12232
AVT (Midlate) Plant II	:	CoH 11263, CoLk 11204, CoLk 11206, CoPb 11214, CoS 11232
IVT (Early)	:	CoLk 13203, CoPb 13181
IVT (Midlate)	:	Co 13035, Co 13036, CoH 13261, CoH 13263, CoLk 13204, CoLk 13205, CoPant 13223, CoPant 13224, CoPb 13182, CoPb 13183,

SHAJAHANPUR

AVT (Early) Plant I	:	Co 12026, Co 12027, CoLk 12203, CoPant 12221
AVT (Early) Plant II	:	CoLk 11201, CoLk 11202, CoLk 11203
AVT (Midlate) Plant I	:	Co 12029, CoH 12263, CoLk 12205, CoPant 12226, CoPb 12211, CoS 12232
AVT (Midlate) Plant II	:	Co 11027, CoH 11263, CoLk 11204, CoLk 11214, CoS 11232
IVT (Early)	:	Co 13034, CoLk 13201, CoLk 13202, CoLk 13203, CoPb 13181, CoS13231
IVT (Midlate)	:	Co 13035, Co 13036, CoH 13261, CoH 13262, CoH 13263, CoLk 13204, CoPant 13223, CoPant 13224, CoPb 13182, CoPb 13183, CoS 13232, CoS 13233

NORTH CENTRAL ZONE : (Table 2 - page 57)

PUSA

: CoLk 09204, CoP 11437, CoP 11438, CoP 11451, CoP 11456, CoP 13437, CoP 13438, CoP 13439, CoSe 13451, CoSe 13452, CoSe 13453, CoSe 13454, BO 155, BO 130

SEORAHI

IVT (Early)	:	CoP 13437, CoSe 13452
IVT (Mid late)	:	CoP 13438, CoSe 13453
AVT (Early) I Plant	:	CoP 12436, CoSe 12451
AVT (Early) II Plant	:	CoP 11436, CoP 11437, CoP 11438
AVT (Mid late)- I Plant	:	CoLk 09204, CoLk 12209, CoP 12438
AVT (Mid late)-II Plant	:	BO 155, CoSe 11453, CoSe 11454, CoSe 11455

EAST COAST ZONE

ANAKAPALLE	:	(Table 4 - page 61)
IVT Early	:	Co 07013, Co 13023, Co 13024, CoA 14321, CoC 14336
IVT Midlate	:	Co 13025, Co 13028, Co 13030, Co 13031, Co 13032, CoA 14323, PI 14377

CUDDALORE

IVT (Early)	:	Co 07013, Co 13023, Co 13024, CoA 14321, CoC 14336, CoV 14356
IVT (Mid late)	:	Co 13025, Co 13028, Co 13029, Co 13030, Co 13031, Co 13032, CoC 14337, PI 14376, PI 14377
AVT (Early) I Plant	:	CoC 13337
AVT- Early (II Plant)	:	CoA 12322, CoOr 12346, CoV 12356
AVT- Midlate I Plant	:	

PENINSULAR ZONE

PADEGAON	:	(Table 7 - page 65)
IVT (Early)	:	Co 13002, Co 13003, Co 13004, CoN 13071, MS 13081
AVT(Early) Plant I	:	Co 11004, CoM 11081, CoM 11082, CoM 11084
AVT(Early) Plant II	:	Co 10004, Co 10005, Co 10024, Co 10026, CoT 10366, CoT 10367
IVT (Midlate)	:	Co 13008, Co 13009, Co 13014, Co 13016, Co 13018, Co 13020, CoM 13082, CoN 13073, CoN 13074, CoSnk 13103, CoSnk 13104, CoSnk 13105, CoSnk 13106, CoT 13366, PI 13131, PI 13132
AVT(Midlate) Plant I	:	Co 11007, Co 11012, CoM 11085, CoM 11086
AVT– Midlate II Plant	:	CoM 11086, CoT 10368, CoT 10369
KOLHAPUR	:	(Table 8 - page 65)
IVT (Early)	:	Co 13002, Co 13003, Co 13004, CoN 13071, CoSnk 13102, MS 13081
IVT (Midlate)	:	Co 13008, Co 13009, Co 13014, Co 13016, Co 13018, Co 13020, CoM 13082, CoN 13073, CoN 13074, CoSnk 13103, CoSnk 13104, CoSnk 13105, CoSnk 13106, CoT 13366, PI 13131, PI 13132
AVT (Early) Plant I	:	Co 11004, CoM 11081, CoM 11082, CoM 11084
AVT (Early) Plant II	:	Co 10004, Co 10005, Co 10024, Co 10026, CoT 10366, CoT 10367
AVT (Midlate) Plant I	:	Co 11007, Co 11012, CoM 11085, CoM 11086
AVT– Midlate II Plant	:	Co 10031, CoM 10083, CoT 10368, CoT 10369
SANKESWHAR	:	(Table 9 - page 67)
IVT (Early)	:	Co 13003, CoN 13072, CoSnk 13101, CoSnk 13102
IVT (Midlate)	:	Co 13008, Co 13009, Co 13011, Co 13014, Co 13016, CoM 13082, CoN 13073, CoN 13074, CoSnk 13104, CoSnk 13105, CoSnk 13106, CoT 13366, PI 13131
AVT (Early) Plant I	:	Co 11001, Co 11004, CoM 11081, CoM 11082, CoM 11084
AVT (Early) Plant II	:	Co 10004, Co 10024, Co 10026, CoT 10366
AVT (Midlate) Plant I	:	Co 11005, Co 11007, Co 11012, Co 11019
AVT (Midlate) Plant II	:	Co 10015, Co 10017, Co 10031, Co 10033, CoM 10083, CoVc 10061, PI 10131

PUNE	:	(Table 10 - page 68)
IVT (Early)	:	Co 12001, Co 12003, CoM 12081, CoM 12082, CoM 12083, CoT 12366, CoN 12072, CoT 12367
IVT (Early) II Plant	:	Co 09004, Co 09007
IVT (Midlate)	:	Co 12012, Co 12016, Co 12017, Co 12019, Co 12021, CoM 12084, CoM 12085, CoN 12073, CoT 12368, VSI 12121
AVT (Early)	:	Co 10004, Co 10006, Co 10024, Co 10026, Co 10027, CoT 10367
AVT Midlate I Plant	:	Co 09009, Co 10015, Co 10031, CoM10083, CoT 10368, CoT 10369, PI 10131, PI 10132, MS 10033
POWARKHEDA	:	(Table 11 - page 69)
AVT(Early) Plant I	:	Co 10004, Co 10024, Co 10026, Co 10027, CoT 10366, CoT 10367, Co 11001, Co 11004, CoM 11081, CoM 11084
AVT (Midlate) Plant I	:	Co 10031, CoM 10083, CoT 10368, CoT 10369, CoVc 10061, PI 10131, PI 10132, Co 11005, Co 11007, Co 11012, CoM 11085, CoM 11086
IVT (Early)	:	Co 12001, Co 12006, CoM 12081, CoM 12083, CoN 12071, CoN 12072, CoT 12366, CoT 12367
IVT (Mid late)	:	Co 12009, Co 12012, Co 12014, Co 12016, Co 12017, Co 12019, Co 12021, Co 12024, CoN 12073, CoT 12368, VSI 12121
NAVSARI	:	(Table 5)
IVT(Early)	:	Co 13002, Co 13003, Co 13004, CoN 13071, CoN 13072, CoSnk 13102, MS 13081
IVT (Midlate)	:	Co 13006, Co 13006, Co 13009, Co 13011, Co 13014,Co 13016, Co 13018, CoM 13082, CoN 13073, CoN 13074, CoSnk 13104, CoSnk 13105, CoT 13366
AVT(Early) Plant I	:	Co 11001, CoM 11084
AVT(Early) Plant II	:	Co 10004, Co 10005, Co 10006, CoT 10366, CoT 10367
AVT (Midlate) Plant I	:	Co 11005, Co 11019, CoM 11085, CoM 11086
AVT (Midlate) Plant II	:	Co 09009, CoM 10083, CoT 10368, CoT 10369, CoVc 10061, PI 10131, PI 13132
COIMBATORE	:	(Table 6)
	:	Co 13004, Co 13018, Co 13020, CoM 13082, CoN 13071, CoN 13073, CoSnk 13104, CoSnk 13106, MS 13081, PI 13131

C. WILT

Location	:	Kapurthala, Lucknow, Pusa, Navsari, Anakapalle
Year of Start	:	2000-2001
Varieties	:	Entries of AVT of the respective zones for the year
Plot size and Planting	:	Two rows of 5 m length planted under wilt sick soils
Standards	:	Any wilt susceptible and resistant variety of the zone.

Observations:

1. Germination count at 45 days of planting
2. Appearance of wilt symptoms on the standing canes (on clumps)

3. At the end of 10 months, 10 clumps are to be uprooted with roots. All canes from the clumps will be split open longitudinally and the wilt severity index scored on a 0—4 scale.

Evaluation : 0-4 Scale of wilt severity index

Grade Symptoms

0 Healthy canes and roots with no external or internal symptoms of wilt.

1 No wilting or drying of leaves, no stunting or shrinking of the stalk or rind, slight pith formation with yellow discolouration of the internal tissues in one or two lower internodes only. No cavity formation or fungal growth seen. Apparently normal and healthy roots.

2 Mild yellowing of top leaves and drying of lower leaves, mild stunting and shrinking of the stalk and rind. Yellowish discolouration of the internal tissuesextend to three or four bottom internodes. Slight cavity formation of the pith, no fungal growth seen, slightly discoloured roots.

3 Mild yellowing of top leaves and drying of lower leaves, mild stunting and shrinking of the stalk and rind. Light brown discolouration of the internal tissues throughout the entire length of the cane except the top. Severe pith and cavity formation. Sparse fungal growth observed in the pith cavities.

4 Complete yellowing and drying of the leaves, marked stunting, shrinking and drying of the stalk and rind, dark brown discolouration of the internal tissues extending throughout the entire length of the cane. Large pith cavities with profuse over growth of the associated fungi. Most of the roots necrotic with dark discoloration and dislodge easily from the stalks. Roots mildly discoloured and slightly necrotic.

The mean wilt severity index is worked out based on the number of canes sampled.

Mean wilt severity index = Sum of wilt indices of individual stalks/Number of stalks sampled

Note: Varieties were screened for wilt resistance in wilt sick plot.

RESULTS

NORTH WEST ZONE (Table 1 - page 57)

LUCKNOW

Incidence of wilt was observed in 5 genotypes *viz.*, CoPant 13222 CoS 13231 CoH 11262 Co 13036 CoPant 12226 and no incidence of wilt disease was observed in other entries.

KAPURTHALA

Out of 42 entries 27 behaved as R, 11 namely Co 13034, Co 13036, CoH 11263, CoLk 11201, CoLk 11203, CoLk 13201, CoLk 13203, CoPant 12226, CoS 11263, CoS 11232, and CoPant 13224 behaved as MR and four *viz.*, CoLk 12203, CoH 11262, Co 13033 and CoH 13263 behaved as MS.

NORTH CENTRAL ZONE (Table 2 - page 59)

PUSA

Out of 18genotypes, nine entries BO 155, BO 130, CoP 13436, CoP 13437, CoP 13438, CoSe 13451, CoSe 13452, CoSe 13453 and CoSe 13454 were graded as R, whereas, seven entries *viz.*, CoP 11437, CoP 11438, CoP 11451, CoLk 09204, BO 91, CoP 9301 and CoP 13439 were graded as MR.

MOTIPUR

Natural incidence of wilt was observed in 4 genotypes *viz.*, CoSe 13452, CoP 13438, CoSe 13453 and CoP 12438, the remaining entries showed no disease.

EAST COAST ZONE (Table 4 - page 61)

ANAKAPALLE

Out of 32 entries tested, 3 entries *viz*., Co 13031, CoA 14323 (2009 A 252), and CoC 14337 exhibited R reaction and the remaining entries showedMR, MS and HS reaction.

PENINSULAR ZONE (Table 5 - page 62)

NAVSARI

Out of 34 entries none showed R reaction, whereas21 entries *viz*., Co 13006, Co 13009 and CoN 13073 (IVT-ML), Co 11001, Co 11004,CoM 11082 and CoM 11084 (AVT-E I Plant),Co 10005, Co 10006, Co 10027, CoT 10366 and CoT 10367 (AVT-E II Plant), Co 11005, Co 11007, Co 11012, CoM 11085 and CoM 11086 (AVT-ML I Plant), Co 10015, Co 10031, CoT 10368 and PI 10132 (AVT-ML II Plant) showedMR reaction.Eightentries exhibited MS reaction and remaining entries showed S reaction to wilt.

SUMMARY

Entries showing Resistance against wilt are as follows

NORTH WEST ZONE

KAPURTHALA

AVT (Early) Plant I	:	Co 12026, Co 12027, CoPant 12221
AVT (Early) Plant II	:	CoLk 11201, CoLk 11202, CoLk 11203
AVT (Midlate) Plant I	:	Co 12029, CoH 12263, CoLk 12205, CoPant 12226, CoPb 12211, CoS 12232
AVT (Midlate) Plant II	:	Co11027, CoH 11263, CoLk 11204, CoLk 11206, CoPb 11214
IVT (Early)	:	Co 13034, CoLk 13201, CoLk 13202, CoLk 13203, CoPant 13221, CoPant 13222, CoPb 13181, CoS 13231
IVT (Midlate)	:	Co 13035, Co 13036, CoH 13261, CoH 13262, CoLk 13204, CoLk 13205, CoPant 13223, CoPant 13224, CoPb 13182, CoPb 13183, CoS 13232, CoS 13233

NORTH CENTRAL ZONE

PUSA

	:	CoLk 09204, CoP 11437, CoP 11438, CoP 11451, CoP 13436, CoP 13437, CoP 13438, CoP 13439, CoSe 13451, CoSe 13452, CoSe 13453, CoSe 13454, BO 130, BO 155

EAST COAST ZONE

ANAKAPALLE

IVT Early	:	Co 13023, Co 13024, CoA 12321, CoA 14321, CoA 14322,
IVT Midlate	:	Co 13031, CoA 14323, CoC 14337, PI 14377

PENINSULAR ZONE

NAVSARI

IVT Early	:	-
IVT Midlate	:	Co 13006, Co 13009, CoN 13073
AVT- (Early) Plant I	:	Co 11001, Co 11004, CoM 11082, CoM 11084
AVT (Early) Plant II	:	Co 10005, Co 10006, Co 10027, CoT 10367
AVT- (Midlate) Plant I	:	Co 11005, Co 11007, Co 11012, CoM 11085, CoM 11086
AVT- (Midlate) Plant II	:	Co 09009, Co 10015, Co 10031, CoT 10368, PI 10132

D: YELLOW LEAF DISEASE

YLD symptoms of mid rib yellowing are expressed during 6-8 months crop stage. If disease severity increases, the yellowing spreads to laminar region and later there will be drying of affected mid rib and adjoining laminar tissue from leaf tip downwards along the mid rib. Another important symptom would be bunching of leaves in the crown. Highly susceptible variety will exhibit severe foliage drying during maturity stage. In place of yellow discoloration, purple or pinkish purple discoloration may also be seen on the mid rib and lamina. Canes of the affected plant do not dry. To assess YLD severity, the following disease severity grades are to be given during maturity stages of the crop (3 observations by 8th, 10th and 12th months). Each time, minimum of 25 canes (free from other biotic stresses) are to be scored.

YLD severity grades

(The colour photographs of YLD symptoms displaying severity grades are available in the soft copy of the technical programme).

Disease grade	Description
0	No symptom of the disease
1	Mild yellowing of midrib in one or two leaves, no sign of typical bunching of leaves caused by YLD
2	Prominent yellowing of midrib on all the leaves in the crown. No bunching of leaves
3	Progress of midrib yellowing to laminar region in the whorl, yellowing on the upper leaf surface, and bunching of leaves
4	Drying of laminar region from leaf tip downwards along the midrib, typical bunching of leaves as a tuft
5	Stunted growth of the cane combined with drying of symptomatic leaves

Mean of the severity grades to be computed and the following YLD severity scale is to be used to assign disease reaction of the variety.

YLD severity scale

Disease grade	Description
Score	Disease reaction
0.0 - 1.0	Resistant
>1.0 – 2.0	Moderately resistant
>2.0 – 3.0	Moderately susceptible
>3.0 – 4.0	Susceptible
>4.0 – 5.0	Highly susceptible

RESULTS

NORTH WEST ZONE : (Table 1 - page 57)

LUCKNOW

YLD incidence was observed in eight genotypes *viz*., CoLk 13201, CoPb 13181, Co 12027, CoH 13263, CoPb 13182, CoH 12263, CoS 12232 and CoPb 11214.

KAPURTHALA

No disease symptoms were observed during the year 2016-17.

UCHANI

In AVT (E) Plant-1, out of 4 entries only Co 12026 showed YLD resistance and entries viz., Co 12027, CoLk 12203 and CoPant 12221 were MS. In AVT (E) Plant II trial, CoLk 11202 was YLD resistant. The entries CoH 11262 and CoLk 11201 were MS and CoLk 11203 was found to be S. Entries CoH 12263, CoLk 12205 in AVT (ML) Plant-1, showed MR and three entries namely, Co 12029, CoS 8436 and CoPb 12211 were MS. The entries viz., CoPant 12226and CoS 12232 CoS 767 and Co Pant 97222 were S to YLD. Out of six entries in AVT (ML) –II, CoH 11263 and CoPb 11214 showed resistant reaction and CoLk 11204 and CoS 8436 were MS. The entries Co 11027 and CoLk 11232 were YLD susceptible and three entries CoLk 11206, Co Pant 97222 andCoS 767 wereHS.Out of nine entries in IVT (E), four entries viz., CoLk 13201, CoLk 13202, CoLk 13203 and CoPant 13221were MR and Co 13033, Co 13034, Co Pant 13222 and CoPb 13181 wereMR to YLD. Of the 15 evaluated under IVT (ML), only CoS 13233showed resistance and four entries viz., CoH 13261, CoH 13262, CoH 13263 andCoS 13232 showed MR reaction against YLD. Eight entries Co 13035, Co 13036, CoLk 13204, CoLk 13205, CoPant 13223, CoPant 13224, CoPb 13182 and CoPb 13183exhibited MS to YLD.

SHAHJAHANPUR

Forty two genotypes were evaluated for YLD resistance in six trials. In AVT (Early I plant), all 4 Co 12026, Co 12027, CoLk 12203 and CoPant 12221 were found to be R. Two genotypesCoLk 11201 and CoLk 11202 were found to be R and CoLk 11203 was MR in AVT (E, II plant). In AVT (M, I plant), all 6 genotypesCo 12029, CoH 12263, CoLk 12205, CoPant 12226, CoPb 12211 and CoS 12232 were rated as R. In AVT (M, II plant), the genotypes CoH 11263, CoLk 11204, CoS 11232 and CoS 767 were R and Co 11027 and CoLk 11214 were MR. Two genotypes CoPant 13222 and CoS 13231 were found to be R and the genotypes CoLk 13201, CoLk 13202, CoPant 13221 and CoPb 13181 were rated as MR in IVT (E). There were 8 genotypes viz., CoH 13263, CoLk 13204, CoLk 13205, CoPant 13223, CoPant 13224, CoPant 97222,

CoS 767 and CoS 8436 found as R and 4 genotypes such as CoPb 13182, CoPb 13183, CoS 13232 and CoS 13233 were MR in IVT (M).

PANTNAGAR

Under natural condition, YLD was assessed on 41 genotypes. Out of these, 25 were recorded as R, 9 as MR, 6 asMS and only one was recorded as S.

NORTH CENTRAL ZONE (Table 2 - page 59)

PUSA

YLD was not observed in any experimental plots.

SEORAHI

Of 23 genotypes screened, 17 genotypes were YLD resistant, 2 were MR and 4 genotypes were MS to YLD. In IVT (E) trial, CoP 13436,CoSe 13451 and CoSe 13452 were found as resistant, whileCoP 13437 was MR to YLD. Among IVT (ML) genotypes, CoP 13438, CoSe 13453 and CoSe 13454 were resistant to YLD, while CoP 13439 was MS to YLD. The entries CoP 12436 and CoSe 12451 were found as resistant, while CoLk 12207 was s MS to YLD in AVT (E) I Plant trial. In AVT (E) II Plant trial, genotypes *viz.*CoP 11437, CoP 11438 and CoSe 11451 were found as resistant, while CoP 11436 was found to be MS to YLD. Among Advanced Varietal Trial (ML) l Plant genotypes, CoLk 09204 and CoLk 12209 were YLD resistant and CoP 12438 was MR to YLD while CoSe 12453 was MS to YLD. In AVT (ML) II Plant trial, all four genotypes viz., BO 155, CoSe 11453, CoSe 11454 and CoSe 11455 were found to be YLD resistant.

EAST COAST ZONE (Table 4 - page 61)

ANAKAPALLE

Out of 64 genotypes, three entries namely 2006 A 64, Co 13029 and Co 7602showed resistance against YLD under natural conditions, while five genotypes viz., Co 7219, CoA 12322, CoA 14323, CoC 13336 and PI 15376 showed MR reaction and remaining genotypes were S under natural conditions.

PENINSULAR ZONE (Table 5 - page 62)

NAVSARI

Of 58 zonal varieties/ entries from IVT (E), IVT (ML), AVT (E I & II Plant), AVT (ML I & II Plant), along with 5 checks (CoC 671, Co 94008, Co 85004, Co 86032 and Co 99004) were evaluated for YLD resistance. 52 entries showed resistant reaction. Five entries viz., MS 13081 (IVT-E), Co 13005, CoT 13366, PI 13131 and PI 13132 (IVT-ML) were found as MR. Only one entry viz., Co 10368 (AVT-ML II Plant) was recorded as MS.Out of five checks, CoC 671 and Co 94008 (IVT-E) were found resistant and only Co 99004 (IVT-ML) was found MR to YLD. The check Co 85004 (IVT-E) exhibited MS reaction and Co 86032 (IVT-ML) was observed as YLD susceptible.

COIMBATORE (Table 6 - page 64)

During the season, about 28 IVT entries and 31 AVT entries were monitored for the YLD severity based on the 0-5 scale. Among the IVT and AVT entries, 10 each were apparently free from the disease symptoms and had shown R reaction. The disease severity in rest of the entries were in the category of MS to MR. Three IVT mid late entries viz., Co 13016, CoT 13366 and PI 13131 and one AVT (ML II plant) entry Co 10031 were found to be susceptible to YLD. Similarly, the ratoon fields of AVT (E I plant) and AVT (ML I plant) were monitored throughout the season where two entries such as, Co 10006 and Co 10027 in AVT (E I plant) ratoon were found apparently free from the disease symptoms. In AVT (ML I plant) ratoon, the entry Co 10031 had shown YLD score more than 3 with severe stunting symptoms and none of the entries in that were found to be free from the disease.

POWARKHEDA (Table 11 - page 69)

A total of 30 AVT genotypes were observed for their resistance to YLD. In the early group, 10 genotypes i.e.,Co 10006, Co 10024, Co 10026, Co 10027, CoT 10366, CoT 10367, Co 11001, CoM 11081, CoM 11082 and CoM 11084 were found to be R whereas others exhibited MR to MS reaction. Among the mid late group, 13 genotypes viz.,Co 09009, Co 10015, Co 10017, Co 10033, Co 11005, Co 11007, Co 11012, Co 11019, CoM 10083, CoM 11085, CoM 11086,CoT 10368, CoVC 10061exhibited YLD resistance whereas remaining four entries were found to be MR.

SANKESHWAR (Table 9 - page 67)

In IVT (E), seven entries viz., Co 13003, CoN 13004, CoN 13071, CoN 13072, CoSnk 13101, CoSnk 13102 and MS 13081 showed R reaction and Co 13002 exhibited MR reaction. In IVT (ML), out of 20 entries, 19 entries showed R reaction and only PI 131312 recorded MR reaction. In AVT- E (PC I), all entries viz., Co 11001, Co 11004, CoM 11081, CoM 11082 and CoM 11084 were R. In AVT– ML (PC I), all six entries viz., Co 11005, Co 11007, Co 11012, Co 11019, CoM 11085 and CoM 11086 were R.

In AVT – E (PC II), out of 8 entries, 7 entries viz., Co 10004, Co 10005, Co 10006, Co 10026, Co 10027, Co 13086 and CoT 10367 showed R reaction, only Co 10024 displayed MR reaction. In AVT–ML (PC II), all entries viz., Co 09009, Co 10015 , Co 10017, Co 10031, Co 10033 , CoM 10083, CoT 10368, CoT 10369, CoVC 10061, PI 10131 and PI 10132 were found to be R.

PP 22: Survey of Sugarcane Diseases Naturally Occurring in the area on important varieties

Objectives : To gather information on the diseases naturally occurring in the area on varieties to compile all India status report yearly.

Location : Lucknow, Kapurthala, Uchani, Shahjahanpur, Pantnagar, Karnal (SBI), Pusa, Modipuram, Seorahi, Buralikson, Anakapalle, Cuddalore, Coimbatore, Sankeshwar, Powarkheda, Tiruvalla, Padegaon, Kolhapur, Navsari and Pune.

Year of Start : 1989-1990

Observations : Periodic observations in June, September and December in all locations to gather information on the %incidence of diseases on all varieties of the area (General survey).

In survey of sugarcane diseases, 22centres gathered information on diseases naturally occurring in their area. In north west zone, in Uttar Pradesh,3-8% incidence of red rot was recorded in Co 0238, CoS 8436, CoS 92423, CoLk 08102, CoS 91269 and CoSe 95422, while 25% incidence was recorded in CoLk 8102, CoSe 95422 and CoS 8436. In the zone comprising Haryana, Uttar Pradesh, Bihar, Uttrakhand, severe red rot incidence (>40%) was recorded in Co 89003 and up to 20% in CoPant 84212 andin the same area all the fields under variety CoH 150 was observed with smut. The Uchanicentre reported occurrence of red rot in CoS 8436, CoJ 85 and Co 89003 and wilt in varieties namely Co 89003, Co 05011, CoS 8436, CoH 119, Co 767 and Co 1148 ranging from 5 to 25 per cent. Thiscentre also reported GSD to the tune of 15% and pokkahboengup to 35% on Co 89003, CoJ 85, Co 0238, CoS 8436, CoH 119, CoH 160, CoH 152 and Co 05011. Pantnagar reported occurrence of ring spots and eye spots in severe form on CoPant 99214, CoS 88230, Co 0118, CoS 767, CoS 96268, CoPant 92423. Shahjahanpur reported occurrence of red rot on variety Co 0238 with incidence of 5-15%, 1-2%, 2-10%, 40% from Nigohi, Rosa, Hargaon and Gola, respectively. The centre also reported incidence of smut up to 3% on varieties Co 0238, Co 1158, CoS 98231, CoS 767, CoSe 92423 and CoLk 94184 with high incidence on CoJ 88.In Punjab red rot was observed up to 6.0 % on Co 89003, CoJ 64 and CoJ 85 and CoPb 91 and CoS 8436 and6-7% on Co 89003 and CoS 8436.

In North central zone the Pusacentre observed wilt in varieties CoLk 94184, CoSe 98231, Co 0118 and Co 0233 and smut in BO 141 and BO 136. The Seorahicentre reported red rot with 15 and 20% on cultivars CoSe 92423 and UP 9530 and wilt on varieties CoS 08279 (2%), Co 0238 (10%) and Co 98014 (15-20%). The centre also reported YLD on Co 05011 and UP 05125 up to 15% and 10% mosaic in CoPant 97222. In Bihar red rot was recorded in varieties CoSe 95422, Co 0238 and BO 130 to the tune of 3-7 %, and pokkahboeng was observed in Co 0238 (5-20%). The centreBuralikson recorded red rot, wilt and YLD in Co 740, Co 997, CoBln 09104.

In East coast zone occurrence of 10-40 % red rot was observed on Co 62175, 81 A 99, 93 V 297, S-12 and 81 V 48 by Anakapallecentre. The centre also reported occurrence of smut from 10-45%, wilt 10-30% and 10-70% of YLD. The Cuddalorecentre reported 2 to 54 % incidence of red rot onCoC 24, CoC 23 and Co 91017, smut in variety CoC 22 and CoSi 6 with 8 % severity andwilt in Co 86032 (2 to 12 %) and YLD on Co 86032 (5 to 15 %) and CoV 09356 (5 to 10 %). The centreNayagarh also recorded red rot incidence of 5-30% in the varieties *viz.* Co 86032, Co 6907, CoOr 03151 andCo 86249.

In Peninsular zone Coimbatore centre reported occurrence of red rot in Co 86027 and TNAU Si8 and sudden outbreak of smut in Co 86032. The centre also found severe brown rust occurence in Co 0323 in Karnataka.Degeneration in the cultivars Co 86032, CoA 92081 and CoV 94101 was also found due to YLD and mosaic. In Western Maharashtra smut incidence was reported up to 8% on Co 7219 by Padegaoncentre. The centre also recorded incidence of rust up to 25-30% on CoM 0265, Co 92005 and Co 86032 and 5-10% rust incidence on CoM 0265. Brown spot was also recorded as major problem (5-20%) in this region. The centreThiruvalla recorded ring spot as the most common and predominant foliar disease from two months age up to harvest. In Gujarat wilt, red rot and smut was recorded to the tune of 2.02, 1.63 and 4.92% respectively. In this region red rot was recorded on CoC 671, Co 86032, Co 86002, Co 0323, CoVSI 03102, CoVSI 0434 and Co 97009 and the maximum incidence of smut was recorded on CoSi 95071, Co 86002 and Co 97009. Powerkhedacentre recorded red rot on CoLk 8001/unknown variety at Narsingpur with incidence up to 20% and smut was found to be major diseases and observed from all the locations surveyed by this centre. Pune centre recorded GSD incidence in Maharashtra up to 15% on CoC 671, Co 86032, CoM 0265, Co 419, CoVSI 9805 and Co 92005 and rust disease up to 15%. Sankeshwarcentre recorded smut, rust, brown spot and grassy shoot as major diseases in their region. Maximum incidence of smut was observed on Co 86032 and Co 8011, CoC 671 and Co 91010, i.e.,11.4% and 10-17% of rust incidence was observed and YLD was observed in some varieties in severe form. The Kohlapurcentre reported rust in the range of 5-25 %, 2-10% ring spot, and pokkahboeng on all sugarcane varieties in the range of 2-5%. Akola centre reported pokkahboeng (5%) and YLD (2%) as major diseases in their region.

RESULTS

NORTH WEST ZONE

LUCKNOW

Incidence of red rot was noticed in Co 0238, CoS 8436, CoS 92423, CoLk 08102, CoS 91269 and CoSe 95422. Localized incidence (3-8 %) of red rot was also noticed in Co 0238 at several locations of Uttar Pradesh. However, in some fields of CoLk 8102, CoSe 95422 and CoS 8436, there was 25% incidence. Incidence of smut was also observed in CoSe 92423 and Co 0238. Incidence of GSD was noticed in most of the field surveyed (1-3 %) to (10-20 %) in CoS 91269. The incidence of pokkah boeng is increasing substantially and the incidence of leaf scald was also noticed in Co 0238.

KARNAL

Survey was carried out under the reserved area of 20 sugar mills of the zone comprising Haryana (14), Uttar Pradesh (3), Bihar (2), Uttrakhand (1). Severe red rot incidence (> 40%) was recorded in Co 89003; upto 20% in CoPant 84212 and trace to 1% on variety Co 89003 under Panipat, Karnal, Asandh (Haryana) and Shamli (UP) area. Similarly up to 10% incidence was recorded in two fields of mix varieties at Laksar (UK). Severe incidence (01- 20%) was noted in ratoon of variety Co 89003 at Panipat followed by CoH 150 (1- 8%, Shahabad) and CoH 152 (trace – 3.0%, Palwal). Incidence in other varieties viz. Co 0238, CoH 156, CoH 160 and CoH 119 ranged from trace to 1.0%. None of the field of variety CoH 150 was free from smut in Shahabad. Further, trace incidence observed in the variety Co 0238 at Sobitgarh (UP). GSD was recorded up to 5% in Co 89003 (ratoon) at Sonipat, 1- 3.0% in CoH 150 (Shahabad) and trace to 2.0% in other varieties i.e. Co 0238, CoS8436, CoJ 88, CoH 160, CoH 152 and CoH 119 in Haryana. Trace to 3.0% incidence was also observed on Co 0238, Co 98014 and CoS 8436 at Mawana. Pokkah boeng incidence was ranging from trace to 3% in varieties viz. CoH 150, CoH 119, CoS 8436, Co 0238, Co 89003, CoJ 85 and CoJ 88 in Haryana, whereas in UP, disease was prevailing in the varieties Co 0238, Co 98014 and CoS 8436. However, in one field of variety Co 0238 in village Jaisinghpur, Mawana (UP) incidence of 10-12% was observed. Further, very severe incidence of top rot (40%) was recorded in CoJ 85 at Meham, 5% in CoH 150 (Shahabad), 1.0- 2.0 % in CoS 8436 (Karnal & Rohtak), up to 2.0% in CoJ 85 (Rohtak) and trace in varieties CoH 119 and CoH 152 at Palwal and Kaithal (Haryana). Disease was recorded by 2.0 – 3.0 % in CoJ 88 under Deoband, Laksar and Sobitgarh areas. Mild to severe incidence of wilt (up to 30.0%) was seen in variety Co 89003 at many fields of Haryana and UP.

UCHANI

Red rot was observed on plant and ratoon crop of CoS 8436, CoJ 85 and Co 89003 varieties in sugar mill zone areas of Karnal, Bhadsu, Shahabad, Panipat, Asandh, Yamunanagar Kaithal and Rohtak during both pre and post monsoon seasons ranging from 2 to 25 per cent. Wilt was noticed in varieties namely Co 89003, Co 05011, CoS 8436, CoH 119 , Co 767 and Co 1148 in Panipat, Sonipat, Yamunanagar, Rohtak, Asandh, Jind , Panipat and Karnal sugar mill zone areas ranging from 5 to 25 per cent. The incidence of wilt in association with red rot was also observed in Panipat and Karnal sugar mill zone areas particularly in Co 89003. The incidence of wilt in association with red rot and root borer was also observed in Karnal, Panipat and Rohtak sugar mill zone areas. Smut incidence in the range of 2- 15% was observed on the varieties Co 0238, Co 89003, CoH 99, CoH 160, Co 0118, CoH 119 and Co 05011 in Shahabad, Karnal, Bhadsu, Rohtak, Jind and Kaithal sugar mill zone areas. Top rot was observed on the varieties viz., CoJ 85, Co 0238, CoH 152 and CoH 119 in Shahabad, Karnal, Kaithal, Yamunanagar and Rohtak sugar mill zone areas ranging from 2 to 60 per cent. GSD was observed in traces to15% in Karnal, Shahabad, Yamunanagar, Jind, Rohtak and Asand areas of Haryana on the varieties which include Co89003, CoJ 85 , Co 0238, CoS 8436, CoH 119, CoH 160 and CoH152. Pokkah boeng (traces to 35%) appeared on varieties viz., Co89003, CoJ 85, Co 0238, CoS 8436, CoH 119, CoH 160, CoH 152 and Co 05011 in Yamunanagar , Karnal, Jind, ,Panipat, Sonipat, Rohtak, Shahabad,Gohana, Kaithal, Panipat and Asand sugar mill zone area. YLD was noticed intraces to 5 % on the varieties Co 0238, CoS 8436, CoH 119, CoH 152, Co 89003, CoH 119, CoH 160 and Co 05011 in Yamunanagar, Karnal, Asand, Jind , Rohtak, Shahabad and Panipat sugar mill zone areas. Incidence of mosaic in traces was observed in CoH 119 and CoS 8436 in Shahabad, Karnal, Panipat and Asand.

PANTNAGAR

During the survey, red rot was not recorded on any of the varieties in the field. Smut was observed in traces in few cultivars during October to January. Wilt was observed on CoS 767 in Liberhedi, and on CoS 88230, CoS 767 in Doiwala. Foliar disease (ring spots and eye spots) were observed in scanty level to mild in almost all the varieties. Most severe on CoPant 99214, CoS 88230, Co 0118, CoS 767, CoS 96268, CoPant 92423 in Khanpur, Laksar and Iqbalpur area. YLD was seen as a minor disease in some pockets in CoPant 84212, CoPant 03220, CoPant 05224 mild incidence in CoPant 90223 and CoS 767. PB was present at low level in some varieties, more in Co 0238 at most of the places.

SHAHJAHANPUR

Red rot was observed on the variety Co 0238 with incidence of 5-15%, 1-2%, 2-10%,40% from Nigohi, Rosa, Hargaon and Gola, respectively. The varieties CoJ 85 and CoJ 88 were affected with 10 to 20% from Mankapur and Nigohi, respectively. An unknown variety was also infected with 60-90% at Rosa (Shahjahanpur) area. Variety Co 1148 was also affected with 1.0% stray from Ramala. Incidence of smut up to 3% was noticed on varieties Co 0238, Co 1158, CoS 98231, CoS 767, CoSe 92423 and CoLk 94184 at Hardoi, Gajraula, Palia and Shahjahanpur. It was also found on CoJ 88 with high incidence at Deoband (Saharanpur). Wilt was reported on the varieties Co 05011, Co 0238, CoS 08279, CoS 08272, CoS 08276 and CoS 08452 from SRI Shahjahanpur, its incidence varied from stray to 5%. This disease also observed on Co 05011 with the incidence of trace to 25% in Gola Research farm, Shamli and Mawana. GSD was reported in almost all the popular sugarcane cultivars and its incidence varied from 2 to 25% in Shahjahanpur and Bareilly. Pokkah boeng disease was reported in Co 0238 with incidence of 15-30% from SRI Shahjahanpur and Hardoi. It was also reported up to incidence of 5% from Shahjahanpur, Sitapur, Gajraula, Palia and Gola. The popular cultivars viz; Co 0238, Co 0118, Co 05011, CoS 08279, CoS 08272, CoS 8436, CoSe 01434 and UP 05125 were affected by YLD in various sugar mill areas. Sugarcane mosaic, stinking rot, pine apple diseases were also noticed at various places in traces.

KAPURTHALA

The disease survey on sugarcane crop was conducted three times during May-June, September and November. Red rot was observed from traces to 6.0 %on Co 89003, CoJ 64 and CoJ 85 and CoPb 91 in Ajnala, Amloh, Bhogpur, Bhudewal, Nawashahr and Phagwara sugar mills areas. Wilt incidence of 6-7% was observed on Co 89003 and CoS 8436 in Dhuri, Nawanshahr, Amloh, Budhewal and Fazilka mills area. The varieties Co 0238 and Co 89003 were found infected with smut from traces to 5.0% in Kiriafgana, Batala, Mukerian, Dasuya Nakodar and Phagwara and Ajnala mills area. Pokkah boeng disease was observed on variety Co 0238 (traces to 2%) in Mukerian, Dasuya, Gurdaspur, Kiriafgana, Batala, Ajnala and Bhogpur sugarmills area. Red stripe/top rot disease was observed traces on CoJ 85 in Bhogpur, Budhewal Dhuri, Amloh and Morinda sugar mills area. GSD was observed with an incidence of 1-2% on Co 0238 in Butter Sevian, Kiriafgana, Mukerian, Dasuya and Gurdaspur Dasuya and Gurdaspur sugarmills area.

NORTH CENTRAL ZONE

PUSA

During survey, incidence of wilt was noticed in varieties CoLk 94184, CoSe 98231, Co 0118 and Co 0233. Smut was observed in BO 141 and BO 136. Variety Co 05011 was found affected with Pokkah Boeng and mosaic diseases. The varieties CoSe 92423, CoS 8436 and CoSe 95422 were found affected with red rot. Red rot and GSD was observed in variety Co 0235. While YLD was noticed in ratoon crop of varieties CoSe 95422 and CoSe 8436 in two clumps only in the farmer field during 2nd week of August, 2016.

SEORAHI

The survey was conducted in various mill zones area of different co-operative and private sugarmills of eastern Uttar Pradesh. Red rotwas reported with 15 and 20% incidence oncultivarsCoSe 92423 and UP 9530 in Ramkola sugar millat the farmer fields. The wilt was observed on varieties CoS 08279 (2%) and Co 0238 (10%) incidence in Seorahi and variety Co 98014 was observed to have 15 –20% incidence in the Ramkola sugar mill atfarmer's field.Traces to 1% incidence of smut was reportedin the plant and ratoon crops of CoSe 11453, UP 05125, CoSe 01434, CoS 08279, CoSe 92423, Co 0238, CoS 8432,Co 0118, Co 05011and CoP 9301 and incidence range from 2 to 8 %from Seorahi, Ramola, Dhara, Khada, Manakapur, Balarampur, Babhanan, Uttaraulla sugar mill zone areas in eastern UP. GSD was noticed in the varieties namely Co 05011, Co 0118, Co 0238, Co 98014, CoS 88230, CoS 91269, CoS 97261, CoS 13231, CoS 08272, CoS 08279, CoSe 92423, CoSe 01424, UP 5125 and CoJ 88 were from Babhanan, Balarampur, Chhatiyawn, Manakapur, Uttaraulla, Ramkola, Seorahi and Sultanpur sugar mill zone areas in the farmers field and its incidence varied from 2 to 6%.The pokkah boeng was also recorded on cultivars CoS 08279, CoS 08272, UP 9530, UP 05125, CoSe 96436, CoSe 92423, CoSe 01434, CoS 06279, CoS 91269 Co 05011, Co 98014, Co 0118 and Co 0238 atBabhanan, Mankapur, Ramkola, Seorahi, Khada and Balarampur sugar mill areas and the incidence varied from 1 to 10% .YLD was also recorded on Co 05011 and UP 05125 from Seorahi sugar mill at the farmer's field up to 15% and 10% mosaic incidence was recorded in the variety CoPant 97222. Further YLD, mosaic and stinking rot were noticed in traces on the varietiesCo 0118, CoS 08272and CoS 08279 at the GSSBRI farm.

MOTIPUR

In Bihar, CoP 9301, Co 0238, CoSe 95422, Co 0118, CoLk 94184, Co 0239, BO 130 were the varieties found in cultivation. Red rot was recorded in varieties CoSe 95422, Co 0238 and BO 130 to the tune of 3-7 %. Whereas Pokkah

Boeng was observed in the variety Co 0238 (5-20 %) and Yellow leaf disease (YLD) was noticed in the varieties *viz*., CoLk 94184, Co 0118, BO 130 and Co 0238.

NORTH EAST ZONE

BURALIKSON

Sugarcane genotypes were found to be affected with red rot, wilt, YLD, pokkahboeng and leaf spot in Golaghat District of Assam. Red rot, wilt and YLD were observed in Co 740, Co 997, CoBln 09104. Red rot incidence varied from trace to 8.82%. Wilt was observed in ratoon crop of Khanikor upto 18.51%. Trace to 5.66% YLD incidence was noticed in Co 997. Foliar disease, ring spot was recorded in CoBln 09103, BO 130 and CoSe 12453 upto 24%. Pokkahboeng was also observed in CoSe 11454, CoLk 09204, CoP 13436, BO 130 in tillering stage. But these genotypes regained from disease condition except the genotype CoSe 11451where top rot phase was observed. Banded sclerotial disease was also observed in BO 155 in traces.

EAST COAST ZONE

ANAKAPALLE

Red rot of 10-40 % was observed on Co 62175, 81 A 99, 93 V 297, S-12 and 81 V 48 in Visakhapatnam, Chittor and Srikakulam districts. Smut incidence was noticed in almost all sugarcane growing areas of Andhra Pradesh ranging from 10-45 % mostly on ratoon crop of CoA 92081, CoV 09356 (2003V46), 91 V 83 and 97 R 83. Wilt incidence also was observed 10-30 % in Coastal areas of Andhra Pradesh on Co 86032, 87 A 380, Co 7219, 91 V 83, Co A 92081, Co 62175 and 81 A 99. YLD is increasing year after year in all sugarcane growing areas of Andhra Pradesh in all the varieties and recorded 10-70%. Top rot, rust, ring spot and GSD are predominant diseases recorded during the period 2016-17 on sugarcane. Rust and ring spot diseases were observed in some areas even after 2-3 months after planting. Though leaf scald disease once appeared in traces, is again seen emerging on a economically significant note especially during 2016 and 2017. This is attributed to the fact of growing NBV1 that has been showing increased susceptibility over years.

CUDDALORE

The survey conducted in Cuddalore, Villupuram, Kanchipuram and Thiruvannamalai Districts of Tamil Nadu and Puducherry state indicated that 2 to 54 % incidence of red rot onCoC 24, CoC 23 and Co 91017. Smut was recorded in variety CoC 22 and CoSi 6 with 2 and 8 % severity. Wilt was observed in Co 86032 (2 to 12 %) and YLD was noticed on Co 86032 (5 to 15 %) and CoV 09356 (5 to 10 %).

NAYAGARH

Incidence of red rot was recorded 5-30% in the varieties *viz.* Co 86032, Co 6907, CoOr 03151 andCo 86249. Ring spot and GSD were predominant diseases in sugarcane and their incidence in the rang of 10-40%. Pokkah boeng was observed during rainy days in the range of 5-10% but plants recovered after the season. Mosaic was prevalent in the areas and incidence varied from 5% to 40%.

PENINSULAR ZONE

COIMBATORE

Detailed surveys for smut, wilt and YLD were conducted in Karnataka and Tamil Nadu. Occurrence of red rot in Co 86027 and TNAU Si8 was found in Namakkal and Tiruvannamalai Dt, respectively. Trace incidence of red rot was found in a ratoon crop of Co 06022 in Nagapattinam Dt. Sudden outbreak of smut in Co 86032 was found in Villupuram and Tiruvannamalai districts. Continuation of the old varieties such as Co 97009 and PI-96-843 with severe smut was found to be the reason for the sudden outbreak of the disease. Further severe wilt outbreak was found in both the states. The varieties Co 62175, Co 86032 and Co 0323 were affected in the Karnataka state and in many varieties in Tamil Nadu. Severe rust occurrence of brown rust was found in Co 0323 in Karnataka. Degeneration in the cultivars Co 86032, CoA 92081 and CoV 94101 was found due to YLD and mosaic. Occurrence of GSD was found in many districts where healthy seed nursery programme is not followed. Degeneration due to YLD was addressed through YLD-free nurseries. Disease-free crops raised from such nurseries recorded ~250 tonnes/ha in the variety in Erode and Namakkal Districts in Tamil Nadu.

PADEGAON

The survey of sugarcane diseases was undertaken in Kolhapur, Satara, Sangli, Ahmednagar, and Solapur districts of Western Maharashtra. The incidence of diseases like smut, GSD, pokkah boeng, rust, YLD, brown spot, pineapple and ring spot was observed in different areas. Smut incidence was noticed up to 8% on Co 7219 at Kasbe-Digraj in Sangli district. The incidence of YLD was noticed in villages from Kolhapur district on Co 86032, CoC 671. GSD was noticed in Pune, Ahmednager and Satara districts on the sugarcane varieties viz., CoM 265 and Co 86032 (ratoon). Pokkah boeng was noticed on CoVSI 9805 and CoC 671 in Solapur district. The incidence of rust up to 25-30% was noticed in Kolhapur district on CoM 0265, Co 92005 and Co 86032. Moreover, 5-10% rust incidence was noticed on CoM 0265 from Satara district. Brown spot was a major problem observed up to 5-20% predominantly in Satara, Sangli and Pune districts because of frequent rains and high humidity.

The incidence of ring spot disease was noticed up to 5% in Kolhapur district on CoM 0265,Co 86032 and Co 92005, whereas trace incidence of pineapple disease was noticed on Co 86032 and CoM 0265.

THIRUVALLA

Ring spot, sheath blight, rust, mosaic and pokkah boeng were recorded but none of the diseases were in a severe stage to cause any drastic yield decline. Sheath blight due to *Rhizoctonia solani* was observed in the entire experimental field in the station during May – June. Ring spot was the most common and predominant foliar disease observed even from two months age up to harvest. Rust disease was observed during August – September months. But the disease subsided with the onset of North East monsoon showers. Mosaic was seen commonly in most of the crop varieties, but the disease was not in such a stage to cause any severe yield reduction and grassy shoot was not observed commonly.

NAVSARI

Surveys were undertaken in 10 sugarcane growing sugar factories area of South Gujarat region. Wilt, red rot and whip smut were the major diseases in South Gujarat region. Area affected under wilt, red rot and whip smut was 2.02, 1.63 and 4.92% respectively. The incidence of smut was recorded on varieties like CoSi 95071, Co 86002, Co 97009 and Co 99004. Maximum incidence of smut was recorded on CoSi 95071, Co 86002 and Co 97009 and it was to the tune of 9.70 % in Bardoli Sugar factory area. The wilt incidence noticed in CoC 671, Co 86032, Co 86002, CoM 0265 and CoSi 95071 varieties and was maximum to the tune of 6.54 % in Gandevi Sugar factory. The red rot was recorded on CoC 671, Co 86032, Co 86002, Co 0323, CoVSI 03102, CoVSI 0434 and Co 97009 and it was to the tune of 1-2 % in all Sugar factory areas. Highest wilt and red rot incidence was noticed in variety CoC 671 and minimum in Co 86032. In addition to these diseases, the incidence of pokkah boeng disease was observed in Co 99004 in Bardoli, Gandevi, Chalthan and Kamrej Sugar factory areas. Grassy shoot, YLD were found in traces at Chalthan, Mahuva, Narmada, Bardoli sugar factory areas and also Navsari surrounding area. Grassy shoot was observed on Co 86032, CoC 671 and CoM 0265 and YLD was noticed on Co 86032 and Co 99004.

POWARKHEDA

Survey of different sugarcane growing areas were undertaken to record the incidence of major diseases like red rot, wilt, smut, GSD, YLD and pokkah boeng. Red rot was recorded on CoLk 8001/Unknown at Narsingpur with incidence of up to 20%. Only 2-3 plots were infected with red rot. Smut was found to be major diseases and observed from all the locations i.e. Hoshangabad, Bankhedi, Kareli, Gadarwara and Narsingpur sugarcane growing area. Mainly, the disease was recorded on Co 7219, Co 86032, Co 99004,Co 06027, Co 94012, Co 8014, CoM 0265, CoJ 64, Co 0238 and CoS 88230. The highest incidence was noticed on Co J 64 up to 12%. Wilt was observed from Kareli, Gadarwara and Narsingpur sugarcane growing areas on Co 94012 with incidence of up to 40%. GSD was observed on Co 86032 and Co J 64 from Kareli sugarcane growing area with the incidence of up to 7%. YLD from Hoshanngabad and Kareli locations on Co JN 86572, Co 09007, Co 85004 Co 99004, Co 86032, CoVSI 434 and CoS 88230 with the incidence of up to 15%. Pokkah boeng was observed in traces.

PUNE

The GSD incidence in Maharashtra was up to 15% on CoC 671, Co 86032, CoM0265, Co 419, CoVSI9805 and Co 92005. Smut incidence was up to 5% in Khandesh and Vidarbha region on Co 86032 and Co 419. Pineapple disease was observed in ill-drained soils up to 5% affecting germination. Due to drought and low humidity for last 2 crop seasons, the incidence of the pokkah boeng was low to 10% throughout Maharashtra. The rust disease up to 15% was observed starting September after the monsoon period and present throughout the year. The eye spot incidence was noted in Southern Maharashtra on CoC671, Co92005 and Co86032 up to 7 %. The mosaic was minor and observed in traces. The incidence of brown spot was noted on CoM0265 up to 5%. The incidence of YLD is increasing on CoC 671, CoM0265, Co 86032, Co 419, VSI434 throughout Maharashtra.

SANKESHWAR

Smut, rust, brown spot and grassy shoot were the major diseases in region. Maximum incidence of smut was observed on Co 86032 and Co 8011, CoC 671 and Co 91010 and it was to the tune of 11.4%. 10-17% rust incidence was observed in some areas after 2-3 months of planting. Brown spot was a major problem observed predominantly in Dharwad and Belgaum districts because of frequent rains and high humidity during rainy season. The pokkah boeng disease was noticed on all sugarcane varieties after receiving pre monsoon shower in May. YLD was observed in some varieties in severe form.

KOLHAPUR

The survey of sugarcane diseases was carried out before onset of south-west monsoon and after over monsoon in the region. The incidence GSD is increased due to use of unhealthy seed material. Smut was not much observed in the zone except on Co 7527 upto 2% in Kagal tehsil. Among the foliar diseases, rust and ring spot fungal diseases are

predominant in the region. The intensity was noticed in the range of 5-25 % (rust) and 2-10% (ring Spot). The pokkah boeng was noticed on all sugarcane varieties in the range of 2-5%. The brown spot caused by *Cercospora longipes* is noticed every year on CoM 0265 sugarcane variety with intensity in the range of 15-20%. The intensity of YLD is more in 8 to 12 months crop on the variety Co 86032.

AKOLA

Surveys in Wardha, Yavatmal and Telhara areas indicated that Pokkah Boeng (up to 5% incidence), YLD (upto 2%), mosaic (traces – 1%) were found in low intensity on Co 265 (Ratoon), Co 86032 and Local variety Paturda. In Nagpur and Bhandara regions, Pokkah boeng was recorded upto 6% on variety Co 03102 and NR 9805. The other varieties Co 86032, CoM0265, Co 03102, Co 92005 and NR-9805 were also affected by Pokkah boeng. YLD and mosaic diseases were also observed on all these varieties. In Wardha regions, Pokkah Boeng, YLD and mosaic were observed on Co 86032, CoVSI 8005, CoM0265and the incidence was very low upto 5% only.

PP 23: Assessment of elite and ISH genotypes for resistance to red rot

Objective : To gather information on *Saccharum* sp. and elite genotypes for resistance to red rot, so that the resistant genotypes could be used in breeding programme as possible donor for resistance.

Locations : Kapurthala, Uchani, Karnal, Shahjahanpur, Lucknow, Pusa, Seorahi, Anakapalle, Cuddalore, and Navsari

Plot Size : One, six metre row of at least 10 clumps

No. of isolates : As indicated in PP 17 experiment

Method of inoculation : Plug method only

Inoculum : As per details given under PP 17 (Pathotypes to be inoculated individually only)

Method of evaluation : As per details in PP 17

Sevencentresgathered information on *Saccharum* sp. and elite genotypes that are resistant to red rot. Among 32 genotypes screened at Kapurthalacentrenone of the entries behaved as resistant, 14 genotypes were found MR against CF08 and 18 against CF09.At Karnal, among 23 genotypes screened five were R/MR to CF08 isolate and eight were R/MR to CF09. Nine clones were evaluated at Uchani and among them 3 were found R/MR. InCuddalorecentre among 27 ISH clones two showed resistant reaction to CF04 and CF06. At Navsariout of 26 ISH genotypes evaluated only one genotype SES 594 gave resistant reaction. At Coimbatore 27 ISH clones were evaluated and among them 14 were identified as resistant to CF06 and eight for CF12 in plug method and in nodal method 18 and 19 were resistant to the two pathotypes, respectively.

RESULT

NORTH WEST ZONE

KAPURTHALA

Of the 32 genotypes, none of the entries behaved as resistant, 14 genotypes were found MR against CF08 and 18 against CF09. Five genotypes ISH-108, ISH 191, ISH-224, ISH-269, and ISH-313 were found MS to CF08 whereas MR to CF09. Genotypes ISH 137 was found S to CF08 and MS to CF09. Five genotypes were HS to both the pathotypes by plug method of inoculation whereas ISH-012, ISH-148, ISH-267 and ISH-287 were HS to CF08 and MR/MS to CF09.

KARNAL

Twenty three ISH genotypes were inoculated with CF08 and CF09 isolates by plug method of inoculation for red rot resistance. Eleven genotypes exhibited S/HS, seven MS and five R/MR reaction to CF08 isolate. Similarly with CF09 isolate, 13 genotypes showed S/HS, two MS and eight R/MR reactions.

UCHANI

Nine ISH clones viz., IA 30-14, IA 30-17, IA 31-32, IA 31-35, B 44-167, F1108, Q-65, Q-45 and 57 NG 131 were evaluated for resistance to red rot by plug method using pathotype CF08 . The clones namely F1108, IA 30-17, and IA 31-35 were found R/MR whereas, genotype B 44-167, IA 30-14, IA 31-32, Q-65, Q-45 and 57 NG 131 showed MS/S reaction against red rot pathotype CF08.

SHAHJAHANPUR

ISH genotypes were collected from SBI Coimbatore and multiplied during 2016-17.

LUCKNOW

Trial not conducted

NORTH CENTRAL ZONE

PUSA

Out of 27 clones, 06 clones (AS 04-1687, AS 04-1689, BM – 1003143, BM 1009163, SA 98-13 and SA – 409) failed to germinate. Due to poor germination, the inoculation was not carried out in rest of clones. After multiplication of seed materials, 27 clones were planted during 2017planting season and inoculation will be done during August, 2017.

SEORAHI

Trial not conducted

PENINSULAR ZONE

CUDDALORE

Among the 27 elite and ISH clones screened for resistance to red rot against CF04 and CF06 by plug method of inoculation, two clones *viz.*, SA 04-454 and Gu 07-2276 recorded resistant reaction. Thirteen clones *viz.*, BM 1005149, BM 1010168, PG 9869137, SA 98-13, SA 04-390, SA 04-496, SA 04-409, AS 04-1689, AS 04-2097, MA 5/37, MA 5/99, MA 5/22 and GU 07-3849 were MR to both the pathotypes.

NAVSARI

Out of 26 elite and ISH genotypes evaluated for red rot resistance, only one genotype SES 594 gave resistant reaction. Fourteen genotypes, viz., ISH 111, ISH 58, ISH 100, ISH 287, ISH 12, ISH 50, ISH 147, ISH 267, ISH 118, ISH 117, ISH 114, ISH 115, AS 04-1687 and GU 07-2276 were observed with MR reaction. Five genotypes *viz.*, ISH 175, ISH 229, AS 04-2097, MA 5/5 and MA 5/51showed MS reaction. Two genotypes viz., ISH 69 and MA 5/99 displayed S reaction. Four genotypes viz., ISH 41, ISH 176, ISH 9 and ISH 43 exhibited HS reaction by plug method.

COIMBATORE

Twenty seven ISH clones were evaluated for red rot by plug and nodal methods for CF06 and CF12 pathotypes. About 14 clones were identified as resistant to CF06 as against eight for CF12 in plug method. In nodal method 18 and 19 were resistant to the two pathotypes, respectively.

ANAKAPALLE

Trial not conducted

PP 28: B. Methodology for screening sugarcane genotypes for resistance to brown rust (*Puccinia Melanocephala*)

Objective: To standardize methodology for inoculation of uredospores of brown rust and rating of resistance

Year of Start: 2013-14

Locations: Pune, Padegaon, Kolhapur, Sankeshwar and Anakapalle

1. **Inoculation methodology:**

(i) Clip inoculation in leaf whorl

As soon as brown rust appears in field, select rust affected leaves, cut leaf bits (clips) measuring 8-10 cm. Select ten rust-free plants of the same susceptible variety in a different location. In three shoots of each plant (clump), insert 2-3 clips in the leaf whorl of each shoot.

(ii) Leaf whorl inoculation

As soon as brown rust appears in field, collect rust affected leaves. Make a suspension of uredospores in sterilized distilled water (10^4-10^5 spores/ml). Pour 1 ml freshly prepared uredospores suspension in each leaf whorl. Inoculate in 10 clumps (three shoots per clump) of same susceptible variety.

In the aforementioned two methods, plants to be inoculated may be marked by cutting one-third of the tips of the uppermost leaves so that they can easily be identified during recording observations.

Observations: After 4 weeks, record symptoms on leaves by counting – (i) average number of rust pustules per square inch, and (ii) number of leaves bearing rust pustules.

ii. Rating of resistance:To be taken up after standardization of inoculation method

Four centres reported the results of standardizing methodology for inoculation of uredinospores of brown rust and the results from all centres revealed that leaf whorl inoculation is ideal for disease development. One centreKohlapur reported the results of screening for rust resistance.

RESULTS

PUNE

While comparing clip inoculation in leaf whorl and leaf whorl inoculation methods, number of rust pustules per square inch leaf was more in leaf whorl method (23.20/inch^2). In clip inoculation, the average number of rust pustules per square inch was 13.00. Therefore, leaf whorl inoculation method is found superior over clip inoculation method.

KOLHAPUR

In clip inoculation method brown rust development was slower than in leaf whorl method. More number of rust pustules was found in the leaf whorl inoculation (40.05/ inch^2) than the clip inoculation method (30.75/inch^2). In addition sugarcane genotypes were screened to identify the resistance and the nresults are given below.

1) **IVT (E):** Among the tested 8 sugarcane genotypes, 3 genotypes *viz.*, Co 13002, CoSnk 13101 and MS 13081 were found free from rust, whereas remaining five showed rust severity in the range of 10-20% under natural condition.

2) **AVT (EI) plant:** Out of 5 sugarcane genotypes, Co 11004, CoM 11082 and CoM 11084 were found free from rust whereas, remaining genotypes showed the

rust intensity in the range of 25-30 % under natural condition.

3) **AVT (E II) plant):** Among the 8 genotypes, 4 genotypes *viz*., Co 10005, Co 10006, Co 10027 and CoT 10367 were found free from rust while remaining genotypes shown rust disease intensity in the range of 10-20% under natural condition.

4) **IVT (ML):** Among the tested20 sugarcane genotypes, 6 genotypes *viz*., Co 13008, Co 13011, Co 13016, CoM 13082, CoSnk 13103 and CoSnk 13106 were found rust free and remaining 14 genotypes showed rust intensity in the range of 5-20% under natural condition.

5) **AVT (ML I) plant**: Of the six sugarcane genotypes, Co 11007, Co 11019 and CoM 11085 were free from rust and remaining sugarcane genotypes recorded rust severity in the range of 20-40%.

6) **AVT (ML II) plant**: Out of 11 genotypes, 4 genotypes *viz*., Co 10015, Co 10031, Co 10033 and CoM 10083 were found free from rust whereas, remaining genotypes recorded rust severity in the range of 10-25%.

7) **Check varieties:** Among the check varieties only Co 86032 and Co 740 were found free from rust and other varieties showed rust severity in the range of 5-35%.

SANKESHWAR

Observations indicated that, out of 2 methods, number of rust pustules (36.54 /inch^2) on inoculated were higher under leaf whorl method. In clip inoculation, the average number of rust pustules per square inch was 24.31. Therefore leaf whorl inoculation method was found superior over clip inoculation.

PADEGAON

The leaf whorl inoculation method recorded higher number of rust pustules (31.91 per sq. inch) and more number of leaves were showing rust pustules (5.6). In clip inoculation method the number of rust pustules were lower (25.85) per sq. inch and less number of leaves were showing rust pustules (5.4). This indicates that the leaf whorl inoculation method is better for screening than the clip inoculation method. A third method i.e. spray inoculation with urediniospores suspension (10^4-10^5 spores/ml) was experimented which recorded the higher number of rust pustules (33.42) per sq. inch than these methods.

ANAKAPALLE

Trial not conducted

PP 31: Screening, epidemiology and management of pokkah boeng in sugarcane

Objectives: To study the development of pokkah boeng disease in relation to weather parameters and its management in sugarcane crop

Location: Uchani, Shahjahanpur, Seorahi, Kolhapur, Akola, Anakapalle

Year of Start: 2011-2012

Observations to be recorded: Screening the desirable varieties for the incidence of pokkah boeng, correlation of climatic factors in relation to disease development and management of pokkah boeng under field conditions if the disease reaches acute phases.

(i) Screening:

Symptoms to be observed:

Mild -Green plants with pokkah boeng (curling/twisting of spindle leaves, twisting of leaves, whitish/chlorotic streaks on the leaves) at varying intensities.

Moderate -Yellowing of 3rd/4th leaf followed by complete yellowing of foliage and expression of top rot symptom

Severe -Yellowing of leaves + Discoloration (Light colored) of silk +wilting symptom in opened stalks

Observe for the presence of above symptoms and grade it as given below

Varieties	%infected Plants				Disease reaction
	Mild	Moderate	Severe	Total incidence	
VI					
V2					
V3					

* No restriction on number of varieties to be studied

Disease Reaction:

0-5% - Resistant; >5-10% - Moderately Susceptible; 10-20% - Susceptible;

20% - Highly Susceptible

(ii) Epidemiology - Record temperature, relative humidity and rainfall from May to September and establish correlation with disease incidence

(iii) Management – (To be taken up during second year of the Project)

Varieties: Two susceptible varieties

Treatments:

T-1 Sett treatment – Overnight soaking with Carbendazim – 0.1% a.i.

T-2 Foliar spray – Carbendazim – 0.05% a.i. (3 sprays at 15 days interval from May 15th)

T-3 – Sett treatment (T1) +Foliar spray with carbendazim (T2)

T-4 Control

Replications : **4**

Observations : Record disease incidence of pokkah boeng displaying symptoms of top rot or wilt or both and present the date in a tabular form.

Nine centres screened the entries for pokkahboeng disease resistance and identified many no. of R/MR genotypes. Studies were also undertaken to assess the epidemiology of pokkahboeng disease and its management. The results showed that the disease incidence was positively correlated with the number of rainy days, low temperature and high RH. Five centres undertook pokkahboeng management experiment and the results of four centresshowed that fungicide (Carbendazim) sett treatment along with foliar spray at 15 days interval was found most effective method to controlpokkahboeng disease.Whereas Pune centre reported that mancozeb @ 0.3 % was found more effective than the carbendazim and the disease control was up to 74.81 %.

RESULTS

I. SCREENING FOR POKKAH BOENG RESISTANCE

NORTH WEST ZONE

KAPURTHALA

Forty-two entries along with two check varieties viz., Co 0238 and CoJ 85 were screened for pokkah boeng under natural conditions. Out of 42 entries, nine genotypes showed MS reaction, six were S and remaining entries were found to be R. Check varieties Co 0238 and CoJ 85 behaved as HS and MS to the disease respectively.

UCHANI

Sixty nine varieties of sugarcane were screened against pokkah boeng under natural conditions. Twenty nine varieties were found resistant to pokkah boeng. Thirty one varieties showed MS reaction to pokkah boeng. Eight varieties (CoH 110, CoH 133, CoH 152, CoJ 85, CoLk 13204, CoPb 11214, CoPant 13222 and CoS 8436exhibited S reaction. Co 0238 variety showed HS reaction against pokkah boeng.

SHAHJAHANPUR

A total of 13 varieties were planted for pokkah boeng screening and its incidence was correlated with climatic conditions. Variety Co 0238 was used as susceptible check for PB. Of 13, ten varieties displayed the behavior of resistant. Rest three varieties were rated as MS.

KOLHAPUR

While screening for pokkah boeng in IVT (E) trial, 8 sugarcane genotypes were screened. Of them, 4 genotypes *viz.*, Co 13003, Co 13004, CoSnk 13101 and CoSnk 13102 were found R whereas Co 13002, CoN 13071, CoN 13072 and MS 13081 were found MS. In AVT Early (I Plant) trial, all the five sugarcane genotypes *viz.*,Co 11001, Co 11004, CoM 11081, CoM 11082 and CoM 11084 were found R.Out of 8 genotypes under AVT Early (II plant), only 3 genotypes *viz.*, Co 10004, Co 10024 and Co 10027 showed Rand Co 10005, Co 10026, CoT 10366 and CoT 10367 showed MS reaction while, remaining genotypes showed S. Under IVT ML, out of 20 genotypes, 10 genotypes *viz.*, Co 13005, Co 13006, Co 13011, Co 13013, Co 13018, CoM 13082, CoSnk 13103, CoSnk 13105, PI 13131 and PI 13132 found R to pokkah boeng and only Co 13014 showed S reaction. The remaining 9 genotypes showed MR reaction.

In AVT ML (I plant) trial, all the six sugarcane genotypes *viz.*,Co 11005, Co 11007, Co 11012, Co 11019, CoM 11085 and CoM 11086 were found R to pokkah boeng. Out of 11 genotypes under AVT ML (II plant), 8 genotypes *viz.*, Co 09009, Co 10015, Co 10031, Co 10033, CoM 10083, CoT 10368, CoT 10369, CoVC 10061 shown resistant reaction to pokkah boeng disease under natural condition. Remaining 3 genotypes exhibitedMS reaction.Among the sugarcane check varieties, Co 85004, Co 86032 and Co 740 were found R to pokkah boeng, whereas, CoC 671, Co 7527 and Co 99004 were found MS.

NORTH CENTRAL ZONE

PUSA

Of 11 genotypes screened under natural condition, four genotypesshowed MR reaction whereas seven genotypes were susceptible to PB. The disease appeared in the 2nd week of June and gradually increased till 1st week of August. Initial symptoms showed whitish, curling, twisting and bending of the leaves from the top portion. Yellowing of foliage and reading of spindles with small holes were also noticed at later stage. High humidity and rainfall favours the disease development.

SEORAHI

A total of 30 genotypes/varieties were screened for PB under natural condition.Out of 30 genotypes, 18 were PB resistant and 5 were MS whereas remaining were S.

EAST COAST ZONE

ANAKAPALLE

Out of 32 varieties / genotypes screened against top rot under natural conditions only CoC 671 showed HS reaction while four entries (Co 13030, Co 419, Co 7219 and Co 997) exhibited S reaction to top rot and remaining entries were R.

PENINSULAR ZONE

PUNE

Out of the 14 genotypes, CoVSI03102 and Co 85004 were free from the disease, while remaining 12 genotypes *viz.*, Co 419, Co 86032, Co 94012,CoC 671, CoVSI9805, VSI434, CoVSI0405, CoVSI0309, CoM0265, CoVSI2000-01, MS 10001 and VSI08005 were found susceptible.

AKOLA

The incidence of pokkah boeng was in range of 1.40 to 9.48 %. CoM11082 showed highest (9.48%) PB incidence in AVT (E I) Plant trial. In AVT (EII) Plant trial, the incidence was ranging from 0.60 to 6.19 %. Co 10006 showed highest (6.19 %) disease incidence. In IVT ML Plant, the incidence of PB was maximum in Co99004 (4.88 %). In AVT ML I Plant, Co11012 showed highest (4.67 %) disease incidence. In AVT ML II Plant, The incidence of PB was ranging from 0.00 to 3.72 % .CoT 10368 showed highest (3.72 %) disease incidence.

II. EPIDEMIOLOGY

In Kapurthala, the disease incidence appeared during 1st fortnight of June and gradually increased till August-September. Rainfall and high humidity play an important role in PB incidence.

In Shahjahanpur, the incidence of PB appeared after rain fall along with high humidity when low temperature prevails in nature. The symptoms of PB were severely affected at 32.8^{0}C (Maximum), 26.0^{0}C (Minimum), relative humidity up to 86.0 %and 462 mm rainfall in the month of July, 2016 followed by August month.

In Uchani centre, PB incidence was noticed in first week of June 2016. PB incidence started increasing during rainfall with high humidity conditions.

In Pusa, the minimum and maximum temperature of 23.0 to 35.2^{0}C, 53.1 to 93.0% relative humidity and 34.6 to 319.2 mm rainfall were observed during May to October, 2016.

In Seorahi, the severity of PB was correlated with weather parameters under natural conditions. The temperature (25-31^o C), relative humidity (67- 91.33%)) and rainfall (255 - 390 mm) were recorded during the year. The disease was maximum in first week of July and gradually increased till the last week of August. After rainfall the reduction in disease was seen from the second week of July. Initial symptoms showed curling and twisting of spindle leaves and chlorotic leaves. No symptoms of top rot and wilt have been observed in the planted fields.

In Anakapalle, the disease incidence was initiated during the first fortnight of June and gradually increased till November and then the disease was slowed down. Highest disease was observed during the month of October. The disease incidence was positively correlated with the number of rainy days, low temperature and high RH.

III. POKKAH BOENG MANAGEMENT

KAPURTHALA

The efficacy of Carbendazim fungicide for the management of pokkah boeng was tested on Co 0238 and CoJ 85 under field conditions. The results revealed that fungicide treatment viz., carbendazim significantly controlled the disease as compared to control. Sett treatment and foliar spray at 15 days interval from May 15th (T_3) was found most effective to control the PB and highest germination and low disease incidence (12.75 % in Co 0238 and 10 % in CoJ 85) was recorded as compared to other treatments.

PUSA

Sett treatment with Carbendazim 0.1% and three foliar spraying with Carbendazim @ 0.05% at 15 days interval showed the maximum (46.8) percent germination and also low disease incidence (5.3) of Pokkah boeng.

ANAKAPALLE

For management of top rot, the sett treatment combined with foliar spraying of Carbendazim @0.05% showed the highest percent germination and also low disease incidence of toprot (83.4 and 4.1 respectively) compared to the other treatments.

SANKESHWAR

The experiments on management revealed that sett treatment (Overnight soaking with carbendazim- 0.1%) + foliar spray carbendazim @ 0.05% showed the highest %germination (88.32) and also low disease incidence (6.38),respectively) compared to other treatments.

PUNE

For management of PB, the fungicides *viz.*, carbendazim and mancozeb were tested along with control in 5 treatments. Both the fungicides were found effective to control PB effectively when they were sprayed thrice at an interval of 15 days after 15th May. However, mancozeb @ 0.3 % was

found more effective than the carbendazim and the disease control was up to 74.81 %.

PP 32: Management of brown spot disease of sugarcane

Objective : To find out effective method of brown spot management through chemicals.

Locations : Pune, Padegaon, Kolhapur and Sankeshwar

Year of Start : 2015-16

Treatment :

I. Variety : Brown spot susceptible variety CoM 0265 (or local susceptible variety)

II. Fungicides

T.1	- Propiconazole	-	0.1 %
T.2	- Hexaconazole	-	0.1 %
T.3	- Triadimefon	-	0.1 %
T.4	- Mancozeb	-	0.3 %
T.5	- Carbendazim	-	0.1 %
T.6	- Control (Untreated)	-	-

III. Time of application of fungicides: To be applied just after appearance of brown spot lesions followed by two sprays at 15 days interval.

Plot size : 6 x 7 sq. m

Design : RBD

Replications : Three

Observations :

1. Germination %
2. Disease incidence% (No. of clumps showing disease / total no. of clumps x 100)
3. Disease severity (% leaf area covered with brown spot lesions based on observations of 10 leaves per clump; total no. of clumps to be observed at least 10)
4. Cane yield per plot and per hectare
5. Brix, Pol %, Purity and CCS %
6. Cost-benefit ratio

Only one centre, i.e., Padegaon reported the results of the trials on management of brown spot disease of sugarcane. It was reported that treatment with Propiconazole 0.1% recorded the lowest brown spot incidence followed by Mancozeb 0.3%.

RESULTS

PADEGAON

The results on intensity of brown spot disease, growth and quality parameters as influenced by different treatments were recorded.The results on germination percentage at 45 DAP were not significant. The germination in different treatments ranged from 57.3 to 66.0%. All the fungicides had a significant influence on the brown spot intensity, cane yield and CCS yield. Among the treatments, Propiconazole 0.1% recorded the lowest disease intensity of 10.0% followed by Mancozeb 0.3 % which recorded the disease intensity of 13.0% and the %disease control of 79.8.

KOLHAPUR

Due to flood condition during rainy season the trail was not completed.

SANKESHWAR

Due to least incidence of brown spot in experimental plot, the trail was not completed.

PUNE

The incidence of the disease was not observed throughout crop period and hence the treatments were not imposed so far.

SALIENT ACHIEVEMENTS

In Plant Pathology program about 21centres participated in 11 different projects,the summary of achievements of these projects is given below.

PP 14: Identification of pathotypes in red rot pathogen

In this program, 12 centres gathered information on new isolates showing pathogenic variability from the designated pathotypes. A total of 95 new isolates along with respective designated pathotypes of their zone were tested on host differentials. Among the 12 centres 10centres used 19 differentials (including new differentials), while Lucknow used 14 differentials, Pusa used 16 differentials to assess pathogen variation. More number of variants have been isolated from the popular varieties such as Co 89003, CoJ 64, CoS 8436, CoSe 92423, CoSe 95422 and Co0238. The centre Shahjahanpur reported possible emergence of 2 new pathotypes i.e. R 1102 and R 1304 in Uttar Pradesh. Kapurthala centre reported that new isolates RI 303 and RI 305 are as virulent as designated pathotype CF08. The centreUchani reported that the isolates RR XXI, RR XXII and RR XXVI arenot only more virulent as CF08 but also showed similarity with CF08. Karnal centre reported that a new isolate Cf89003 exhibited more virulence with I to S

reactions on 14 differentials, suggesting the possible emergence of new pathotype in the subtropics In Peninsular zone, the study at Coimbatore clearly indicated occurrence of new pathotype CF12 and the same has been confirmed by the host differential experiments conducted at Thiruvalla.

PP17: Evaluation of zonal varieties for red rot, smut and wilt

In evaluation of ZVT entries a total of 15 centres have carried out red rot testing, 16 for smut and 6 have screened the clones for wilt resistance and identified many numbers of entries as R/MR to red rot, smut and wilt from all the four zones and they also recorded YLD resistance among the entries.

PP 22: Survey of sugarcane diseases naturally occurring in the area on important varieties

In survey of sugarcane diseases, 22centres gathered information on diseases naturally occurring in their area. In north west zone, in Uttar Pradesh, 3-8% incidence of red rot was recorded in Co 0238, CoS 8436, CoS 92423, CoLk 08102, CoS 91269 and CoSe 95422, while 25% incidence was recorded in CoLk 8102, CoSe 95422 and CoS 8436. In the zone comprising Haryana, Uttar Pradesh, Bihar, Uttrakhand, severe red rot incidence (>40%) was recorded in Co 89003 and up to 20% in CoPant 84212 andin the same area all the fields under variety CoH 150 was observed with smut. The Uchani centre reported occurrence of red rot in CoS 8436, CoJ 85 and Co 89003 and wilt in varieties namely Co 89003, Co 05011, CoS 8436, CoH 119, Co 767 and Co 1148 ranging from 5 to 25 per cent. This centre also reported GSD to the tune of 15% and pokkah boeng up to 35% on Co 89003, CoJ 85, Co 0238, CoS 8436, CoH 119, CoH 160, CoH 152 and Co 05011. Pantnagar reported occurrence of ring spots and eye spots in severe form on CoPant 99214, CoS 88230, Co 0118, CoS 767, CoS 96268, CoPant 92423. Shahjahanpur reported occurrence of red rot on variety Co 0238 with incidence of 5-15%, 1-2%, 2-10%, 40% from Nigohi, Rosa, Hargaon and Gola, respectively. The centre also reported incidence of smut up to 3% on varieties Co 0238, Co 1158, CoS 98231, CoS 767, CoSe 92423 and CoLk 94184 with high incidence on CoJ 88.In Punjab red rot was observed up to 6.0 % on Co 89003, CoJ 64 and CoJ 85 and CoPb 91 and CoS 8436 and6-7% on Co 89003 and CoS 8436.

In North central zone the Pusa centre observed wilt in varieties CoLk 94184, CoSe 98231, Co 0118 and Co 0233 and smut in BO 141 and BO 136. The Seorahi centre reported red rot with 15 and 20% on cultivars CoSe 92423 and UP 9530 and wilt on varieties CoS 08279 (2%), Co 0238 (10%) and Co 98014 (15-20%). The centre also reported YLD on Co 05011 and UP 05125 up to 15% and 10% mosaic in CoPant 97222.

In Bihar red rot was recorded in varieties CoSe 95422, Co 0238 and BO 130 to the tune of 3-7 %, and pokkah boeng was observed in Co 0238 (5-20%). The centre Buralikson recorded red rot, wilt and YLD in Co 740, Co 997, CoBln 09104.

In East coast zone occurrence of 10-40 % red rot was observed on Co 62175, 81 A 99, 93 V 297, S-12 and 81 V 48 by Anakapalle centre. The centre also reported occurrence of smut from 10-45%, wilt 10-30% and 10-70% of YLD. The Cuddalore centre reported 2 to 54 % incidence of red rot on CoC 24, CoC 23 and Co 91017, smut in variety CoC 22 and CoSi 6 with 8 % severity andwilt in Co 86032 (2 to 12 %) and YLD on Co 86032 (5 to 15 %) and CoV 09356 (5 to 10 %). The centre Nayagarh also recorded red rot incidence of 5-30% in the varieties *viz.* Co 86032, Co 6907, CoOr 03151 andCo 86249.

In Peninsular zone Coimbatore centre reported occurrence of red rot in Co 86027 and TNAU Si8 and sudden out break of smut in Co 86032. The centre also found severe brown rust occurence in Co 0323 in Karnataka. Degeneration in the cultivars Co 86032, CoA 92081 and CoV 94101 was also found due to YLD and mosaic. In Western Maharashtra smut incidence was reported up to 8% on Co 7219 by Padegaon centre. The centre also recorded incidence of rust up to 25-30% on CoM 0265, Co 92005 and Co 86032 and 5-10% rust incidence on CoM 0265. Brown spot was also recorded as major problem (5-20%) in this region. The centre Thiruvalla recorded ring spot as the most common and predominant foliar disease from two months age up to harvest. In Gujarat wilt, red rot and smut was recorded to the tune of 2.02, 1.63 and 4.92% respectively. In this region red rot was recorded on CoC 671, Co 86032, Co 86002, Co 0323, CoVSI 03102, CoVSI 0434 and Co 97009 and the maximum incidence of smut was recorded on CoSi 95071, Co 86002 and Co 97009. Powerkheda centre recorded red rot on CoLk 8001/unknown variety at Narsingpur with incidence up to 20% and smut was found to be major diseases and observed from all the locations surveyed by this centre. Pune centre recorded GSD incidence in Maharashtra up to 15% on CoC 671, Co 86032, CoM 0265, Co 419, CoVSI 9805 and Co 92005 and rust disease up to 15%. Sankeshwar centre recorded smut, rust, brown spot and grassy shoot as major diseases in their region. Maximum incidence of smut was observed on Co 86032 and Co 8011, CoC 671 and Co 91010, i.e.,11.4% and 10-17% of rust incidence was observed and YLD was observed in some varieties in severe form. The Kohlapur centre reported rust in the range of 5-25%, 2-10% ring spot, and pokkah boeng on all sugarcane varieties in the range of 2-5%. Akola centre reported pokkah boeng (5%) and YLD (2%) as major diseases in their region.

PP 23: Assessment of elite and ISH genotypes for resistance to red rot

Seven centres gathered information on *Saccharum* sp. and elite genotypes that are resistant to red rot. Among 32 genotypes screened at Kapurthala centren one of the entries behaved as resistant, 14 genotypes were found MR against CF08 and 18 against CF09.At Karnal, among 23 genotypes screened five were R/MR to CF08 isolate and eight were R/MR to CF09. Nine clones were evaluated at Uchani and among them 3 were found R/MR. In Cuddalore centre among 27 ISH clones two showed resistant reaction to CF04 and CF06. At Navsari out of 26 ISH genotypes evaluated only one genotype SES 594 gave resistant reaction. At Coimbatore 27 ISH clones were evaluated and among them 14 were identified as resistant to CF06 and eight for CF12 in plug method and in nodal method 18 and 19 were resistant to the two pathotypes, respectively.

PP 28: B. Methodology for screening sugarcane genotypes for resistance to brown rust

Four centres reported the results of standardizing methodology for inoculation of uredinospores of brown rust and the results from all centres revealed that leaf whorl inoculation is ideal for disease development. One centre Kohlapur reported the results of screening for rust resistance.

PP 31: Screening, epidemiology and management of pokkah boeng in sugarcane

Nine centres screened the entries for pokkah boeng disease resistance and identified many no. of R/MR genotypes. Studies were also undertaken to assess the epidemiology of pokkah boeng disease and its management. The results showed that the disease incidence was positively correlated with the number of rainy days, low temperature and high RH. Five centres undertook pokkah boeng management experiment and the results of four centres showed that fungicide (Carbendazim) sett treatment along with foliar spray at 15 days interval was found most effective method to control pokkah boeng disease.Whereas Pune centre reported that mancozeb @ 0.3 % was found more effective than the carbendazim and the disease control was up to 74.81 %.

PP 32: Management of brown spot disease of sugarcane

Only one centre, i.e., Padegaon reported the results of the trials on management of brown spot disease of sugarcane. It was reported that treatment with Propiconazole 0.1% recorded the lowest brown spot incidence followed by Mancozeb 0.3%.

Summary

Eleven projects were under taken in the discipline of Plant Pathology in four agro-climatic zones at 21 centres.

Several variants of red rot pathogen have been isolated from the popular varieties viz., Co 89003, CoJ 64, CoS 8436, CoSe 92423, CoSe 95422 and Co0238. The possible emergence of 2 new pathotypes viz., R 1102 and R 1304 have been reported from Shahjahanpur centre.

The new isolates RI 303 and RI 305 virulent as pathotype CF08 have been reported from Kapurthala centre. Karnal centre reported a new isolate Cf 89003 which exhibited more virulence with I to S reactions on 14 differentials, suggesting the possible emergence of new pathotype in the subtropics.

15 centres have under taken red rot testing, 16 for smut and 6 have screened the clones for wilt resistance and identified numbers of entries as R/MR to red rot, smut and wilt from all the four zones.

During standardization of methodology for inoculation of uredinospores of brown rust leaf whorl inoculation is ideal for brown rust disease development that may be used for screening of sugarcane genotypes resistant to brown rust. Management of brown spot disease of sugarcane by making use of Propiconazole 0.1% reported by Padegaon centre.

Out of five centres undertook pokkah boeng disease management experiments, four centres reported that fungicide (Carbendazim) sett treatment along with foliar spray at 15 days interval was found most effective.

Occurrence of YLD, wilt, rust, *pokkah boeng* and brown spot to varying proportions were recorded in different states. YLD occurrence is reported from all the states especially occured in epidemic proportion in all the states of tropical region. Occurrence of GSD has been reported in most of the regions, however its severity was found to be more in Uttar Pradesh.

North West Zone

Table 1. Evaluation of sugarcane genotypes for red rot, smut, wilt and YLD

S. No.	Genotype	Red rot												Smut			Wilt		YLD	
		Lucknow				Shahjahanpur				Kapurthala				Lucknow	Shahjahanpur	Kapurthala	Lucknow	Kapurthala	Lucknow	Shahjahanpur
		Plug Method		Nodal Method		Plug Method		Nodal Cotton Swab		Plug Method		Cotton swab								
		CF 08	CF 09	CF 08	CF 09	CF 08	CF 09	CF 08	CF 09	CF 08	CF 09	CF 08	CF 09							
Initial Varietal Trail (Early)																				
1	Co 13033	-	-	-	-	MR	MR	R	R	MR	MR	R	R	-	MS	MR	-	MS	-	MS
2	Co 13034	MR	MS	MR	MR	MR	MR	R	R	MS	MR	R	R	S	MR	MS	-	MR	-	MS
3	CoLk 13201	MR	MR	MR	MR	S	MS	S	R	S	MS	R	R	-	MR	R	-	MR	-	MR
4	CoLk 13202	MR	MR	MR	MR	MR	MR	R	R	MR	MR	R	R	-	MR	MS	-	R	S	MR
5	CoLk 13203	MR	MR	MR	MR	MS	S	R	S	MS	S	R	R	S	R	MR	-	MR	-	MS
6	CoPant 13221	MR	MR	MR	MR	MR	MR	R	R	MR	MR	R	R	-	MS	R	-	R	-	MR
7	CoPant 13222	HS	HS	S	S	S	S	S	S	MS	S	S	R	-	MS	HS	S	R	-	R
8	CoPb 13181	MR	MR	MR	MR	MS	MS	R	R	MS	MS	R	R	-	R	MR	-	R	S	MR
9	CoS 13231	R	S	R	MS	MR	MR	R	R	MR	MR	R	R	S	R	R	S	R	-	R
10	Co 0238	-	-	-	-	MS	MS	R	R	MR	MR	R	R	-	R	S	-	-	-	-
11	CoJ 64	-	-	-	-	S	S	S	S	HS	HS	S	S	-	MR	S	-	-	-	R
12	Co 453 (S)	-	-	-	-	S	S	S	S	-	-	-	-	-	-	-	-	-	-	-
13	Co 1158 (S)	-	-	-	-	-	-	-	-	-	-	-	-	-	HS	-	-	-	-	-
Advanced Varietal Trail (Early) – I Plant																				
1.	Co 12026	HS	HS	S	S	MS	S	R	R	MR	MR	R	R	S	MS	MR	-	R	-	R
2.	Co 12027	MR	MR	MR	MR	MR	MR	R	R	MR	MR	R	R	-	MR	MS	-	R	S	R
3.	CoLk 12203	MR	MR	MR	MR	MR	MR	R	R	MS	MS	R	R	S	R	MS	-	MS	-	R
4.	CoPant 12221	MS	MS	MR	MR	MS	MS	R	R	MR	MR	R	R	S	MR	MS	-	R	-	R
5.	CoJ 64	-	-	-	-	HS	HS	S	R	HS	HS	S	S	-	MR	S	-	-	-	R
6.	Co 0238	-	-	-	-	MS	MS	R	R	MR	MR	R	R	-	MS	S	-	-	-	R
Advanced Varietal Trail (Early) – II Plant																				
1.	CoH 11262	HS	HS	S	S	HS	HS	S	S	S	HS	S	S	-	MS	MR	S	MS	-	MS
2.	CoLk 11201	MR	MR	MR	MR	MR	MR	R	R	MS	MR	R	R	-	MR	MS	-	MR	-	R
3.	CoLk 11202	MR	MR	MR	MR	MR	MR	R	R	MR	MR	R	R	S	MR	MS	-	R	-	R
4.	CoLk 11203	MR	MR	MR	MR	MS	MS	R	R	MR	MS	R	R	-	MS	S	-	MR	-	MR
5.	Co 0238	-	-	-	-	MS	S	R	R	MR	MR	S	S	-	R	S	-	-	-	MR
6.	CoJ 64	-	-	-	-	HS	HS	S	S	HS	HS	R	R	-	R	S	-	-	-	R
Initial Varietal Trial (Midlate)																				
1.	Co 13035	MR	MR	MR	MR	MR	MR	R	R	S	MS	S	R	S	R	MS	-	R	-	R
2.	Co 13036	MR	MS	MR	MR	MR	MR	R	R	MR	MR	R	R	-	R	MS	S	MR	-	MR
3.	CoH 13261	R	MR	R	MR	MS	MS	R	R	MS	MR	R	R	-	R	MR	-	R	-	MS
4.	CoH 13262	MR	MR	MR	MR	MR	MR	R	R	MR	MR	R	R	-	R	R	-	R	-	MR
5.	CoH 13263	MR	MR	MR	MR	MR	MS	R	R	MS	S	R	R	-	MR	MS	-	MS	S	R
6.	CoLk 13204	MR	MR	MR	MR	MR	MR	R	R	MS	MS	R	R	-	MR	S	-	R	-	R
7.	CoLk 13205	MR	MR	MR	MR	HS	S	S	S	HS	S	R	S	-	MS	MS	-	R	-	R
8.	CoPant 13223	MS	MS	MR	MR	MR	MR	R	R	MR	MR	R	R	-	R	R	-	R	-	R
9.	CoPant 13224	MR	MR	MR	MR	MR	MR	R	R	MR	MR	R	R	-	R	MR	-	MR	-	R
10.	CoPb 13182	R	R	R	R	MR	MR	R	R	MR	MR	R	R	S	R	MS	-	R	S	MR
11.	CoPb 13183	HS	HS	S	S	S	S	S	S	HS	HS	S	S	S	MR	MR	-	R	-	MR
12.	CoS 13232	MR	MR	MR	MR	MR	MR	R	R	MS	MS	R	R	S	MR	MR	-	R	-	MR
13.	CoS 13233	HS	HS	S	S	MS	MS	R	R	MS	MS	S	R	-	R	MS	-	R	-	MR
14	CoPant 97222					HS	MS	S	R	MS	MS	S	S		R	S		-		R
15	CoS 767					MR	MS	R	R	S	HS	R	R		MS	MS		-		R

16	CoS 8436					MS	MS	R	R	MR	MR	S	S		R	MS		-		R
17	Co 453 (S)					S	S	S	S			S	R		-	MS		R		-
18	Co 1158 (S)					-	-	-	-			R	R		HS	MS		MR		-
Advanced Varietal Trail (Midlate) – I Plant																				
1.	Co 12029	MR	MR	MR	MR	MR	MR	R	R	MR	MR	R	R	S	R	MS	-	R	-	R
2.	CoH 12263	MS	MS	MR	MR	MR	MS	R	R	MR	MR	R	R	S	R	MR	-	R	S	R
3.	CoLk 12205	MR	MR	MR	MR	MS	MR	R	R	MS	MS	R	R	S	MS	S	-	R	-	R
4.	CoPant 12226	MS	MS	MR	MR	MR	MR	R	R	MR	MR	R	R	-	MR	MR	S	MR	-	R
5.	CoPb 12211	MS	S	MR	MS	S	MS	R	R	MR	MR	R	R	S	MS	MR	-	R	-	R
6	CoS 12232	MR	MR	MR	MR	MR	MR	R	R	MS	MS	R	R	-	R	MS	-	MR	S	R
7	CoS 767					MS	HS	R	S	S	HS	S	S		R	S		-		R
8	CoS 8436					MS	MS	R	R	MR	MR	R	R		MR	MS		-		R
9	CoPant 97222					S	S	S	S	MS	MS	S	S		R	MS		-		R
Advanced Varietal Trail (Midlate) – II Plant																				
1.	Co 11027	MR	MS	MR	MR	MR	MR	R	R	MR	MR	R	R	S	MS	MS	-	R	-	MR
2.	CoH 11263	R	R	R	R	MR	MR	R	R	MR	MR	R	R	S	MR	MR	-	MR	-	R
3.	CoLk 11204	MR	MS	MR	MR	MR	MS	R	R	MR	MR	R	R	S	MR	MS	-	R	-	R
4.	CoLk 11206	MR	MR	MR	MR	MR	MR	R	R	MR	MR	R	R	-	MR	MS	-	R	-	MS
5.	CoPb 11214	MR	MS	MR	MS	MR	MR	R	R	MR	MR	R	R	-	MR	MR	-	R	S	MR
6.	CoS 11232	MR	MR	MR	MR	MR	MR	R	R	MR	MR	R	R	-	R	MS	-	MR	-	R
7	CoS 767					MS	HS	R	S	S	HS	S	S		R	S		-		R
8	CoS 8436					MS	MR	R	R	MR	MR	R	R		R	MS		-		MR
9	CoPant 97222					S	S	S	S	MS	MS	S	S		R	MS		-		R

S. No.	Genotype	Red rot												Smut	YLD		
		Uchani				(SBI) Karnal				Pantnagar				Pantnagar	Uchani	(SBI) Karnal	Pantnagar
		Plug Method		Nodal Method		Plug Method		Cotton Swab		Plug Method		Nodal Cotton swab					
		CF 08	CF 09	CF 08	CF 09	CF 08	CF 09	CF 08	CF 09	CF 08	CF 09	CF 08	CF 09				
Initial Varietal Trail (Early)																	
1.	Co 13033	MR	MR	R	R	MR	MR	R	R	R	R	R	R	S	MS	R	R
2.	Co 13034	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	MS	MS	R	MS
3	CoLk 13201	MS	MS	R	R	S	MS	R	R	R	R	R	R	S	MR	MR	R
4	CoLk 13202	MR	MR	R	R	MR	MR	R	R	S	S	R	R	MS	MR	R	R
5	CoLk 13203	MS	S	R	R	MS	S	R	R	R	R	R	R	R	MR	R	MR
6	CoPant 13221	MR	MR	R	R	MR	MR	R	R	MS	MS	R	R	MS	MR	R	MR
7	CoPant 13222	S	MS	S	S	S	HS	S	S	MR	MR	R	R	S	MS	MR	R
8	CoPb13181	MS	MS	R	R	MS	MS	R	R	MS	MS	R	R	R	MS	R	MS
9	CoS13231	MR	MR	R	R	MR	MR	R	R	R	R	R	R	S	MS	R	R
10	CoJ 64	HS	S	S	S										MS		
11	Co 0238	MR	MR	R	R										S		
Advanced Varietal Trail (Early) – I Plant																	
1.	Co 12026	MR	MR	R	R	MR	MR	R	R	R	R	R	R	R	R	R	MS
2.	Co 12027	MS	MS	R	R	MR	R	R	R	S	S	S	S	R	MS	R	MS
3.	CoLk 12203	MR	MR	R	R	MR	R	R	R	R	R	R	R	R	MS	MR	MR
4.	CoPant 12221	MR	MR	R	R	MS	MR	R	R	MS	MS	R	R	R	MS	R	R
5.	CoJ 64	HS	S	S	S										MS		
6.	Co 0238	MR	MR	R	R										MS		
Advanced Varietal Trail (Early) – II Plant																	
1.	CoH 11262	MR	MR	R	R	HS	HS	S	S	MR	MR	R	R	R	MS	MR	S
2.	Co LK 11201	MS	MR	R	R	MS	MR	R	R	R	R	R	R	R	MS	R	R
3.	Co LK 11202	MR	MR	R	R	MR	MR	R	R	R	R	R	R	MR	MR	MR	R
4.	Co LK 11203	MS	MR	R	R	MS	MS	R	R	R	R	R	R	S	S	MR	R
5.	CoJ 64	HS	S	S	S										MS		
6.	Co 0238	MR	MR	R	R										S		

4.	CoH 13262	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	R	MR	R	MS
5.	CoH 13263	MR	R	R	R	MR	MS	R	R	MR	MR	R	R	MS	MR	MS	MR
6.	CoLk 13204	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	MR	MS	R	R
7.	CoLk 13205	S	MS	R	R	HS	MS	R	R	MR	MR	R	R	R	MS	R	R
8.	CoPant 13223	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	R	MS	R	R
9.	CoPant 13224	MR	R	R	R	MR	MR	R	R	MR	MR	R	R	R	MS	R	R
10.	CoPb 13182	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	MS	MS	R	MR
11.	CoPb 13183	S	MS	S	S	S	HS	S	S	MR	MR	R	R	R	MS	R	R
12.	CoS 13232	MS	MS	R	R	MS	MS	R	R	MS	MS	S	S	MS	MR	R	R
13.	CoS 13233	MS	MS	R	R	MS	MS	R	R	MR	MR	R	R	MS	R	R	MS
14.	CoS 767	MS	S	R	R										S		
15.	CoS 8436	MR	MR	R	R										MS		
16.	CoPant 97222	S	MS	S	S										S		
Advanced Varietal Trail (Midlate) – I Plant																	
1.	Co 12029	MR	MR	R	R	R	MR	R	R	MR	MR	R	R	MS	MS	MR	R
2.	CoH 12263	MR	R	R	R	MR	MS	R	R	MR	MR	R	R	R	MR	R	R
3.	CoLk 12205	MS	MR	R	R	MS	MS	R	R	MR	MR	R	R	MR	MR	R	R
4.	CoPant 12226	MS	MR	R	R	MR	MR	R	R	R	R	R	R	R	S	R	MR
5.	CoPb 12211	MS	MR	R	R	S	S	R	R	R	R	R	R	R	MS	R	R
6.	CoS 12232	MS	MS	R	R	MR	R	R	R	MR	MR	R	R	R	S	MR	R
7.	Co S 767	MS	S	R	R										HS		
8.	CoS 8436	MR	MR	R	R										MS		
9.	CoPant 97222	S	MS	S	S										HS		
Advanced Varietal Trail (Midlate) – II Plant																	
1.	Co 11027	MR	MR	R	R	R	MR	R	R	R	R	R	R	R	S	MR	R
2.	CoH 11263	R	R	R	R	R	R	R	R	MR	MR	R	R	R	MR	MR	R
3.	CoLk 11204	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	R	MS	R	R
4.	CoLk 11206	MR	MS	R	R	MR	MS	R	R	MR	MR	R	R	R	HS	MS	R
5.	CoPb 11214	MR	MR	R	R	MR	MR	R	R	R	R	R	R	R	MR	MR	MR
6.	CoS 11232	MR	MR	R	R	R	MR	R	R	R	R	R	R	R	MS	R	R
7.	CoS 767	MS	S	S	S										HS		
8.	CoS 8436	MR	MR	R	R										MS		
9.	CoPant 97222	S	MS	S	S										HS		

North Central Zone

Table 2. Evaluation of sugarcane genotypes for red rot, smut and wilt -Pusa

Sl. No	Varieties	Plug				Cotton Swab		Smut	Wilt
		CF07	Score	CF08	Score	CF07	CF08		
1	CoLk 09204	3.0	MR	3.2	MR	R	R	R	MR
2	CoP 11437	2.2	MR	2.4	MR	R	R	MR	MR
3	CoP 11438	2.4	MR	2.2	MR	R	R	R	MR
4	CoP 11451	3.2	MR	3.8	MR	R	R	R	MR
5	CoP 13436	1.2	R	1.4	MR	R	R	MR	R
6	CoP 13437	2.6	MR	2.4	MR	R	R	MR	R
7	CoP 13438	2.8	MR	3.2	MR	R	R	MR	R
8	CoP 13439	3.0	MR	1.2	R	R	R	R	MR
9	CoSe 13451	2.6	MR	2.2	MR	R	R	MR	R
10	CoSe 13452	2.4	MR	2.6	MR	R	R	MR	R
11	CoSe 13453	2.8	MR	2.2	MR	R	R	MR	R
12	CoSe 13454	3.2	MR	2.8	MR	R	R	MR	R
13	BO 155	2.2	MR	2.4	MR	R	R	R	R
14	BO 130	2.8	MR	2.2	MR	R	R	MR	R
15	BO 91	2.2	MR	2.2	R	R	R	R	MR
16	CoP 9301	2.6	MR	2.2	R	R	R	R	MR
17	CoSe 92423	6.4	S	6.2	S	S	S	MR	MS
18	CoSe 95422	6.4	S	6.6	S	S	S	S	S
19	Co 1148	-	-	-	-	-	-	S	-

S. No.	Genotype	Red rot								Smut		YLD		Wilt
		Motipur				Seorahi				Motipur	Seorahi	Motipur	Seorahi	Motipur
		Plug Method		Nodal Method		Plug Method		Cotton Swab						
		CF 08	CF 09	CF 08	CF 09	CF 08	CF 09	CF 08	CF 09					
Initial Varietal Trail (Early)														
1.	CoP 13436	MR	MR	MR	MR	S	R	MS	R	S	HS	-	R	-
2.	CoP 13437	MS	MS	MR	MR	S	R	S	S	-	R	S	MR	-
3.	CoSe 13451	MR	MR	MR	MR	MS	R	MR	R	-	HS	-	R	-
4.	CoSe 13452	MR	MR	MR	MR	MR	R	MR	R	S	R	-	R	S
Advanced Varietal Trail (Early)- I Plant														
1.	CoLk 12207	MR	MR	MR	MR	MS	R	MS	R	S	MS	-	MS	-
2.	CoP 12436	MR	MR	MR	MR	MR	R	MR	R	-	R	-	R	-
3.	CoSe 12451	MR	MS	MR	MR	MR	R	MR	R	-	R	-	R	-
Advanced Varietal Trail (Early)- II Plant														
1.	CoP 11436	MR	MR	MR	MR	MS	R	MS	R	-	R	S	MS	-
2.	CoP 11437	MR	MR	MR	MR	MR	R	MR	R	-	R	S	R	-
3.	CoP 11438	MR	MR	MR	MR	MS	R	MR	R	-	R	-	R	-
4.	CoSe 11451	MR	MR	MR	MR	MR	R	MR	R	-	R	-	R	-
Initial Varietal Trail (Midlate)														
1.	CoP 13438	MR	MS	MR	MS	MS	R	MR	R	-	R	-	R	S
2.	CoP 13439	MR	MR	MR	MR	MR	R	MR	R	S	HS	S	MS	-
3.	CoSe 13453	MS	MR	MR	MR	MR	R	MR	R	-	R	-	R	S
4.	CoSe 13454	MR	MR	MR	MR	S	R	MS	R	S	HS	S	R	-
Advanced Varietal Trail (Midlate)- I Plant														
1.	CoLk 09204	MR	MR	MR	MR	MR	R	MR	R	-	R	S	R	-
2.	CoLk 12209	MR	MR	MR	MR	MS	R	MS	R	-	R	-	R	-
3.	CoP 12438	MS	MS	MR	MR	MR	R	MR	R	-	R	-	MR	S
4.	CoSe 12453	MR	MR	MR	MR	MR	R	MR	R	-	R	-	MS	-
Advanced Varietal Trail (Midlate)- II Plant														
1.	BO 155	MR	MR	MR	MR	MR	R	MS	R	-	R	-	R	-
2.	CoSe 11453	MR	MR	MR	MR	MR	R	MR	R	-	R	-	R	-
3.	CoSe 11454	MR	MR	MR	MR	MR	R	MR	R	-	R	-	R	-
4.	CoSe 11455	MS	MR	MR	MR	MR	R	MR	R	-	R	-	R	-

North Eastern Zone

Table 3. Evaluation of sugarcane genotypes for red rot resistance- Buralikson

Sl. No.	Entries	CF 07			CF 08		
		Plug method	Reaction	Nodal method	Plug method	Reaction	Nodal Method
IVT- Early							
1.	CoP 13436	2.72	MR	R	2.40	MR	R
2.	CoP 13437	3.00	MR	R	3.20	MR	R
IVT- Midlate							
3.	CoP 13438	2.20	MR	R	2.68	MR	R
AVT (Early)- I Plant							
4.	CoLk 12207	2.00	R	R	2.20	MR	R
5.	CoP 12436	2.83	MR	R	3.30	MR	R
6.	CoSe 12451	3.20	MR	R	3.66	MR	R
AVT (Early)- II Plant							
7.	CoP 11436	2.80	MR	R	2.20	MR	R
8.	CoP 11437	2.33	MR	R	2.05	MR	R
9.	CoP 11438	2.50	MR	R	2.45	MR	R
10.	CoSe 11451	2.50	MR	R	2.60	MR	R

AVT (Midlate)- I Plant							
11.	CoLk 09204	2.40	MR	R	2.90	MR	R
12.	CoLk 12209	1.40	R	R	2.73	MR	R
13.	CoP 12438	2.60	MR	R	2.80	MR	R
14.	CoSe 12453	2.50	MR	R	2.10	MR	R
AVT (Midlate)- II Plant							
15.	BO 155	3.00	MR	R	2.40	MR	R
16.	CoSe 11453	2.83	MR	R	2.20.	MR	R
17.	CoSe 11454	2.60	MR	R	3.45	MR	R
18.	CoSe 11455	2.80	MR	R	3.50	MR	R
Local check							
19.	Akipura	6.20	S	S	5.40	MS	S
Standard Check							
Midlate							
20.	BO91	3.00	MR	R	2.40	MR	R
21.	CoP 09301	2.40	MR	R	2.30	MR	R
22.	CoSe 92423	2.50	MR	R	2.50	MR	R
Early							
23.	BO 130	2.30	MR	R	2.30	MR	R
24.	CoSe 95422	2.10	MR	R	2.60	MR	R

East Coast Zone

Table 4: Evaluation of genotypes for red rot, smut, wilt & YLD resistance

S. No.	Clone	Red rot										Smut		YLD		Wilt
		Anakapalle						Cuddalore								
		Plug method			Cotton swab			Plug method		Nodal method						
		CF04	CF05	CF06	CF04	CF05	CF06	CF06	CF04	CF06	CF04	Anakapalle	Cuddaloe	Anakapalle	Cuddalore	Anakapalle
Initial Varietal Trail (Early)																
1	Co 07013	MS	MS	MS	R	R	R	MS	MS	R	R	MR	MR	MS	S	MR
2	Co 13023	MR	MR	MR	R	R	R	MR	MR	R	R	MR	MR	MR	S	MR
3	Co 13024	MR	MR	MR	R	R	R	MR	MR	R	R	MR	MR	MR	S	MR
4	CoA 12321 (2006 A 64)	R	MR	R	R	R	R					HS		MR	R	
5	CoA 12322 (2006A102)	MR	MR	MR	R	R	R					HS		MS	MR	
6	CoA 14321 (2009A107)	R	MR	R	R	R	R	MR	MR	R	R	MR	MR	MR	S	MR
7	CoA 14322 (2009A235)	S	S	S	S	S	S	S	S	S	S	S	HS	MR	S	MS
8	CoC 14336	MS	MS	MS	R	R	R	MR	MR	R	R	MR	MR	S	S	MR
9	CoV 14356	HS	HS	HS	S	S	S	S	S	S	S	MS	MR	S	S	MR
Initial Varietal Trail (Midlate)																
1	Co 13025	MR	MR	MR	R	R	R	MR	MR	R	R	MR	MR	MS	S	MR
2	Co 13027	MR	MR	MR	R	R	R	MR	MR	R	R	S	S	MS	S	MR
3	Co 13028	R	R	R	R	R	R	MR	MR	R	R	MR	MR	MS	S	MR
4	Co 13029	MR	MR	MR	R	R	R	MR	MR	R	R	MS	MR	MS	R	R
5	Co 13030	R	R	R	R	R	R	MR	MR	R	R	MR	MR	MS	S	MR
6	Co 13031	MR	MR	MR	R	R	R	MR	MR	R	R	MR	MR	R	S	R
7	Co 13032	HS	HS	HS	S	S	S	S	S	S	S	MR	R	S	S	MR
8	CoA 14323 (2009A252)	R	R	R	R	R	R	MR	MR	R	R	MR	MS	R	MR	MR
9	CoA 14324 (2009A385)	S	S	S	S	S	S	S	S	S	S	MS	MS	S	S	MR
10	CoC 14337	MR	MR	MR	R	R	R	MR	MR	R	R	S	R	R	S	MS

11	PI 14376	HS	HS	HS	S	S	S	S	S	S	S	MS	MR	S	S	MR
12	PI 14377	MR	MR	MR	R	R	R	MR	MR	R	R	MR	MR	MR	S	MR
13	CoV 92102	MR	MR	MR	R	R	R					S		MR	S	
14	Co 86249	MR	R	R	R	R	R					MS		MR	S	
15	Co 419	HS	HS	HS	S	S	S					HS		HS	S	
16	CoC 671	HS	HS	HS	S	S	S					MS		HS	HS	
17	Co 997	HS	HS	HS	S	S	S					MR		HS	HS	
18	85 A 261	HS	HS	HS	S	S	S					HS		S	S	
19	Co 6907	HS	HS	HS	S	S	S					HS		HS	MS	
20	Co 7219	HS	HS	HS	R	R	R					HS		S	MR	
21	Co 7706	HS	HS	HS	R	R	R					MR		MR	HS	
Advanced Varietal Trail (Early) – I Plant																
1.	CoA 13322							MR	MR	R	R		MS		MR	
2.	CoA 13323							MS	MS	R	R		MS		R	
3.	CoC 13336							MR	MR	R	R		MS		MR	
4.	CoC 13337							MR	MR	R	R		MR		MR	
5.	CoV 13356							MS	MS	R	R		R		MS	
Advanced Varietal Trail (Early) – II Plant																
1.	CoA 12321							MR	MS	R	R		S		R	
2.	CoA 12322							MR	MR	R	R		MR		R	
3.	CoA 12323							S	S	S	S		MS		MR	
4.	CoOr 12346							MS	MS	R	R		MR		MR	
5.	CoV 12356							MR	MR	R	R		MR		MR	
Advanced Varietal Trail (Midlate) – I Plant																
1.	CoA 11326							MR	MR	R	R		MR		MR	
2.	CoA 12324							MS	MS	R	R		R		MR	
3.	CoC 13339							MR	MR	R	R		MR		MR	
4.	CoOr 13346							MR	MR	R	R		MR		MR	
5	CoC 671							HS	HS	S	S		HS		-	
6	Co 86249							MR	MR	R	R		S		-	

Peninsular Zone

Table 5: Evaluation of sugarcane genotypes for redrot, smut, wilt and YLD

S. N.	Clone	Red rot						Smut	Wilt	YLD
		Navsari		Thiruvalla						
		Plug method	Cotton swab	Plug Method		Cotton Swab		Navsari	Navsari	Navsari
		Reaction	Reaction	CF 06	CF 12	CF 06	CF 12			
Initial Varietal Trial (Early)										
1.	Co 13002	MR	R	R	MR	R	R	R		R
2.	Co 13003	MR	R	MR	R	R	R	MR		R
3.	Co 13004	MR	R	MR	MR	R	R	R		R
4.	CoN 13071	MR	R	MS	MR	R	R	R		R
5.	CoN 13072	MR	R	MR	MR	R	R	MR		R
6.	CoSnk 13101	MS	R	R	MR	R	R	HS		R
7.	CoSnk 13102	MS	R	MR	MS	R	S	R		R
8.	MS 13081	MR	R	R	MR	R	R	R		MR
9.	Co 85004	MS	R	MR	MR	R	R			
10.	Co 94008	MR	R	MR	MR	R	R			
11.	CoC 671	HS	S	S	MS	R	R			
Advanced Varietal Trial (Early) – I Plant										
1.	Co 11001	MR	R	MR	MS	R	R	R	MR	R
2.	Co 11004	MR	R	MR	MR	R	R	HS	MR	R
3.	CoM 11081	MS	MS	MR	MS	R	R	MS	MS	R
4.	CoM 11082	MR	R	MS	MS	R	R	S	MR	R
5.	CoM 11084	MR	R	MS	S	R	S	R	MR	R
6	Co 85004			MR	MR	R	R			
7	Co 94008			MR	MR	R	R			
8	CoC 671			S	S	S	S			

Advanced Varietal Trial (Early) – II Plant										
1.	Co 10004	S	R	MR	MR	R	R	MR	S	R
2.	Co 10005	MR	R	MR	MR	R	R	R	MR	R
3.	Co 10006	MR	R	MR	MR	R	R	R	MR	R
4.	Co 10024	MS	R	R	MR	R	R	S	MS	R
5.	Co 10026	MR	R	MR	MS	R	S	HS	S	R
6.	Co 10027	MR	R	MR	MR	R	R	MS	MR	R
7.	CoT 10366	S	R	R	MR	R	R	R	MS	R
8.	CoT 10367	MR	R	R	MR	R	R	MR	MR	R
9.	Co 85004			MR	MR	R	R			
10.	Co 94008			MR	MR	R	R			
11.	CoC 671			S	S	S	S			
Initial Varietal Trial (Midlate)										
1.	Co 13005	MS	R	R	R	R	R	S	-	MR
2.	Co 13006	MR	R	S	MR	S	R	R	MR	R
3.	Co 13008	HS	R	MR	R	R	R	R	-	R
4.	Co 13009	HS	R	MR	R	R	R	R	MR	R
5.	Co 13011	MR	R	R	R	R	R	R	-	R
6.	Co 13013	MR	R	MR	R	R	R	MS	MS	R
7.	Co 13014	MR	R	MR	MR	R	R	R	-	R
8.	Co 13016	MR	R	MR	S	R	S	R	-	R
9.	Co 13018	MR	R	MR	S	R	R	R	-	R
10.	Co 13020	MR	R	MR	MR	R	R	S	-	R
11.	CoM 13082	MR	R	MR	R	R	R	R	-	R
12.	CoN 13073	MR	R	MR	R	R	R	R	MR	R
13.	CoN 13074	MR	R	MR	MR	R	R	R	-	R
14.	CoSnk 13103	MR	R	MS	MR	S	R	MS	-	R
15.	CoSnk 13104	MS	R	MR	R	R	R	MR	-	R
16.	CoSnk 13105	HS	R	MR	MR	R	R	R	-	R
17.	CoSnk 13106	MR	R	MR	MR	R	R	HS	-	R
18.	CoT 13366	MS	R	MR	R	R	R	R	-	MR
19.	PI 13131	MR	R	MS	MR	R	R	MS	-	MR
20.	PI 13132	MR	R	R	R	R	R	HS	-	MR
21.	Co 99004	MR	R	MR	MS	R	R	S	-	MR
22.	Co 86032	HS	R	MS	MR	R	R	R	MR	R
Advanced Varietal Trial (Midlate) – I Plant										
1.	Co 11005	MR	R	MR	MR	R	R	R	MR	R
2.	Co 11007	MR	R	MR	MR	R	R	MS	MR	R
3.	Co 11012	MS	R	MR	MR	R	R	S	MR	R
4.	Co 11019	MR	R	MS	MR	R	R	R	S	R
5.	CoM 11085	MR	R	S	MS	R	R	R	MR	R
6.	CoM 11086	MS	R	MR	MR	R	R	R	MR	R
7.	Co 86032			MR	MR	R	R			
8.	Co 99004			R	R	R	R			
Advanced Varietal Trial (Midlate) – II Plant										
1.	Co 09009	MR	R	MR	R	MR	R	MR	MR	R
2.	Co 10015	MR	R	MR	R	MR	R	S	MR	R
3.	Co 10017	HS	S	MR	R	MS	S	S	S	R
4.	Co 10031	MR	R	MR	R	MS	R	MS	MR	R
5.	Co 10033	S	R	MR	R	MR	R	HS	MS	R
6.	CoM 10083	MR	R	MS	R	S	R	MR	S	R
7.	CoT 10368	MR	R	MR	R	MR	R	R	MR	MS
8.	CoT 10369	MR	R	MR	R	MS	R	R	MS	R
9.	CoVc 10061	MR	R	MR	R	R	R	R	S	R
10.	PI 10131	MR	R	R	R	MR	R	MR	MS	R
11.	PI 10132	MS	R	MR	R	S	R	R	MR	R
12.	Co 86032			MR	R	MR	R			
13.	Co 99004			R	R	R	R			

Table 6. Evaluation of sugarcane genotypes for red rot, smut and YLD- Coimbatore

S No.	Entry	CF06			CF12			Smut
		Plug method		Nodal method	Plug method		Nodal method	
		Score	Reaction		Score	Reaction		
1	Co 13002	1.6	R	R	4.2	MS	R	MS
2	Co 13003	1.6	R	R	5.0	MS	R	MS
3	Co 13004	1.5	R	R	8.0	S	S	MR
4	Co 13005	2.0	R	R	7.0	S	S	HS
5	Co 13006	4.2	MS	R	6.0	MS	R	MS
6	Co 13008	2.0	MR	R	-	RT	RT	S
7	Co 13009	2.6	MR	R	9.0	HS	S	HS
8	Co 13011	2.5	MR	R	6.8	S	S	MS
9	Co 13013	0.0	R	R	6.1	S	S	HS
10	Co 13014	2.4	MR	R	6.2	S	S	MS
11	Co 13016	3.0	MR	R	9.0	HS	S	S
12	Co 13018	2.0	R	R	5.4	MS	R	MR
13	Co 13020	3.4	MR	R	7.0	S	S	R
14	CoM 13082	3.4	MR	R	3.8	MR	R	R
15	CoN 13071	8.0	S	RT	8.1	HS	RT	MR
16	CoN 13072	8.0	S	R	8.0	S	S	HS
17	CoN 13073	3.4	MR	R	7.0	S	R	MR
18	CoN 13074	2.0	R	R	7.4	S	S	S
19	CoSnk 13101	2.4	MR	R	6.2	S	S	MS
20	CoSnk 13102	4.6	MS	R	5.0	MS	S	S
21	CoSnk 13103	8.0	S	R	5.6	MS	R	MS
22	CoSnk 13104	3.0	MR	R	4.2	MS	R	MR
23	CoSnk 13105	2.6	MR	R	3.6	MR	R	HS
24	CoSnk 13106	5.0	MS	R	5.2	MS	R	R
25	CoT 13366	8.1	HS	S	9.0	HS	S	MS
26	MS 13081	2.0	R	R	2.8	MR	R	R
27	PI 13131	9.0	HS	S	9.0	HS	S	MR
28	PI 13132	1.8	R	R	9.0	HS	S	HS
29	Co 12001	4.4	MS	R	7.0	S	R	-
30	Co 12017	5.0	MS	R	6.0	MS	R	-
31	Co 12021	3.0	MR	R	3.6	MR	S	-
32	Co 12024	5.0	MS	R	4.4	MS	R	-
33	CoN 12071	2.0	R	R	7.0	S	R	-
Standard – red rot								
34	CoC 671	9.0	HS	S	9.0	HS	S	-
35	Co 94012	9.0	HS	S	9.0	HS	S	-
Standard – smut								
	Co 96007						-	HS
	Co 97009						-	HS

Table 7. Evaluation of sugarcane genotypes for smut resistance-Padegaon

S. No.	Genotype	Smut %	Reaction	S.No.	Genotype	Smut %	Reaction
IVT – Early							
1	Co 13002	6.90	MR	36	CoSnk 13104	0.00	R
2	Co 13003	10.00	MR	37	CoSnk 13105	0.00	R
3	Co 13004	0.00	MR	38	CoSnk 13106	0.00	R
4	CoN 13071	0.00	R	39	CoT 13366	0.00	R
5	CoN 13072	17.50	MS	40	PI 13131	0.00	R
6	CoSnk 13101	21.95	S	41	PI 13132	0.00	R
7	CoSnk 13102	10.42	MS	**AVT – Midlate I Plant**			
8	MS 13081	0.00	R	42	Co 11005	20.83	S
AVT – Early I Plant				43	Co 11007	0.00	R
9	Co 11001	32.43	HS	44	Co 11012	3.33	MR
10	Co 11004	4.00	MR	45	Co 11019	38.24	HS
11	CoM 11081	0.00	R	46	CoM 11085	5.56	MR
12	CoM 11082	0.00	R	47	CoM 11086	0.00	R
13	CoM 11084	0.00	R	**AVT – Midlate II Plant**			
AVT – Early II Plant				48	Co 09009	15.91	MS
14	Co 10004	0.00	R	49	Co 10015	36.36	HS
15	Co 10005	11.90	R	50	Co 10017	24.49	S
16	Co 10006	37.04	HS	51	Co 10031	11.43	MS
17	Co 10024	0.00	R	52	Co 10033	26.83	S
18	Co 10026	0.00	R	53	CoM 10083	0.00	R
19	Co 10027	33.33	HS	54	CoT 10368	0.00	R
20	CoT 10366	0.00	R	55	CoT 10369	0.00	R
21	CoT 10367	0.00	R	56	CoVC 10061	31.58	HS
IVT– Midlate				57	PI 10131	18.18	MS
22	Co 13005	30.30	HS	58	PI 10132	20.00	MS
23	Co 13006	37.50	HS	**Checks**			
24	Co 13008	0.00	R	59	Co 85004	18.42	MS
25	Co 13009	2.63	MR	60	Co 94008	0.00	R
26	Co 13011	31.71	HS	61	CoC 671	33.33	HS
27	Co 13013	18.75	MS	62	Co 86032	0.00	R
28	Co 13014	0.00	R	63	Co 99004	20.8	S
29	Co 13016	0.00	R	64	CoM 265	0.00	R
30	Co 13018	0.00	R	65	Co 740	36.17	HS
31	Co 13020	0.00	R	66	Co 7219	33.33	HS
32	CoM 13082	0.00	R	67	Co 7527	35.90	HS
33	CoN 13073	0.00	R	68	MS 10001	0.00	R
34	CoN 13074	0.00	R	69	CoVSI 3102	0.00	R
35	CoSnk 13103	5.88	MR				

Table 8. Evaluation of sugarcane genotypes for smut resistance-Kolhapur

S. No	Genotypes	Smut incidence (%)	Reaction	YLD
IVT Early				
1	Co 13002	4.53	R	R
2	Co 13003	7.45	MR	R
3	Co 13004	0.00	R	MR
4	CoN 13071	0.00	R	MR
5	CoN 13072	12.85	MS	MR
6	CoSnk 13101	16.73	MS	R
7	CoSnk 13102	8.62	MR	R
8	MS 13081	0.00	R	MR

AVT Early I Plant				
1	Co 11001	25.05	S	R
2	Co 11004	0.00	R	S
3	CoM 11081	0.00	R	R
4	CoM 11082	0.00	R	MR
5	CoM 11084	0.00	R	R
3. Advanced Varietal Trial- Early II Plant				
1	Co 10004	0.00	R	S
2	Co 10005	0.00	R	R
3	Co 10006	28.13	S	MS
4	Co 10024	0.00	R	S
5	Co 10026	0.00	R	MR
6	Co 10027	26.45	S	MR
7	CoT 10366	0.00	R	MR
8	CoT 10367	0.00	R	MR
IVT Midlate				
1	Co 13005	24.65	S	MR
2	Co 13006	29.13	S	R
3	Co 13008	0.00	R	MS
4	Co 13009	0.00	R	R
5	Co 13011	26.70	S	R
6	Co 13013	12.47	MS	R
7	Co 13014	0.00	R	R
8	Co 13016	0.00	R	MR
9	Co 13018	0.00	R	R
10	Co 13020	0.00	R	R
11	CoM 13082	0.00	R	R
12	CoN 13073	0.00	R	MR
13	CoN 13074	0.00	R	MR
14	CoSnk 13103	1.93	MR	MR
15	CoSnk 13104	0.00	R	MS
16	CoSnk 13105	0.00	R	R
17	CoSnk 13106	0.00	R	R
18	CoT 13366	0.00	R	MS
19	PI 13131	0.00	R	MS
20	PI 13132	0.00	R	S
AVT Midlate I Plant				
1	Co 11005	16.53	MS	R
2	Co 11007	0.00	R	R
3	Co 11012	0.00	R	R
4	Co 11019	27.86	S	R
5	CoM 11085	2.13	MR	MR
6	CoM 11086	0.00	R	R
7	CoT 10368	0.00	R	MR
8	CoT 10369	0.00	R	S
9	CoVC 10061	23.15	S	MR
10	PI 10131	12.63	MS	S
11	PI 10132	15.33	MS	MR
Checks				
1	CoC 671	12.47	MS	S
2	Co 94008	0.00	R	MS
3	Co 85004	26.65	S	R
4	Co 86032	0.00	R	MR
5	Co 99004	16.21	MR	S
6	Co 740	28.48	S	R
7	Co 7527	26.32	S	MS
8	CoM 0265	0.00	R	MR

Table 9. Evaluation of sugarcane genotypes for smut resistance-Sankeshwar

Sl. No	Entry	Smut Reaction	YLD	Sl. No	Entry	Smut Reaction	YLD
I. IVT (Early)				**AVT - Early (PC I)**			
1	Co 13002	HS	MR	1	Co 11001	R	R
2	Co 13003	R	R	2	Co 11004	R	R
3	CoN 13004	S	R	3	CoM 11081	R	R
4	CoN 13071	S	R	4	CoM 11082	R	R
5	CoN 13072	R	R	5	CoM 11084	R	R
6	CoSnk 13101	R	R	**Checks**			
7	CoSnk 13102	R	R	1	Co 94008	R	HS
8	MS 13081	HS	R	2	CoC 671	MS	R
Checks				3	Co 85004	R	R
9	Co 94008	HS	R	4	Co 8011	MS	R
10	CoC 671	HS	R	5	Co 740	S	R
11	Co 85004	R	R	**AVT Midlate (PC I)**			
12	Co 8011	S	R	1	Co 11005	R	R
13	Co 740	HS	R	2	Co 11007	R	R
IVT (ML)				3	Co 11012	R	R
1	Co 13005	S	R	4	Co 11019	R	R
2	Co 13006	S	R	5	CoM 11085	S	R
3	Co 13008	R	R	6	CoM 11086	HS	R
4	Co 13009	R	R	**Checks**			
5	Co 13011	R	R	7	Co 86032	R	R
6	Co 13013	HS	R	8	Co 99004	HS	R
7	Co 13014	R	R	9	Co 8011	S	R
8	Co 13016	R	R	10	Co 740	HS	R
9	Co 13018	HS	R	**AVT early PC II**			
10	Co 13020	S	R	1	Co 10004	R	R
11	CoM 13082	R	R	2	Co 10005	S	R
12	CoN 13073	R	R	3	Co 10006	HS	R
13	CoN 13074	R	R	4	Co 10024	R	MR
14	CoSnk 13103	S	R	5	Co 10026	R	R
15	CoSnk 13104	R	R	6	Co 10027	HS	R
16	CoSnk 13105	R	R	7	CoT 10366	R	R
17	CoSnk 13106	R	R	8	CoT 10367	HS	R
18	CoT 13366	R	R	**Checks**			
19	PI 13131	R	R	1.	CoC 671	S	MR
20	PI 13132	R	MR	2.	Co 85004	R	R
Checks				3	Co 94008	S	R
1	Co 86032	R	MR	4	Co 8011	HS	R
2	Co 99004	HS	R	5	Co 740	HS	R
3	Co 8011	HS	R	**AVT- ML PC II**			
4	Co 740	S	R	1	Co 09009	HS	R
				2	Co 10015	R	R
				3	Co 10017	R	R
				4	Co 10031	R	R
				5	Co 10033	R	R
				6	CoM 10083	R	R
				7	CoT 10368	S	R
				8	CoT 10369	S	R
				9	CoVc 10061	R	R
				10	PI 10131	R	R
				11	PI 10132	HS	R
				Checks			
				1	Co 86032	R	R
				2	Co 99004	S	R
				3	Co 8011	HS	R
				4	Co 740	HS	R

Table 10. Evaluation of sugarcane genotypes for smut resistance - Pune

Sl. No.	Genotype	Smut (%)	Reaction
IVT Early			
1	Co 12001	0.0	R
2	Co 12003	0.0	R
3	CoM 12081	0.0	R
4	CoM 12082	0.0	R
5	CoM 12083	0.0	R
6	CoT 12366	0.0	R
7	CoN 12072	0.0	R
8	CoT 12367	0.0	R
9	Co 12007	25.00	S
10	Co 12008	25.00	S
11	Co 12006	40.00	HS
12	CoN 12071	33.33	HS
AVT Early			
1	Co 10004	0.0	R
2	Co 10006	0.0	R
3	Co 10024	0.0	R
4	Co 10026	0.0	R
5	Co 10027	0.0	R
6	CoT 10367	0.0	R
7	Co 10005	14.28	MS
8	CoT 10366	18.18	MS
IVT Early II Plant			
1	Co 09004	0.0	R
2	Co 09007	0.0	R
3	CoN 09072	18.18	MS
IVT Midlate			
1	Co 12012	0.0	R
2	Co 12016	0.0	R
3	Co 12017	0.0	R
4	Co 12019	0.0	R
5	Co 12021	0.0	R
6	CoM 12084	0.0	R
7	CoM 12085	0.0	R
8	CoN 12073	0.0	R
9	CoT 12368	0.0	R
10	VSI 12121	0.0	R
11	Co 12014	14.28	MS
12	CoM 12086	15.47	MS
13	CoN 12074	11.11	MS
14	Co 12024	25.00	S
15	Co 12009	75.00	HS
AVT Midlate I Plant			
1	Co 09009	0.0	R
2	Co 10015	0.0	R
3	Co 10031	0.0	R
4	CoM10083	0.0	R
5	CoT 10368	0.0	R
6	CoT 10369	0.0	R
7	PI 10131	0.0	R
8	PI 10132	0.0	R
9	MS 10033	10.00	MR
10	CoVc 10061	11.11	MS
11	Co 10017	25.00	S
Standard check			
1	Co 740	20.00	MS
2	Co 7219	25.00	S

Table 11. Evaluation of sugarcane genotypes for smut resistance- Powarkheda

Sl. No.	Genotype	Smut	YLD	Sl. No.	Genotype	Smut	YLD
Advance Varietal Trial (Early I)				**Initial Varietal Trial (Early)**			
1	Co 10004	MR	MR	1	Co 12001	R	-
2	Co 10005	MS	MR	2	Co 12003	MS	-
3	Co 10006	MS	R	3	Co 12006	R	-
4	Co 10024	MR	R	4	Co 12007	MS	-
5	Co 10026	MR	R	5	Co 12008	S	-
6	Co 10027	R	R	6	CoM 12081	MR	-
7	CoT 10366	R	R	7	CoM 12082	MS	-
8	CoT 10367	R	R	8	CoM 12083	R	-
9	Co 11001	MR	R	9	CoN 12071	MR	-
10	Co 11004	R	MS	10	CoN 12072	R	-
11	CoM 11081	R	R	11	CoT 12366	R	-
12	CoM 11082	MS	R	12	CoT 12367	R	-
13	CoM 11084	MR	R	13	Co 7219	S	-
14	Co 7219	S	-				
Advance Varietal Trial (mid late)				**Initial Varietal Trial (mid late)**			
1	Co 09009	MS	R	1	Co 12009	MR	-
2	Co 10015	S	R	2	Co 12012	MR	-
3	Co 10017	S	R	3	Co 12014	R	-
4	Co 10031	MR	MR	4	Co 12016	R	-
5	Co 10033	MS	R	5	Co 12017	MR	-
6	CoM 10083	MR	R	6	Co 12019	R	-
7	CoT 10368	R	R	7	Co 12021	R	-
8	CoT 10369	R	MR	8	Co 12024	MR	-
9	CoVc 10061	R	R	9	CoM 12084	MR	-
10	PI 10131	MR	MR	10	CoM 12085	MS	-
11	PI 10132	MR	MR	11	CoM 12086	MS	-
12	Co 11005	R	R	12	CoN 12073	R	-
13	Co 11007	R	R	13	CoN 12074	MS	-
14	Co 11012	MR	R	14	CoT 12368	MR	-
15	Co 11019	MS	R	15	VSI 12121	MR	-
16	CoM 11085	MR	R	16	Co 7219	S	-
17	CoM 11086	MR	R				
18	Co 7219	S	-				

4. ENTOMOLOGY

During 2016-17 following programmes were implemented in Entomology discipline. List of the projects and summary of achievements is discussed below.

List of projects

E4.1 : Evaluation of zonal varieties/genotypes for their reaction against major insect-pests

E.28 : Survey and surveillance of sugarcane insect pests

E.30 : Monitoring of insect-pests and bio-agents in sugarcane agro-ecosystem

E34 : Standardization of simple and cost effective techniques for mass multiplication of sugarcane bio-agents

E.36 : Management of borer complex of sugarcane through lures

E37 : Bio-efficacy of new insecticides for the control of sugarcane early shoot borer

E 4.1 : Evaluation of zonal varieties/genotypes for their reaction against major insect-pests

NORTH WESTERN ZONE

1. Regional Research Station, PAU., Kapurthala (Punjab)

The lowest incidence of early shoot borer was recorded in CoPb 13181 (4.15%) under IVT E category whereas, it was highest in CoS 13232 (16.51%) under IVT ML category. The rest of all genotypes showed intermediate incidence against early shoot borer. Thus, all genotypes showed less to moderately susceptible reaction against early shoot borer. The cumulative incidence of top borer ranged from 5.81 per cent in CoPb 13181 (IVT E) to 18.64 per cent in Co 238 (AVT E II P) and exhibited low to moderately susceptible reaction against top borer. The infestation index of stalk borer ranged from 0.04 per cent in CoH 13263 to 0.25 per cent in CoPb 13183 under IVT ML and showed less susceptible reaction to stalk borer in all tested genotypes.

2. Regional Research Station, Uchani Dist- Karnal (Haryana)

The incidence of early shoot borer was recorded as low (2.6%) in genotype CoPb 11214 under AVT ML II P and high (15.9%) in genotype CoS 8436 (IVT ML and IVT ML I P). The genotype tested under different maturity groups are graded as less to moderately susceptible reaction against early shoot borer. The incidence of top borer was recorded as low to moderate and varied from 1.60 per cent in genotype CoS 12232 (AVT ML I P) to 6.50 per cent in genotype CoH 11262 (AVT E II P). Thus, all screened genotypes showed less susceptible reaction against top borer. The stalk borer infestation index was varied from 0.3 per cent in CoLk 13203 (IVT E) to 2.4 per cent in CoPant 13224 (IVT ML) and showed less to moderately susceptible reaction. The incidence of root borer was found minimum (15.60%) in genotype CoPb 13181 (IVT E) and maximum (34.8%) in genotype CoPant 13221 and thus graded as moderately to highly susceptible genotypes.

3. ICAR-SBI Coimbatore Regional Centre, Karnal (Haryana)

The per cent incidence of early shoot borer ranged from 0.0 per cent in CoS 10231(Ratoon) to 5.40 per cent in Co 12026 (AVT E I P). Thus, all the tested genotypes showed less susceptible reaction to early shoot borer. Whereas, the per cent incidence of top borer was ranged from 0.00 per cent in AVT E I P (Co 0238, Co 12027, Co 12026, CoLk 12203, Co 05011, CoH 12263, CoPb 12211) and AVT E II P (CoH 11262, CoLk 11201, Co 0238, Co 11027, CoH 11263, CoPb 11214) to 3.20 per cent in CoH 10262 (Ratoon). Thus, all genotypes exhibited less susceptible reaction to top borer. The lowest per cent incidence of root borer was observed in CoPb 11214 (9.7%) under AVT E II P and highest in CoH 10261 (66.20%) under ratoon category. Thus, all the tested genotypes showed less to highly susceptible reaction to root borer. The infestation of stalk borer was ranged from 0.10 per cent in Co 0238 (Ratoon) to 5.40 per cent in Co 0238 (AVT E II P). Thus, all the tested genotypes showed less to moderately susceptible reaction to stalk borer.

4. U.P. Council of Sugarcane Research, Shahjahanpur (U.P.)

The incidence of early shoot borer was recorded as low (8.08%) in CoS 767 (AVT ML I P) to high (23.94%) in Co 0238 (AVT E R), thus it showed less to moderately susceptible reaction to early shoot borer. The incidence of top shoot borer at harvest was minimum (5.33%) in CoS 767 (AVT ML I P) and Co 11027, CoH 11263, CoLk 12206 (AVT ML II P) to maximum (21.33%) in CoLk 12205 (AVT ML I P) and Co Pant 97222 (AVT ML R). Thus, all the tested genotypes showed less to highly susceptible reaction to top borer. The stalk borer infestation index was ranged from 0.84 per cent in CoH 11263 (AVT ML II P) to 4.91 per cent in Co 0238 (AVT E R) and grouped as less to moderately susceptible reaction to stalk borer.

5. ICAR-IISR, Lucknow (U.P.)

The top borer incidence (IV Brood) was recorded as minimum (0.00%) in CoS12232 (AVT ML) to maximum (15.74%) in CoS767 (AVT ML), thus all genotypes exhibited less to moderately susceptible reaction. The infestation index of

stalk borer ranged from 0.01 per cent in CoPant12226 (AVT ML) to 0.39 per cent in Co0238 (AVT E) and registered less susceptible reaction. The incidence of internode borer was low (10.00%) in CoJ64 (AVT E) to high (42.79%) in CoH11263 (AVT ML) and showed less to highly susceptible reaction.

NORTH CENTRAL ZONE AND EASTERN ZONE

6. SRI, RAU, Pusa (Bihar)

The cumulative incidence of early shoot borer was recorded as lowest (6.75 %) in genotype CoLK 12207 under AVT E I P and highest (16.58%) in genotype CoSe 11454 under AVT ML II P. The genotypes tested under different maturity groups graded as less to moderately susceptible reaction against early shoot borer. While, incidence of top borer was found minimum (7.30%) in genotype CoP 13438 (IVT ML) and maximum (11.30%) in genotype CoP 13436 (IVT E) and graded as less to moderately susceptible reaction. The stalk borer infestation index was varied from zero per cent in IVT E (CoP 13436, CoSe 13451, CoSe 95422); AVT E I P (CoLK 12207, BO 130); AVT ML I P (CoLK 09204, BO 91); AVT ML II P (CoSe 11454, CoSe 11455, BO 91) and AVT E II P (CoP 11436, CoP 11437, CoP 11438) to 0.63 per cent in Co0238 (AVT E) and showed less susceptible reaction for all tested genotype. The incidence of root borer was varied from 6.99 per cent in genotype CoP 13436 (IVT E) to 10.25 per cent in genotype CoSe 11454 (IVT M) and all the tested genotypes exhibited less susceptible reaction to root borer.

7. G.S. Sugarcane Breeding and Research Station, Seorahi (U.P.)

The incidence of early shoot borer ranged from 10.62 per cent (CoSe92423- AVT ML II P) to 17.04 per cent (CoLk12209- AVT ML I P) and implies that all genotypes grouped into less to moderately susceptible reaction. The incidence of top shoot borer (at harvest) was low (7.01%) in CoSe 12453 (AVT ML I P) to high (13.15%) in CoP 12436 (AVT E I P) and all tested genotypes showed less to moderately susceptible reaction. The root borer incidence was minimum (0.10%) in BO130 (AVT E I P) to high (3.77%) in CoP 12438 (AVT ML I P) and all tested genotypes grouped as less susceptible. The stalk borer infestation index was varied from 0.08 per cent (CoSe 12453- AVT ML I P) to 4.27 per cent (CoP 12436- AVT E I P) and registered as less to moderately susceptible group.

PENINSULAR ZONE

8. SRS, Dr. PDKV, Akola (M.S.)

The early shoot borer incidence was minimum (1.52%) in Co10005 (AVT E II P), while it was maximum (13.68%) in CoSnk13102 (IVT E I P). Thus, all the tested genotypes showed less susceptible reaction. The scale insect incidence was found to be low (22.0%) in Co86032 (AVT ML II P) to 46.00 per cent in Co09009 (AVT ML II P) and registered as moderately to highly susceptible reaction. The pyrilla incidence was lowest (0.43%) in CoN13071, CoN13072 (IVT E I P) to highest (1.78%) in CoVC10061 (AVT ML II P). Thus, all the tested genotypes exhibited less susceptible reaction.

9. CSRS, MPKV, Padegaon (M.S.)

The early shoot borer per cent incidence (cumulative) ranged from 4.10 per cent in CoC 671 (AVT E R) to 50.36 per cent in Co 94008 (AVT E II P) and all tested genotypes grouped as less to highly susceptible reaction. The incidence of internode borer was recorded as low (20.00%) in Co 10031 (AVT ML II P) and Co 86032 (AVT ML II P) to high (70.00%) in Co 94008 (IVT E) and thus data showed less to highly susceptible reaction in all evaluated genotypes. The incidence of top shoot borer was found to be nil in all the tested genotypes under six groups. The mealy bug incidence was minimum (43.33%) in MS 13081 (IVT E) to cent per cent in IVT ML (Co 13011), AVT ML II P (Co 10017, Co 10031, CoM 10083, CoT 10368, CoT 10369, Co 99004, Co 10017). Thus, all the screened genotypes showed highly susceptible reaction. Scale insect incidence was found to be nil (CoN 13072, CoSnk 13101, MS 13081, Co 94008, CoC 671- IVT E; Co 13005, Co 13006, Co 13011, Co 13013, Co 13014, Co 13016, Co 13020, CoN 13074, CoSnk 13103, CoSnk 13104, CoSnk 13105, CoSnk 13106, CoT 13366, PI 13131, PI 13132, Co 86032, Co 99004- IVT ML; Co 11001, Co 11004, CoM 11081, CoM 11082, CoM 11084, Co 85004, Co 94008, CoC 671- AVT E I P; Co 10004, Co 10005, Co 10006, Co 10024, Co 10026, Co 10027, CoT 10366, CoT 10367, Co 85004, Co 94008, CoC 671- AVT E II P; Co 11005, Co 11007, Co 11012, Co 11019, CoM 11085, CoM 11086, Co 86032, Co 99004- AVT ML I P; PI 10132- AVT ML II P; PI 10132- AVT ML II P). The mealy bug incidence was highest (85.0%) in Co 10017 (AVT ML R). All the evaluated genotypes against mealy bug exhibited less to highly susceptible reaction.

10. Vasantdada Sugar Institute (VSI), Pune (M.S.)

The cumulative incidence of early shoot borer was found to be lowest (1.39%) in Co 10005 (AVT E R) to highest (58.47%) in Co 10006 (AVT E II P), thus all the tested genotypes grouped as less to highly susceptible. The incidence of internode borer was maximum (24.0%) in Co 10026 (AVT E II P) and minimum (0.00%) in Co 85004 (IVT E). Thus, all evaluated genotypes showed less susceptible reaction. The incidence of mealy bug was found to be nil in Co 13011, Co 13013, Co N 13073, Co Snk 13103, Co Snk 13104, Co Snk 13105, CoT 13366, Co 99004 under IVT ML; Co 11004, CoM 11081, CoM 11082, CoM 11084 under AVT E I P; Co 10006, Co 10024, Co 10026, Co 10027, Co 94008 under AVT E II P;

Co 10017, Co 10031, CoVc 10061, PI 10131, PI 10132, Co 86032, Co 99004 under AVT ML II P and Co 10031 under AVT ML R. However, it was maximum (28.0%) in Co 85004 (AVT E R). Thus, all the screened genotypes categorised as less to moderately susceptible reaction to mealy bug. The incidence of scale insect was recorded as nil in all the tested genotypes except Co 85004 (13.33%) under AVT E I P; Co 10026 (8.00%) under AVT E II P; Co 11007 (1.33%) and Co 86032 (12.00) under AVT ML I P, and Co 10033 (8.00%) and PI 10132 (2.00%) under AVT ML I P. All the evaluated genotypes against scale insect exhibited less susceptible reaction.

11. ZARS, JNKVV, Powarkheda (M.P.)

The early shoot borer incidence was found to be low (3.00%) in Co 10031 (AVT ML II P) to high (21.33%) in Co 10026 (AVT E II P). Thus, all the screened genotypes grouped as less to moderately susceptible. The pyrilla population was maximum (9.82 pyrilla/leaf) in Co 10026 (AVT E II P) and it was minimum (2.72 pyrilla/leaf) in Co 11082 (AVT E I P) Therefore, thus all tested genotypes showed less to moderately susceptible reaction.

12. MSRS, NAU, Navsari (Gujarat)

The cumulative incidence of early shoot borer was found to be low (1.32%) in CoM 11081 (AVT E I P) to high (16.22%) in CoSnk 13104 (IVT ML). Thus, all the screened genotypes showed less to moderately susceptible reaction. The incidence of top borer (at harvest) was ranged from 1.87 per cent in CoN 13071 (IVT E) to 10.41 per cent in CoSnk 13104 (IVT ML), thus all screened genotypes exhibited less susceptible reaction. The scale insect incidence was recorded as nil in IVT E (Co 13002, Co 13003, Co 13004, CoN 13071, CoN 13072, CoSnk 13101, CoSnk 13102, MS 13081); AVT E I P (Co 11001, CoM 11081) to high in 20.0 per cent in Co 11004 (AVT E I P). Thus, all genotypes exhibited less susceptible reaction. The mealy bug incidence was found to be nil in IVT E (Co 13002, Co 13003, CoSnk 13101, CoSnk 13102, MS 13081); AVT E I P (Co 11001, CoM 11081, CoM 11084); AVT E II P (Co 10026, Co 10027, CoT 10366, CoT 10367); IVT ML (Co 13005, Co 13006, Co 13008, Co 13011, CoM 13082, CoSnk 13103, PI 13131, PI 13132); AVT ML I P (Co 11005, Co 11007, CoM 11085, CoM 11086) and AVT ML II P (Co 10015, Co 10017, Co 10031, Co 10033, PI 10132) and implies that all evaluated genotypes showed less to moderately susceptible reaction. The root borer incidence was registered as low (8.00%) in IVT E (Co 13003, Co 13004, CoN 13071, CoSnk 13101); AVT E I P (Co 11001, CoM 11082), AVT E II P (Co 10004, Co 10005, Co 10024); IVT ML (Co 13008, Co 13013, Co 13014, Co 13016, Co 13020, CoM 13082, CoSnk 13103, CoSnk 13104, CoSnk 13105, CoT 13366, PI 13131); AVT ML I P (Co 11005, Co 11012, Co 11019) and AVT ML II P (Co 09009, Co 10017, Co 10031, Co 10033, CoM 10083, CoT 10368, CoT 10369, CoVC 10061, PI 10132) while it was high (20.00%) in AVT E II P (Co 94008) and AVT ML II P (Co 99004). Thus, all tested genotypes showed less to moderately susceptible reaction.

13. ZARS, UAS, Mandya (Karnataka)

The incidence of early shoot borer was ranged from 4.75 per cent (Co 13071- IVT E) to 21.33 per cent (Co 10024- AVT E II P) and all tested genotypes categorized as less to moderately susceptible group. The top shoot borer incidence was recorded as low (4.25%) in Co 86032 (IVT ML) to high (23.00%) in CoN 13072 (IVT E), Thus all tested genotypes exhibited less to highly susceptible reaction. The internode borer incidence was found to be minimum (5.33%) in Co 13008 (IVT ML) to maximum (44.33%) in Co 94008 (AVT E II P) and all the tested genotypes showed less to highly susceptible reaction.

14. Regional Sugarcane & Jaggery Research Station, Kolhapur (M.S.)

Report is not submitted by concern centre.

15. ICAR-SBI, Coimbatore (T.N.)

The early shoot borer incidence was recorded as minimum (19.59%) in Co 13016 (IVT ML) to maximum (77.11%) in Co 85004 (IVT E), thus all genotypes exhibited moderately to highly susceptible reaction. The incidence of internode borer was low (32.00%) in CoC 671 (AVT E I P) to high (82.00%) in Co 13011 (IVT ML) and showed moderately to highly susceptible reaction. The root borer incidence was nil in all tested genotypes. The top shoot borer incidence was recorded as nil in CoSnk 13105 (IVT ML) and Co 85004 (AVT E II P) to high (2.32%) in CoM 10083 (AVT ML II P), Thus all tested genotypes exhibited less susceptible reaction.

EAST COAST ZONE

16. RARS, ANGRAU, Anakapalle (A.P.)

The early shoot borer (cumulative incidence) was found to be low (1.95%) in Co A 12 322 under AVT E II P to high (16.53%) in Co A 99082 (93A 145) under IVT ML Ratoon. Thus, all the genotype tested showed less to moderately susceptible reaction. The incidence of internode borer was ranged from 16.7 per cent in Co A 12 321 under AVT E II P to 88.89 per cent in Co A 92081 (87A 298) under IVT ML R. Thus, all the genotype under different groups exhibited less to highly susceptible reaction.

17. Sugarcane Research Station, Vuyyuru (A.P.) – Voluntary centre

All the tested genotypes exhibited less susceptible reaction to early shoot borer and it was showed highly susceptible reaction to internode borer and scale insect at Vuyyuru centre.

North West Zone

1. RRS (PAU), Kapurthala (Punjab)

IVT Early					AVT (Early) I-Plant				AVT (Early) II-Plant			
Sl No.	Variety	ESB	TB*	StB	Variety	ESB	TB	Stb	Variety	ESB	TB	Stb
1.	Co 13033	LS	MS	LS	Co 12026	LS	LS	LS	CoH 11262	LS	MS	LS
2.	Co 13034	LS	LS	LS	Co 12027	LS	LS	LS	CoLk 11201	LS	LS	LS
3.	CoLk 13201	LS	LS	LS	CoLk 12203	LS	MS	LS	CoLk 11202	LS	MS	LS
4.	CoLk 13202	LS	MS	LS	CoPant 12221	LS	LS	LS	CoLk 11203	LS	LS	LS
5.	CoLk 13203	LS	MS	LS	-	-	-	-	-	-	-	-
6.	CoPant 13221	LS	LS	LS	-	-	-	-	-	-	-	-
7.	CoPant 13222	LS	MS	LS	-	-	-	-	-	-	-	-
8.	CoPb 13181	LS	LS	LS	-	-	-	-	-	-	-	-
9.	CoS 13231	LS	LS	LS	-	-	-	-	-	-	-	-
CK	Co 64	LS	MS	LS	CoJ 64	LS	LS	LS	CoJ 64	LS	LS	LS
	CoPant 84211	LS	LS	LS	CoPant 84211	LS	MS	LS	CoPant 84211	LS	MS	LS
	Co 238	LS	MS	LS	Co 238	LS	MS	LS	Co 238	LS	MS	LS

IVT (Midlate)					AVT (Midlate) I-Plant				AVT (Midlate) II-Plant			
Sl No.	Variety	ESB	TB*	StB	Variety	ESB	TB	Stb	Variety	ESB	TB	Stb
1.	Co 13035	LS	LS	LS	Co 12029	LS	LS	LS	Co 11027	MS	LS	LS
2.	Co 13036	LS	LS	LS	CoH 12263	LS	LS	LS	CoH 11263	LS	MS	LS
3.	CoH 13261	MS	LS	LS	CoLk 12205	LS	LS	LS	CoLk 11204	LS	MS	LS
4.	CoH 13262	LS	LS	LS	CoPant 12226	LS	MS	LS	CoLk 11206	LS	MS	LS
5.	CoH 13263	LS	LS	LS	CoPb 12211	LS	LS	LS	CoPb 11214	LS	LS	LS
6.	CoLk 13204	LS	LS	LS	CoS 12232	LS	MS	LS	CoS 11232	LS	LS	LS
7.	CoLk 13205	LS	MS	LS	-	-	-	-	-	-	-	-
8.	CoPant 13223	LS	MS	LS	-	-	-	-	-	-	-	-
9.	CoPant 13224	LS	MS	LS	-	-	-	-	-	-	-	-
10.	CoPb 13182	LS	LS	LS	-	-	-	-	-	-	-	-
11.	CoPb 13183	LS	LS	LS	-	-	-	-	-	-	-	-
12.	CoS 13232	MS	LS	LS	-	-	-	-	-	-	-	-
13.	CoS 13233	MS	MS	LS	-	-	-	-	-	-	-	-
CK	CoS 767	LS	MS	LS	CoS 767	LS	LS	LS	CoS 767	LS	LS	LS
	CoS 8436	LS	LS	LS	CoS 8436	LS	LS	LS	CoS 8436	LS	LS	LS
	CoPant 97222	LS	MS	LS	CoPant 97222	LS	LS	LS	CoPant 97222	LS	MS	LS

ESB: Early shoot borer: TB*: Top borer (cumulative incidence III and IV brood); StB: Stalk borer

2. RRS, UCHANI, KARNAL (Haryana)

Initial Varietal Trial (Early)

Sl.No.	Variety/Genotypes	ESB	TB	StB*	RB	Pyrilla	Whitefly	Black bug	Webbing mite
1	Co 13033	LS	LS	LS	MS	LS	LS	LS	MS
2	Co 13034	LS	LS	LS	HS	LS	MS	LS	LS
3	CoLk 13201	LS	LS	LS	HS	LS	LS	LS	LS
4	CoLk13202	LS	LS	LS	MS	LS	LS	LS	LS
5	CoLk 13203	LS	LS	LS	MS	LS	MS	LS	MS
6	CoPant 13221	LS	LS	LS	HS	LS	LS	LS	LS
7	CoPant 13222	LS	LS	MS	MS	LS	LS	LS	LS
8	CoPb 13181	LS	LS	LS	MS	LS	LS	LS	LS
9	CoS 13231	LS	LS	LS	HS	LS	LS	LS	LS
CK	CoJ 64	LS	LS	LS	MS	LS	MS	LS	LS
	Co 0238	LS	LS	LS	MS	LS	LS	LS	LS

AVT (Early) - I Plant

Sl.No	Variety/Genotypes	ESB	TB	StB*	RB	Pyrilla	Whitefly	Black bug	Webbing mite
1	Co 12026	LS	LS	LS	MS	LS	LS	LS	LS
2	Co 12027	LS	LS	MS	MS	LS	MS	LS	LS
3	CoLk 12203	LS	LS	LS	MS	LS	LS	LS	LS
4	CoPant 12221	LS	LS	LS	MS	LS	LS	LS	LS
CK	CoJ 64	LS	LS	LS	MS	LS	MS	LS	LS
	Co 0238	LS	LS	LS	MS	LS	LS	LS	LS

A V T (Early) - II Plant									
Sl.No	**Variety/Genotypes**	**ESB**	**TB**	**StB***	**RB**	**Pyrilla**	**Whitefly**	**Black bug**	**Webbing mite**
1	Co 12026	LS	LS	LS	MS	LS	LS	LS	LS
2	Co 12027	LS	LS	MS	MS	LS	MS	LS	LS
3	CoLk 12203	LS	LS	LS	MS	LS	LS	LS	LS
4	CoPant 12221	LS	LS	LS	MS	LS	LS	LS	LS
CK	CoJ 64	LS	LS	LS	MS	LS	MS	LS	LS
	Co 0238	LS	LS	LS	MS	LS	LS	LS	LS

I V T -Midlate									
Sl.No	**Variety/Genotypes**	**ESB**	**TB**	**StB***	**RB**	**Pyrilla**	**Whitefly**	**Black bug**	**Webbing mite**
1	Co 13035	LS	LS	LS	MS	LS	LS	LS	LS
2	Co 13036	LS	LS	LS	HS	LS	LS	LS	LS
3	CoH 13261	LS	LS	LS	MS	LS	LS	LS	LS
4	CoH 13262	LS	LS	LS	MS	LS	LS	LS	LS
5	CoH 13263	LS	LS	LS	MS	LS	LS	LS	MS
6	CoLk 13204	LS	LS	LS	MS	LS	MS	LS	LS
7	CoLk 13205	LS	LS	LS	HS	LS	LS	LS	LS
8	CoPant 13223	LS	LS	LS	MS	LS	LS	LS	LS
9	CoPant 13224	LS	LS	MS	HS	LS	LS	LS	LS
10	CoPb 13182	LS	LS	LS	MS	LS	LS	LS	LS
11	CoPb 13183	LS	LS	LS	HS	LS	MS	LS	LS
12	CoS 13232	LS	LS	LS	HS	LS	MS	LS	LS
13	CoS 13233	LS	LS	LS	MS	LS	LS	LS	LS
CK	CoS 767	LS	LS	LS	MS	LS	LS	LS	MS
	CoS 8436	MS	LS	LS	MS	LS	LS	LS	LS
	CoPant 97222	LS	LS	LS	MS	LS	MS	LS	LS

A V T (Midlate) -I Plant									
Sl.No	**Variety/Genotypes**	**ESB**	**TB**	**StB***	**RB**	**Pyrilla**	**Whitefly**	**Black bug**	**Webbing mite**
1	Co 12029	LS	LS	LS	MS	LS	LS	LS	MS
2	CoH 12263	LS	LS	LS	MS	LS	MS	LS	LS
3	CoLk 12205	LS	LS	LS	MS	LS	MS	LS	LS
4	CoPant 12226	LS	LS	LS	MS	LS	LS	LS	LS
5	CoPb 12211	LS	LS	MS	MS	LS	MS	LS	LS
6	CoS 12232	LS	LS	LS	MS	LS	MS	LS	LS
CK	CoS 767	LS	LS	LS	MS	LS	LS	LS	MS
	CoS 8436	MS	LS	LS	MS	LS	LS	LS	LS
	CoPant 97222	LS	LS	LS	MS	LS	MS	LS	LS

A V T (Midlate) - II Plant									
Sl.No	**Variety/Genotypes**	**ESB**	**TB**	**StB***	**RB**	**Pyrilla**	**Whitefly**	**Black bug**	**Webbing mite**
1	Co 11027	LS	LS	LS	MS	LS	LS	LS	LS
2	CoH 11263	LS	LS	LS	MS	LS	LS	LS	LS
3	CoLk 11204	LS	LS	LS	MS	LS	MS	LS	LS
4	CoLk 11206	LS	LS	LS	MS	LS	LS	LS	LS
5	CoPb 11214	LS	LS	LS	HS	LS	MS	LS	LS
6	CoS 11232	LS	LS	LS	MS	LS	MS	LS	LS
CK	CoS 767	LS	LS	LS	MS	LS	LS	LS	MS
	CoS 8436	MS	LS	LS	MS	LS	LS	LS	LS
	CoPant 97222	LS	LS	LS	MS	LS	MS	LS	LS

ESB: Early shoot borer; TB: Top borer; StB*: Stalk borer (infestation Index): RB: Root borer.

3. ICAR-SBI- Coimbatore Regional Centre, Karnal (Haryana)

AVT Ratoon							AVT-I Plant					
Sl.No.	Variety/Genotypes	BB	ESB	TB	RB	StB	Variety/Geno types	BB	ESB	TB	RB	StB
1	CoS 8436	LS	LS	LS	HS	LS	Co 0238	--	LS	LS	MS	LS
2	CoPb 10182	LS	LS	LS	HS	LS	CoPant 12221	--	LS	LS	MS	LS
3	CoPb10181	LS	LS	LS	MS	LS	Co 12027	--	LS	LS	HS	LS
4	CoPant 10221	LS	LS	LS	MS	LS	Co 12026	--	LS	LS	LS	LS
5	CoH 10262	LS	LS	LS	MS	LS	CoLk 12203	--	LS	LS	MS	LS
6	Co 10036	LS	LS	LS	MS	LS	CoS 12232	--	LS	LS	LS	LS
7	CoS 10231	LS	LS	LS	HS	LS	Co 05011	--	LS	LS	MS	LS
8	CoH 10261	LS	LS	LS	HS	LS	Co 12029	--	LS	LS	MS	LS
9	Co 0238	LS	LS	LS	HS	LS	CoH 12263	--	LS	LS	LS	LS
10	Co 10035	LS	LS	LS	HS	LS	CoLk12205	--	LS	LS	MS	LS

AVT –II Plant						
Sl.no.	Variety / Genotypes	BB	ESB	TB	RB	StB
1.	CoH 11262	--	LS	LS	MS	LS
2	CoLk 11201	--	LS	LS	MS	LS
3	CoLk 11202	--	LS	LS	LS	LS
4	CoLk 11203	--	LS	LS	MS	LS
5	Co0238	--	LS	LS	HS	LS
6	Co 11027	--	LS	LS	MS	LS
7	CoH 11263	--	LS	LS	HS	LS
8	CoLk 11204	--	LS	LS	MS	LS
9	CoLk 11206	--	LS	LS	MS	LS
10	CoPb 11214	--	LS	LS	LS	LS
11	CoS 11232	--	LS	LS	MS	LS
12	Co 05011	--	LS	LS	MS	LS

BB: Black bug; ESB:Early shoot borer; TB: Top borer; RB: Root borer; StB: Stalk borer

4. U.P. Council of Sugarcane Research, Shajahanpur (U.P.)

Sl.No.	AVT (Midlate) –I Plant				AVT (Midlate)-II Plant			
	Vareity/Genotypes	ESB	TB*	StB	Vareity/Genotypes	ESB	TB*	StB
1	CoS 12232	LS	LS	MS	CoS 11232	LS	LS	LS
2	CoPb 12211	MS	MS	LS	Co 11027	LS	LS	LS
3	CoPant 12226	MS	MS	MS	CoH 11263	LS	LS	LS
4	CoLk 12205	LS	HS	MS	CoLk 12204	MS	LS	MS
5	CoH 12263	MS	MS	MS	CoLk 12206	MS	LS	MS
6	Co 12029	LS	MS	MS	CoPb 11214	MS	MS	LS
Ck	CoS 767	LS	LS	MS	CoS 8436	LS	LS	MS
	CoS 8436	LS	LS	MS	CoS 767	LS	LS	LS
	CoPant 97222	MS	MS	MS	CoPant 97222	LS	MS	MS

Sl.No.	AVT (Early) –I Plant				AVT (Early)-II Plant			
	Vareity/Genotypes	ESB	TB*	StB	Vareity/Genotypes	ESB	TB*	StB
1	CoPant 12221	LS	MS	LS	CoLk 11201	MS	LS	MS
2	Co 12026	LS	MS	MS	CoLk 11202	MS	LS	LS
3	Co 12027	LS	MS	MS	CoLk 11203	MS	MS	MS
4	CoLk 12203	LS	LS	MS	CoH 11262	MS	LS	LS
Ck	CoJ 64	LS	LS	MS	CoJ 64	MS	MS	LS
	Co 0238	LS	MS	MS	Co 0238	MS	MS	MS

Sl.No.	AVT (Midlate) –Ratoon				AVT (Early)-Ratoon			
	Vareity/Genotypes	ESB	TB*	StB	Vareity/Genotypes	ESB	TB*	StB
1	CoS 11232	LS	LS	LS	CoLk 11201	MS	LS	MS
2	Co 11027	LS	LS	MS	CoLk 11202	MS	LS	LS
3	CoH 11263	LS	MS	LS	CoLk 11203	MS	MS	MS
4	CoLk 12204	MS	LS	MS	CoH 11262	MS	LS	MS
5	CoLk 12206	MS	LS	MS	-	-	-	-
6	CoPb 11214	LS	MS	LS	-	-	-	-
Ck	CoS 8436	LS	LS	MS	-	-	-	-
	CoS 767	MS	LS	LS	CoJ 64	MS	MS	MS
	Co Pant 97222	LS	HS	MS	Co 0238	MS	MS	MS

ESB: Early shoot borer;TB*: Top borer (at harvest) StB: Stalk borer

5. ICAR-IISR, Lucknow (U.P.)

AVT (Early)-I Plant						AVT (Midlate)-I Plant				
Sl.No.	Variety/Genotypes	TB		StB	INB	Variety/Genotypes	TB		StB	INB
		III Brood	IV Brood				III Brood	IV Brood		
1	Co 12027	LS	LS	**MS**	**LS**	**Co11027**	**LS**	**LS**	**MS**	**LS**
2	CoH 1126 2	LS	LS	MS	LS	Co12029	LS	LS	MS	MS
3	CoLk 11201	LS	LS	MS	LS	CoH11263	LS	LS	HS	HS
5	CoLk 11202	LS	LS	HS	MS	CoH12263	LS	LS	LS	MS
4	CoLk 11203	MS	LS	MS	LS	CoLk11204	LS	LS	MS	LS
6	CoLk12203	LS	LS	MS	LS	CoLk11206	LS	LS	MS	MS
7	CoPant 12221	LS	LS	MS	LS	CoLk12205	LS	LS	MS	MS
CK	Co 0238	MS	MS	HS	MS	-	-	-	-	-
	Co J64	MS	MS	HS	LS	-	-	-	-	-
8	-	-	-	-	-	CoPb11214	LS	LS	MS	LS
9	-	-	-	-	-	CoPb12211	LS	LS	MS	LS
10	-	-	-	-	-	CoPant12226	LS	MS	MS	MS
11	-	-	-	-	-	CoS12232	LS	LS	MS	MS
CK	-	-	-	-	-	CoS767	MS	MS	HS	MS
	-	-	-	-	-	CoPant97222	MS	MS	MS	MS

TB*: Top borer (at harvest) StB: Stalk borer; INB-Internode borer

North Central and Eastern Zone

6. SRI CRAU, Pusa (Bihar)

IVT (Early)						AVT (Early) – I Plant				
Sl.No.	Variety	ESB	TB*	StB	RB	Variety	ESB	TB*	StB	RB
1.	CoP 13436	LS	MS	LS	LS	CoLK 12207	LS	LS	LS	LS
2.	CoP 13437	LS	LS	LS	LS	CoP 12436	MS	MS	LS	LS
3.	CoSe 13451	LS	LS	LS	LS	CoSe 12451	LS	LS	LS	LS
4.	CoSe 13452	MS	LS	LS	LS	-	-	-	-	-
CK	BO 130	LS	LS	LS	LS	BO 130	LS	LS	LS	LS
	CoSe 95422	MS	MS	LS	LS	CoSe 95422	MS	LS	LS	LS

IVT (Midlate)						AVT (Early) – I Plant				
Sl.No	Variety	ESB	TB*	StB	RB	Variety	ESB	TB*	StB	RB
1.	CoP 13438	LS	LS	LS	LS	CoLK 09204	LS	LS	LS	LS
2.	CoP 13439	LS	MS	LS	LS	CoP 12438	LS	LS	LS	LS
3.	CoSe 13453	LS	LS	LS	LS	CoLK 12209	LS	MS	LS	LS
4.	CoSe 13454	LS	LS	LS	LS	CoSe 12453	LS	MS	LS	LS
CK	BO 191	LS	LS	LS	LS	BO 91	LS	LS	LS	LS
	CoP 9301	LS	MS	LS	LS	CoP 9301	LS	LS	LS	LS

IVT (Midlate)						AVT (Early) – I Plant				
Sl.No	Variety	ESB	TB*	StB	RB	Variety	ESB	TB*	StB	RB
1.	BO 155	LS	LS	LS	LS	CoP 11436	LS	LS	LS	LS
2.	CoSe 11453	LS	MS	LS	LS	CoP 11437	LS	LS	LS	LS
3.	CoSe 11454	MS	LS	LS	LS	CoP 11438	LS	MS	LS	LS
4.	CoSe 11455	LS	MS	LS	LS	CoP 11451	MS	LS	LS	LS
CK	BO 91	LS	LS	LS	LS	BO 130	LS	LS	LS	LS
	CoP 9301	LS	LS	LS	LS	CoSe 95422	MS	LS	LS	LS
	CoSe 92423	MS	MS	LS	LS	-	-	-	-	-

ESB: Early shoot borer;TB*: Top borer (IV brood); StB: Stalk borer; RB: Root borer

7. G.S. Sugarcane Breeding and Research Station, Seorahi (U.P)

AVT (Midlate) – I Plant						AVT (Midlate) – II Plant				
Sl.No.	Variety	ESB	TB*	StB	RB	Variety	ESB	TB*	StB	RB
1.	CoLk 09204	LS	MS	LS	LS	BO155	MS	LS	LS	LS
2.	CoLk12209	MS	LS	LS	LS	CoSe11453	LS	LS	LS	LS
3.	CoP 12438	MS	LS	LS	LS	CoSe11454	LS	LS	LS	LS
4.	CoSe 12453	LS	LS	LS	LS	CoSe11455	LS	LS	LS	LS
CK	BO91	LS	LS	LS	LS	BO91	LS	LS	LS	LS
	CoP9301	LS	LS	LS	LS	CoP9301	MS	MS	LS	LS
	-	-	-	-	-	CoSe92423	LS	LS	LS	LS

AVT (Midlate) – I Plant						AVT (Midlate) – II Plant				
Sl.No.	Variety	ESB	TB*	StB	RB	Variety	ESB	TB*	StB	RB
1	CoLk 12207	LS	MS	LS	LS	CoP11436	LS	LS	LS	LS
2	CoP 12436	LS	MS	LS	LS	CoP11437	MS	MS	LS	LS
3	CoSe 12451	LS	MS	LS	LS	CoP11438	MS	MS	LS	LS
CK	BO130	MS	MS	LS	LS	CoSe 11451	LS	LS	LS	LS
	CoSe 95422	LS	MS	LS	LS	BO130	MS	MS	LS	LS
	-	-	-	-	-	CoSe95422	MS	MS	LS	LS

Peninsular Zone

8. SRS, Dr. PDKV, Akola (M.S)

IVT (Early)-Plant							
Sl.No.	Variety/ Genotypes	ESB				Scale insect	Pyrilla
		30 DAP	60 DAP	90 DAP	120 DAP		
1	Co13002	MS	MS	LS	LS	MS	LS
2	Co13003	HS	MS	LS	LS	MS	LS
3	Co85004	MS	LS	LS	LS	HS	LS
4	CoN13071	MS	MS	LS	LS	MS	LS
5	CoN13072	MS	LS	LS	LS	MS	LS
6	CoC671	MS	MS	LS	LS	MS	LS
7	CoSnk13102	HS	MS	LS	LS	HS	LS
8	MS13081	HS	MS	LS	LS	HS	LS
9	Co13004	HS	MS	LS	LS	HS	LS
10	Co94008	MS	MS	LS	LS	MS	LS
11	CoSnk13101	MS	LS	LS	LS	MS	LS

AVT (Early)-I Plant							
1	Co11001	MS	LS	LS	LS	HS	LS
2	Co85004	MS	LS	LS	LS	MS	LS
3	CoM11081	MS	MS	LS	LS	MS	LS
4	Co94008	MS	LS	LS	LS	MS	LS
5	CoM11084	LS	LS	LS	LS	HS	LS
6	Co11004	MS	LS	LS	LS	MS	LS
7	CoM11082	MS	LS	LS	LS	HS	LS
8	CoC671	LS	LS	LS	LS	MS	LS

AVT (Early)-II Plant							
1	Co10004	MS	LS	LS	LS	HS	LS
2	Co10005	LS	LS	LS	LS	MS	LS
3	Co10006	MS	MS	LS	LS	MS	LS
4	Co10024	LS	LS	LS	LS	HS	LS
5	Co10026	LS	LS	LS	LS	HS	LS
6	Co10027	LS	LS	LS	LS	MS	LS
7	CoT10366	MS	LS	LS	LS	MS	LS
8	CoT10367	LS	LS	LS	LS	MS	LS
9	Co 85004 (C)	LS	LS	LS	LS	MS	LS
10	Co 94008 (C)	LS	LS	LS	LS	MS	LS
11	CoC 671 (C)	LS	LS	LS	LS	HS	LS

IVT (Midlate)-Plant							
Sl.No.	Variety/Genotypes	ESB				Scale insect	Pyrilla
		30 DAP	60 DAP	90 DAP	120 DAP		
1	Co13005	MS	LS	LS	LS	MS	LS
2	Co13006	LS	LS	LS	LS	HS	LS
3	Co13008	LS	LS	LS	LS	HS	LS
4	Co13009	LS	LS	LS	LS	HS	LS
5	Co13011	LS	LS	LS	LS	MS	LS
6	Co13013	LS	LS	LS	LS	MS	LS
7	Co13014	LS	LS	LS	LS	MS	LS
8	Co13016	LS	LS	LS	LS	MS	LS
9	Co13018	LS	LS	LS	LS	MS	LS

10	Co13020	LS	LS	LS	LS	HS	LS
11	CoM13082	LS	LS	LS	LS	HS	LS
12	Co86032	LS	LS	LS	LS	MS	LS
13	CoN13073	LS	LS	LS	LS	MS	LS
14	CoN13074	LS	LS	LS	LS	HS	LS
15	Co99004	MS	MS	LS	LS	MS	LS
16	CoSnk13103	MS	LS	LS	LS	HS	LS
17	CoSnk13104	LS	LS	LS	LS	HS	LS
18	CoSnk13105	LS	LS	LS	LS	HS	LS
19	CoSnk13106	LS	LS	LS	LS	MS	LS
20	CoT13366	LS	LS	LS	LS	MS	LS
21	PI13131	MS	LS	LS	LS	MS	LS
22	PI13132	MS	LS	LS	LS	MS	LS

AVT (Midlate)- I Plant							
1	Co11005	LS	LS	LS	LS	MS	LS
2	Co11007	LS	LS	LS	LS	HS	LS
3	Co86032	LS	LS	LS	LS	MS	LS
4	Co11019	LS	LS	LS	LS	MS	LS
5	CoM11085	LS	LS	LS	LS	MS	LS
6	CoM11086	LS	LS	LS	LS	HS	LS
7	Co11012	MS	MS	LS	LS	HS	LS
8	Co99004	MS	LS	LS	LS	MS	LS

AVT (Midlate)- II Plant							
1	Co09009	LS	LS	LS	LS	HS	LS
2	Co10015	LS	LS	LS	LS	HS	LS
3	Co10017	MS	LS	LS	LS	HS	LS
4	Co10031	LS	LS	LS	LS	MS	LS
5	Co10033	LS	LS	LS	LS	MS	LS
6	CoM10083	LS	LS	LS	LS	MS	LS
7	CoT10368	LS	LS	LS	LS	HS	LS
8	CoT10369	LS	LS	LS	LS	MS	LS
9	CoVC10061	LS	LS	LS	LS	MS	LS
10	PI 10131	LS	LS	LS	LS	MS	LS
11	PI 10132	LS	LS	LS	LS	MS	LS
12	Co86032	LS	LS	LS	LS	MS	LS
13	Co99004	LS	LS	LS	LS	MS	LS

ESB: Early shoot borer

9. CSRS, MPKV, Paedegaon (M.S)

	IVT (Early)					IVT (Early) – I Plant				
Sl.No.	**Variety/Genotypes**	**ESB***	**INB**	**Mealy bug**	**Scale Insect**	**Variety/Genotypes**	**ESB***	**INB**	**Mealy bug**	**Scale Insect**
1	Co 13002	MS	HS	HS	MS	Co 11001	HS	MS	HS	LS
2	Co 13003	MS	HS	HS	MS	Co 11004	HS	MS	HS	LS
3	Co 13004	MS	HS	HS	HS	CoM 11081	HS	HS	HS	LS
4	CoN 13071	MS	HS	HS	MS	CoM 11082	MS	HS	HS	LS
5	CoN 13072	MS	HS	HS	LS	CoM 11084	MS	HS	HS	LS
6	CoSnk 13101	MS	HS	HS	LS	Co 85004	HS	MS	HS	LS
7	CoSnk 13102	HS	HS	HS	HS	Co 94008	HS	MS	HS	LS
8	MS 13081	HS	HS	HS	LS	CoC 671	MS	MS	HS	LS
9	Co 85004	MS	MS	HS	MS	-	-	-	-	-
10	Co 94008	HS	HS	HS	LS	-	-	-	-	-
11	CoC 671	HS	HS	HS	LS	-	-	-	-	-

IVT (Early)-II Plant						IVT (Midlate)				
Sl.No.	Variety/Genotypes	ESB*	INB	Mealy bug	Scale Insect	Variety/Genotypes	ESB*	INB	Mealy bug	Scale Insect
1	Co 10004	MS	HS	HS	LS	Co 13005	MS	HS	HS	LS
2	Co 10005	MS	HS	HS	LS	Co 13006	MS	HS	HS	LS
3	Co 10006	HS	HS	HS	LS	Co 13008	LS	HS	HS	MS
4	Co 10024	MS	HS	HS	LS	Co 13009	MS	MS	HS	HS
5	Co 10026	MS	HS	HS	LS	Co 13011	LS	HS	HS	LS
6	Co 10027	HS	MS	HS	LS	Co 13013	LS	MS	HS	LS
7	CoT 10366	MS	HS	HS	LS	Co 13014	LS	MS	HS	LS
8	CoT 10367	HS	MS	HS	LS	Co 13016	LS	HS	HS	LS
9	Co 85004	MS	LS	HS	LS	Co 13018	LS	HS	HS	MS
10	Co 94008	HS	MS	HS	LS	Co 13020	HS	HS	HS	LS
11	CoC 671	HS	MS	HS	LS	CoM 13082	LS	MS	HS	HS
12	-	-	-	-	-	CoN 13073	MS	HS	HS	MS
13	-	-	-	-	-	CoN 13074	MS	MS	HS	LS
14	-	-	-	-	-	CoSnk 13103	MS	HS	HS	LS
15	-	-	-	-	-	CoSnk 13104	MS	HS	HS	LS
16	-	-	-	-	-	CoSnk 13105	MS	HS	HS	LS
17	-	-	-	-	-	CoSnk 13106	MS	HS	HS	LS
18	-	-	-	-	-	CoT 13366	MS	HS	HS	LS
19	-	-	-	-	-	PI 13131	MS	MS	HS	LS
20	-	-	-	-	-	PI 13132	HS	HS	HS	LS
21	-	-	-	-	-	Co 86032	HS	MS	HS	LS
22	-	-	-	-	-	Co 99004	MS	HS	HS	LS

AVT (Midlate) – I Plant						AVT (Midlate)-II Plant				
Sl.No.	Variety/Genotypes	ESB*	INB	Mealy bug	Scale Insect	Variety/Genotypes	ESB*	INB	Mealy bug	Scale Insect
1	Co 11005	MS	HS	HS	LS	Co 09009	MS	HS	HS	MS
2	Co 11007	LS	HS	HS	LS	Co 10015	HS	MS	HS	MS
3	Co 11012	LS	MS	HS	LS	Co 10017	HS	MS	HS	MS
4	Co 11019	MS	MS	HS	LS	Co 10031	MS	LS	HS	MS
5	CoM 11085	LS	MS	HS	LS	Co 10033	MS	MS	HS	MS
6	CoM 11086	LS	MS	HS	LS	CoM 10083	HS	HS	HS	LS
7	Co 86032	MS	MS	HS	LS	CoT 10368	MS	HS	HS	HS
8	Co 99004	MS	HS	HS	LS	CoT 10369	MS	LS	HS	MS
9	-	-	-	-	-	CoVC10061	LS	MS	HS	LS
10	-	-	-	-	-	PI 10131	MS	HS	HS	LS
11	-	-	-	-	-	PI 10132	MS	HS	HS	LS
12	-	-	-	-	-	Co 86032	MS	LS	HS	MS
13	-	-	-	-	-	Co 99004	LS	HS	HS	HS

AVT (Midlate) –Ratoon						AVT (Early)-Ratoon				
Sl.No.	Variety/Genotypes	ESB*	INB	Mealy bug	Scale Insect	Variety/Genotypes	ESB*	INB	Mealy bug	Scale Insect
1	Co 09009	MS	MS	HS	HS	Co 10004	LS	MS	HS	HS
2	Co 10015	MS	LS	HS	MS	Co 10005	MS	MS	HS	HS
3	Co 10017	MS	LS	HS	HS	Co 10006	MS	MS	HS	HS
4	Co 10031	MS	MS	HS	HS	Co 10024	LS	MS	HS	HS
5	Co 10033	LS	MS	HS	HS	Co 10026	LS	HS	HS	HS
6	CoM 10083	MS	MS	HS	HS	Co 10027	LS	MS	HS	HS
7	CoT 10368	MS	LS	HS	HS	CoT 10366	LS	MS	HS	HS
8	CoT 10369	MS	MS	HS	HS	CoT 10367	LS	LS	HS	HS
9	CoVC10061	MS	LS	HS	HS	Co 85004	MS	MS	HS	HS
10	PI 10131	MS	MS	HS	HS	Co 94008	MS	MS	HS	HS
11	PI 10132	LS	MS	HS	HS	CoC 671	LS	HS	HS	HS
12	Co 86032	MS	MS	HS	HS	-	-	-	-	-
13	Co 99004	MS	LS	HS	MS	-	-	-	-	-

ESB*: Early shoot borer (Cumulative incidence); INB: Internode borer

10. Vasantdada Sugar Institute (VSI), Pune (M.S)

Sl. No.	IVT (Early)					AVT (Early)-I Plant				
	Variety/Genotypes	ESB*	INB	Mealy bug	Scale Insect	Variety/Genotypes	ESB*	INB	Mealy bug	Scale Insect
1	Co13002	MS	LS	MS	---	Co 11001	MS	LS	LS	---
2	Co13003	MS	LS	MS	---	Co 11004	MS	LS	LS	---
3	Co13004	HS	LS	MS	---	CoM 11081	MS	LS	LS	---
4	CoN 13071	HS	LS	MS	---	CoM 11082	LS	LS	LS	---
5	CoN 13072	HS	LS	MS	---	CoM 11084	MS	LS	LS	---
6	CoSnk 13101	HS	LS	MS	---	Co 85004 (Std.)	LS	LS	MS	---
7	CoSnk 13102	HS	LS	MS	---	Co 94008 (Std.)	HS	LS	LS	---
8	MS 13081	HS	LS	MS	---	CoC 671 (Std.)	MS	LS	LS	---
9	Co 85004 (std)	HS	LS	MS	---	-	-	-	-	-
10	Co 94008(std)	HS	LS	MS	---	-	-	-	-	-
11	CoC 671 (std)	HS	LS	MS	---	-	-	-	-	-

Sl. No.	IVT (Early)-II Plant					AVT (Early)-Ratoon				
	Variety/Genotypes	ESB*	INB	Mealy bug	Scale Insect	Variety/Genotypes	ESB*	INB	Mealy bug	Scale Insect
1	Co 10004	LS	LS	LS	---	Co 10004	LS	LS	MS	---
2	Co 10005	LS	LS	LS	---	Co 10005	LS	LS	MS	---
3	Co 10006	HS	LS	LS	---	Co 10006	LS	LS	MS	---
4	Co 10024	MS	LS	LS	---	Co 10024	LS	LS	MS	---
5	Co 10026	LS	MS	LS	---	Co 10026	LS	LS	LS	---
6	Co 10027	MS	LS	LS	---	Co 10027	LS	LS	MS	---
7	CoT 10366	LS	LS	LS	---	CoT 10366	LS	LS	MS	---
8	CoT 10367	MS	LS	LS	---	CoT 10367	LS	LS	MS	---
9	Co 85004 (Std.)	LS	LS	LS	---	Co 85004 (Std)	LS	LS	MS	---
10	Co 94008 (Std.)	HS	LS	LS	---	Co94008 (Std)	LS	LS	LS	---
11	CoC 671 (Std.)	LS	LS	LS	---	CoC 671 (Std)	LS	LS	MS	---

Sl. No.	IVT (Midlate)					AVT (Midlate)- I Plant				
	Variety/Genotypes	ESB*	INB	Mealy bug	Scale Insect	Variety/Genotypes	ESB*	INB	Mealy bug	Scale Insect
1	Co 13005	LS	LS	LS	---	Co11005	LS	LS	LS	LS
2	Co 13006	LS	LS	LS	---	Co 11007	MS	LS	LS	LS
3	Co 13008	LS	LS	LS	---	Co 11012	MS	LS	MS	LS
4	Co 13009	HS	LS	LS	---	Co 11019	LS	LS	MS	LS
5	Co 13011	MS	LS	LS	---	CoM 11085	LS	LS	MS	LS
6	Co 13013	MS	LS	LS	---	CoM 11086	MS	LS	MS	LS
7	Co 13014	MS	LS	LS	---	Co 86032 (Std)	MS	LS	MS	MS
8	Co 13016	HS	LS	MS	---	Co 99004 (Std.)	MS	LS	MS	LS
9	Co 13018	MS	LS	LS	---	-	-	-	-	-
10	Co 13020	LS	LS	MS	---	-	-	-	-	-
11	Co M 13082	LS	LS	LS	---	-	-	-	-	-
12	Co N 13073	LS	LS	LS	---	-	-	-	-	-
13	Co N 13074	MS	LS	LS	---	-	-	-	-	-
14	Co Snk 13103	MS	LS	LS	---	-	-	-	-	-
15	Co Snk 13104	LS	LS	LS	---	-	-	-	-	-
16	Co Snk 13105	MS	LS	LS	---	-	-	-	-	-
17	Co Snk 13106	HS	LS	MS	---	-	-	-	-	-
18	CoT 13366	LS	LS	LS	---	-	-	-	-	-
19	PI 13131	MS	LS	MS	---	-	-	-	-	-
20	PI 13132	HS	LS	LS	---	-	-	-	-	-
21	Co 86032 (Std.)	MS	LS	MS	---	-	-	-	-	-
22	Co 99004 (Std.)	LS	LS	LS	---	-	-	-	-	-

Sl. No.	IVT (Midlate)-II Plant					AVT (Midlate)- Ratoon				
	Variety/Genotypes	ESB*	INB	Mealy bug	Scale Insect	Variety/Genotypes	ESB*	INB	Mealy bug	Scale Insect
1	Co 09009	HS	LS	LS	LS	Co 09009	LS	LS	LS	MS
2	Co 10015	MS	LS	LS	LS	Co 10015	LS	LS	MS	LS
3	Co 10017	MS	LS	LS	LS	Co 10017	LS	LS	MS	HS
4	Co 10031	LS	LS	LS	LS	Co 10031	LS	LS	LS	LS
5	Co 10033	LS	LS	LS	LS	Co 10033	LS	LS	LS	MS
6	CoM 10083	MS	LS	MS	LS	CoM 10083	LS	LS	MS	LS
7	CoT 10368	MS	LS	MS	LS	CoT 10368	LS	LS	MS	LS
8	CoT 10369	LS	LS	LS	LS	CoT 10369	LS	LS	MS	LS
9	Co Vc 10061	LS	LS	LS	LS	Co Vc 10061	LS	LS	MS	LS
10	PI 10131	MS	LS	LS	LS	PI 10131	LS	LS	MS	LS
11	PI 10132	MS	LS	LS	LS	PI 10132	LS	LS	MS	LS
12	Co 86032 (Std)	HS	LS	LS	LS	Co 86032 (Std)	LS	LS	MS	LS
13	Co 99004 (Std)	LS	LS	LS	LS	Co 99004 (Std)	LS	LS	MS	LS

ESB*: Early shoot borer (Cumulative incidence); INB: Internode borer

11. ZARS, JNKVV, POWERKHERA (M.P.)

IVT (Early)				IVT (Early)-I Plant		
Sl.No.	Entries/Genotypes	ESB	Pyrilla	Entries/Genotypes	ESB	Pyrilla
1	Co 13002	MS	MS	Co 11001	LS	LS
2	Co 13003	LS	LS	Co 11004	LS	LS
3	Co 13004	LS	LS	Co 11081	LS	MS
4	CoN 13071	LS	MS	Co 11082	LS	LS
5	CoN 13072	LS	MS	Co 11084	LS	LS
6	Co SNK 13101	LS	MS	Co 10004	MS	MS
7	Co SNK 13102	LS	MS	Co 10005	MS	MS
8	MS 13081	LS	MS	Co 10006	MS	MS
9	-	-	-	Co 10024	LS	MS
10	-	-	-	Co 10026	MS	MS
11	-	-	-	Co 10027	MS	MS
12	-	-	-	Co 10366	LS	MS
13	-	-	-	Co 10367	LS	LS
14	-	-	-	Co 85004 (CK)	LS	MS
15	-	-	-	Co 94008(CK)	LS	MS
16	-	-	-	CoC 671(CK)	MS	MS

IVT (Midlate)				IVT (Midlate)-I Plant		
Sl.No.	Entries/Genotypes	ESB	Pyrilla	Entries/Genotypes	ESB	Pyrilla
1	Co 13005	LS	MS	Co 11005	LS	MS
2	Co 13006	LS	MS	Co 11007	LS	MS
3	Co 13008	LS	LS	Co 11012	LS	MS
4	Co 13009	LS	MS	Co 11019	LS	MS
5	Co 13011	LS	LS	CoM 11085	LS	MS
6	Co 13013	LS	MS	CoM 11086	LS	MS
7	Co 13014	MS	MS	Co 09009	LS	MS
8	Co 13016	LS	MS	Co 10015	LS	LS
9	Co 13018	LS	MS	Co 10017	LS	MS
10	Co 13020	MS	MS	Co 10031	LS	LS
11	CoM 13082	MS	MS	Co 10033	LS	MS
12	CoN 13073	LS	MS	Co 10083	LS	MS
13	CoN 13074	LS	LS	Co 10368	LS	MS
14	CoSNK 13103	LS	LS	Co 10369	LS	LS
15	CoSNK 13104	LS	MS	Co 10061	LS	MS
16	CoSNK 13105	LS	MS	Co 10131	LS	MS
17	CoSNK 13106	LS	LS	Co 10132	LS	MS
18	CoT 13366	LS	MS	Co 86032	LS	MS
19	PI 13131	MS	MS	Co 99004	LS	MS

ESB: Early shoot borer

12. MSRS, NAU, Navasari (Gujarat)

IVT (Early)							AVT (Early)-I Pant					
Sl No.	Genotype	ESB	TB*	RB	Scale insect	Mealy bug	Genotype	ESB	TB*	RB	Scale insect	Mealy bug
1	Co 13002	LS	LS	MS	-	-	Co 11001	MS	LS	LS	-	-
2	Co 13003	LS	LS	LS	-	-	Co 11004	LS	LS	MS	MS	MS
3	Co 13004	LS	LS	LS	-		CoM 11081	LS	LS	LS	-	-
4	CoN 13071	LS	LS	LS	-		CoM 11082	LS	LS	LS	-	MS
5	CoN 13072	LS	LS	MS	-		CoM 11084	MS	LS	LS	-	-
6	CoSnk 13101	LS	LS	LS	-	-	Co 85004	LS	LS	MS	MS	MS
7	CoSnk 13102	LS	LS	MS	-	-	Co 94008	MS	LS	MS	LS	LS
8	MS 13081	LS	LS	MS	-	-	CoC 671	MS	MS	MS	MS	LS
9	Co 85004 (CK)	LS	LS	MS	LS	MS	-	-	-	-	-	-
10	Co 94008(CK)	LS	LS	MS	LS	LS	-	-	-	-	-	-
11	Co C 671(CK)	LS	MS	MS	LS	MS	-	-	-	-	-	-

AVT (Early)-II Plant							AVT (Midlate)					
Sl No.	Genotype	ESB	TB*	RB	Scale insect	Mealy bug	Genotype	ESB	TB*	RB	Scale insect	Mealy bug
1	Co 10004	LS	LS	LS	LS	LS	Co 13005	MS	MS	MS	-	-
2	Co 10005	LS	LS	LS	LS	MS	Co 13006	LS	LS	LS	-	-
3	Co 10006	LS	LS	MS	LS	LS	Co 13008	LS	LS	LS	-	-
4	Co 10024	LS	LS	LS	LS	LS	Co 13009	LS	LS	MS	-	MS
5	Co 10026	LS	LS	LS	LS	-	Co 13011	LS	LS	MS	-	-
6	Co 10027	LS	LS	MS	LS	-	Co 13013	LS	LS	LS	-	MS
7	CoT 10366	LS	LS	MS	LS	-	Co 13014	LS	LS	LS	-	MS
8	CoT 10367	LS	LS	LS	LS	-	Co 13016	LS	LS	LS	-	MS
9	Co 85004	LS	LS	MS	MS	MS	Co 13018	MS	LS	MS	-	MS
10	Co 94008	MS	LS	MS	LS	LS	Co 13020	LS	LS	LS	-	MS
11	CoC 671	MS	MS	MS	MS	LS	CoM 13082	LS	LS	LS	-	-
12	-	-	-	-	-	-	CoN 13073	LS	LS	MS	-	MS
13	-	-	-	-	-	-	CoN 13074	MS	LS	MS	-	MS
14	-	-	-	-	-	-	CoSnk 13103	LS	LS	LS	-	-
15	-	-	-	-	-	-	CoSnk 13104	MS	MS	LS	-	MS
16	-	-	-	-	-	-	CoSnk 13105	LS	LS	LS	-	MS
17	-	-	-	-	-	-	CoSnk 13106	LS	LS	MS	-	MS
18	-	-	-	-	-	-	CoT 13366	MS	MS	LS	-	MS
19	-	-	-	-	-	-	PI 13131	MS	LS	LS	-	-
20	-	-	-	-	-	-	PI 13132	LS	LS	MS	-	-
21	-	-	-	-	-	-	Co 99004	LS	MS	MS	-	LS
22	-	-	-	-	-	-	Co 86032	MS	LS	MS	-	MS

AVT (Midlate) – I Plant							AVT (Midlate)-II Pant					
Sl No.	Genotype	ESB	TB*	RB	Scale insect	Mealy bug	Genotype	ESB	TB*	RB	Scale insect	Mealy bug
1	Co 11005	LS	LS	LS	-	-	Co 09009	LS	LS	LS	-	MS
2	Co 11007	LS	LS	MS	-	-	Co 10015	LS	LS	MS	-	-
3	Co 11012	LS	LS	LS	-	MS	Co 10017	LS	LS	LS	-	-
4	Co 11019	LS	LS	LS	-	MS	Co 10031	LS	LS	MS	-	-
5	CoM 11085	LS	LS	MS	-	-	Co 10033	LS	LS	LS	-	-
6	CoM 11086	LS	LS	LS	-	-	CoM 10083	LS	LS	LS	-	MS
7	Co 99004	LS	MS	MS	-	LS	CoT 10368	LS	LS	LS	-	MS
8	Co 86032	LS	LS	MS	-	MS	CoT 10369	LS	LS	LS	-	-
9	-	-	-	-	-	-	CoVC 10061	LS	LS	LS	-	MS
10	-	-	-	-	-	-	PI 10131	LS	LS	MS	-	MS
11	-	-	-	-	-	-	PI 10132	LS	LS	LS	-	-
12	-	-	-	-	-	-	Co 99004	LS	MS	MS	-	LS
13	-	-	-	-	-	-	Co 86032	LS	LS	MS	-	MS

13. ZARS, UAS, Mandya (Karnataka)

IVT (Early)					AVT(Early)-I				AVT (Early)-II			
Sl.No.	Genotype	ESB	TB	INB	Genotype	ESB	TB	INB	Genotype	ESB	TB	INB
1	Co 13071	LS	LS	LS	Co11004	LS	LS	LS	Co 10005	LS	LS	LS
2	CoSnk13101	LS	LS	LS	CoM11082	LS	LS	LS	Co 10026	LS	LS	LS
3	CoSnk 13102	LS	LS	LS	CoM11084	LS	LS	LS	Co 10027	LS	LS	LS
4	MS13081	LS	LS	LS	-	-	-	-	CoT 10367	LS	LS	LS

IVT (Midlate)					AVT(Midlate)-I Plant				AVT (Midlate)-II Plant			
Sl.No.	Genotype	ESB	TB	INB	Genotype	ESB	TB	INB	Genotype	ESB	TB	INB
1	Co 13008	LS	LS	LS	Co11019	LS	LS	LS	Co 10033	LS	LS	LS
2	Co13013	LS	LS	LS	CoM 11085	LS	LS	LS	PI 10131	LS	LS	LS
3	Co 13020	LS	LS	LS	CoM11086	LS	LS	LS	PI 10132	LS	LS	LS
4	-	-	-	-	-	-	-	-	CoVC 10061	LS	LS	LS

14. ICAR-SBI, Coimbatore (T.N.)

IVT (Early)					AVT (Early)- I Plant			
Sl.No.	Genotype	ESB	INB*	TB	Genotype	ESB	INB*	TB
1	Co 13002	HS	-	LS	Co 11001	HS	HS	LS
2	Co 13003	HS	-	LS	Co 11004	HS	HS	LS
3	Co 13004	HS	-	LS	CoM 11081	HS	HS	LS
4	CoN 13071	HS	-	LS	CoM 11082	HS	HS	LS
5	CoN 13072	HS	-	LS	CoM 11084	HS	HS	LS
6	CoSnk 13101	HS	-	LS	CoC 671	-	MS	LS
7	CoSnk 13102	HS	-	LS	Co 85004	-	MS	LS
8	MS 13081	HS	-	LS	Co 94008	-	HS	LS
9	CoC 671	HS	-	LS	-	-	-	-
10	Co 85004	HS	-	LS	-	-	-	-

IVT (Early)-II Plant					AVT (Midlate)			
Sl.No.	Genotype	ESB	INB*	TB	Genotype	ESB	INB*	TB
1	Co 10004	HS	-	LS	Co 13005	HS	HS	LS
2	Co 10005	HS	-	LS	Co 13006	HS	HS	LS
3	Co 10006	HS	-	LS	Co 13008	HS	HS	LS
4	Co 10024	HS	-	LS	Co 13009	HS	HS	LS
5	Co 10026	HS	-	LS	Co 13011	HS	HS	LS
6	Co 10027	HS	-	LS	Co 13013	HS	MS	LS
7	CoT 10366	HS	-	LS	Co 13014	HS	HS	LS
8	CoT 10367	HS	-	LS	Co 13016	HS	HS	LS
9	Co 94008	HS	-	LS	Co 13018	HS	HS	LS
10	Co 671	-	-	LS	Co 13020	HS	HS	LS
11	Co 85004	-	-	LS	CoM 13082	HS	HS	LS
12	-	-	-	-	CoN 13073	HS	HS	LS
13	-	-	-	-	CoN 13074	HS	HS	LS
14	-	-	-	-	CoSnk 13103	HS	HS	LS
15	-	-	-	-	CoSnk 13104	HS	HS	LS
16	-	-	-	-	CoSnk 13105	HS	HS	LS
17	-	-	-	-	CoSnk 13106	HS	HS	LS
18	-	-	-	-	CoT 13366	HS	HS	LS
19	-	-	-	-	PI 13131	HS	HS	LS
20	-	-	-	-	PI 13132	HS	HS	LS
21	-	-	-	-	Co 86032	-	HS	LS
22	-	-	-	-	Co 99004	-	HS	LS

AVT (Midlate)- I Plant					AVT (Midlate)- II Plant			
Sl.No.	Genotype	ESB	INB*	TB	Genotype	ESB	INB*	TB
1	Co 11005	HS	HS	LS	Co 09009	HS	HS	LS
2	Co 11007	HS	HS	LS	Co 10015	HS	HS	LS
3	Co 11012	HS	MS	LS	Co 10017	HS	HS	LS
4	Co 11019	HS	HS	LS	Co 10031	HS	HS	LS
5	CoM 11085	HS	HS	LS	Co 10033	HS	HS	LS
6	CoM 11086	HS	HS	LS	CoM 10083	HS	HS	LS
7	Co 99004	-	HS	LS	CoT 10368	HS	HS	LS
8	Co 86032	-	HS	LS	CoT 10369	HS	HS	LS
9	-	-	-	-	CoVc 10061	HS	HS	LS
10	-	-	-	-	PI 10131	-	HS	LS
11	-	-	-	-	PI 10132	HS	HS	LS
12	-	-	-	-	Co 86032	-	HS	LS
13	-	-	-	-	Co 99004	HS	HS	LS

East Coast Zone

15. RARS, ANGRAU, ANAKAPALLE (A.P.)

IVT Early				IVT(Midlate)			AVT (Early)- I Plant		
Sl.No	Genotype	ESB	INB	Genotype	ESB	INB	Genotype	ESB	INB
1	Co A 14 321	LS	HS	Co A 14 323	LS	HS	Co A 13 322	LS	HS
2	Co A 14 322	LS	HS	Co A 14 324	LS	MS	Co A 13 323	LS	HS
3	Co C 14 336	LS	HS	-	-	-	Co C 13 336	LS	MS
4	-	-	-	-	-	-	Co C 13 337	LS	HS
5	-	-	-	-	-	-	Co V 13 356	LS	MS

AVT (Midlate)- I Plant				AVT(Early)-II Plant		
Sl.No	Genotype	ESB	INB	Genotype	ESB	INB
1	Co C 13 339	LS	HS	Co A 12 321	LS	LS
2	Co Or 13 346	LS	LS	Co A 12 322	Ls	MS
3	-	-	-	Co A 12 323	LS	HS
4	-	-	-	Co C 12 336	LS	HS
5	-	-	-	Co Or 12 346	LS	HS
CK				Co A 99082 (93A 145) (ESB & INB)	MS	HS
				Co A 92081 (87A 298) (Scale insect)	MS	HS

IVT (Early)- R				IVT(Midlate)-R		
Sl.No	Genotype	ESB	INB	Genotype	ESB	INB
1	Co A 13321	LS	HS	Co A 13 326	LS	HS
2	Co A 13322	MS	HS	Co A 13 327	LS	HS
3	Co A 13323	LS	HS	Co A 13 328	LS	HS
4	Co A 13324	LS	HS	-	-	-
CK				Co A 92081 (87A 298)	LS	HS
				Co A 99082 (93A 145)	MS	HS

ESB: Early shoot borer; INB: Internode borer

E.28 : Survey and surveillance of sugarcane insect pests

NORTH WEST ZONE

1. Regional Research Station, PAU., Kapurthala (Punjab)

The incidence of early shoot borer, top borer, stalk borer and root borer ranged from 4-5, 3-4, 6-7 and 4-5 per cent, respectively in different varieties of sugarcane *viz.*, Co 238, CoJ 85, Co 89003 and CoJ 88 at different cane growing areas of Punjab. The incidence of pyrilla, mite and black bug were found 7-8, 5-6 and 7-8 per cent, respectively on different varieties *viz.*, CoJ 85, Co 238, Co 89003, CoJ 64 and CoJ 88 in cane growing area of Dasuya, Mukerian, Phagwara, Batala,

Gurdaspur, Ajnala, Nakodar, Dhuri, Amloh, Fazilka, Mukatsar, Faridkot, Budhewal, Ludhiana and Morinda. The incidence of whitefly was found to traces to low in prevailing locations.

2. Regional Research Station, Uchani Dist- Karnal (Haryana)

Survey of insect-pests during pre-monsoon season revealed that in Sugar Mill Zone Karnal, a low to moderate incidence of termites (4.5-12.4%) in plant crop in varieties Co 89003, Co 0238, Co 0118, Co 05011 and CoH 160 was observed in sandy soils. The low to moderate incidence of pink stem borer, *Sesamia inferens* was observed during month of March to first fortnight of April. A moderate incidence of thrips (6-11%), low to moderate incidence of early shoot borer (2.8-12.4 %) and low incidence of top borer (2-3 %) was observed in plant and ratoon crop in varieties CoJ 85, Co 89003, Co 0238, Co 0118, Co 05011, CoS 8436, CoP84212 and CoH 160. During monsoon season in Karnal sugar mill zone, top borer incidence was observed as low to moderate and stalk borer had moderate incidence in Co 0238, Co 89003, Co 05011, CoS 8436, CoP 84212 and CoH 160 varieties of sugarcane. However, black bug population was recorded low to high (8-36 bugs/whorl) in plant and ratoon crop. The incidence of root borer was low to moderate (8-17%) and low to moderate (1-4 grub/m^2) incidence of white grub in sandy soils.

3. ICAR-SBI Coimbatore Regional Centre, Karnal (Haryana)

The incidence of these two pests found increasing severely where pink borer and internode borer incidence was 60.0 and 10.0 per cent, respectively in Haryana. Early shoot borer, top borer, root borer, stalk borer, pyrilla, mealy bug, mites, black bug, white grubs and termites were identified as major pests in U.P and Uttarakhand. Whereas, early shoot borer, pink borer, internode borer, top borer, root borer, stalk borer, pyrilla, black bug and mites and mealy bug were listed as major insect pests of sugarcane in Haryana. The incidence of leaf webbing mite was recorded as sporadic pest however leaf sheath blister mites listed as regular pest of sugarcane under the zone. Blister mite incidence was 91.7, 76.0 and 22.0 per cent in U.P, Uttarakhand and Haryana, respectively.

4. U.P. Council of Sugarcane Research, Shahjahanpur (U.P.)

During hot weather, the incidence of early shoot borer was low and ranged from 4.50 per cent (Rosa factory zone) to 9.00 per cent (Tilhar factory zone). The per cent incidence of top borer was recorded low to moderate in all surveyed sugar factory zones. The minimum (5.00%) incidence of top borer was recorded around Kumbhi sugar factory zone while maximum (11.00%) around Tilhar factory zone. The infestation of stalk borer was recorded low in all surveyed factory zone. It ranged from 10.50 per cent on cane basis 2.85 per cent intensity around Hargaon factory zone to 17.50 per cent on cane basis with 5.04 per cent intensity around Rosa factory zone. The occurrence of *Epiricania melanoleuca* was traces in most of the fields.

5. ICAR-IISR, Lucknow (UP)

During the year 2016-17, insect survey was conducted in command areas of USDM, Ltd. Shamli, DSCL Sugar-Hariawan and Loni, The Simbhaoli Sugar Ltd., Chilwaria in U.P. The incidence of top borer (II brood), ESB, web mite, white grub were observed as 2-8%, 2-3%, 3-6% , 10-20% and 1-4%, respectively in variety Co 0238 in different villages of USDM, Shamli. White grub (8-10%) was observed in varieties Co 89003, Co 05011 and Co 95422 in DSCL-Hariawan and Loni. The incidence of root borer was increasing and was around 5 per cent in Chilwaria areas with one location of heavy patch of root borer incidence (20%).

NORTH CENTRAL & EASTERN ZONES

6. SRI, RAU, Pusa (Bihar)

The per cent incidence of early shoot borer (5.5 to 11.5%), root borer (3 to 6%), top borer (10.5 to 17.5%), stalk borer (below 5%), army worm (6.5 to 15.5%) and pyrilla (6.5 to 19) per leaf were observed as the key pests of sugar factory reserved area of sugarcane. The incidence of other pests *viz.*, plassey borer, mealy bug, termite, grass hopper, scale insect, whitefly, etc. were also recorded in traces. Besides, sugar mills reserved area, a roving survey was also conducted at sugarcane field in and around Pusa at monthly interval. The per cent incidence of early shoot borer, root borer, top borer and stalk borer were varied from 2.0 to 9.0%, 2.0 to8.0% and 5.0 to 16.0%, and 1.0 to 7.0%, respectively.

7. G.S. Sugarcane Breeding and Research Station, Seorahi (U.P.)

During hot weather, the incidence of early shoot borer was low and ranged from 3.50% in Balrampur factory zone to 6.00% in Seorahi factory zone. The per cent incidence of top borer was recorded low in all surveyed factory zone. The minimum (7.00%) incidence of top borer was recorded in Ramkola factory zone while maximum (11.50%) around Khadda factory zone. The infestation of stalk borer was observed low in all surveyed factory zone.

PENINSULAR ZONE

8. SRS, Dr. PDKV, Akola (M.S.)

During the survey programme, the incidence of internode borer was 12.00-16.0 per cent in Wardha, Yavatmal and Telhara area. The per cent incidence of pyrilla was recorded as low to moderate in all surveyed area (12.0%). The

incidence of early shoot borer was 20.34 per cent in above areas. The incidence of internode borer was 8.00-16.0 per cent in Nagpur and Bhandara area. The incidence of pyrilla was observed low and ranged from 8.00 to 12.00 per cent in Nagpur and Bhandara area.

9. CSRS, MPKV, Padegaon (M.S.)

The early shoot borer was key pest of this area and per cent insect infestation was highest in *suru* planting than *adsali* and *preseasonal*. The incidence of early shoot borer ranged 8.00 to 31.20 per cent (Av. 11.00%). The per cent incidence of internode borer ranged from12.60 to 22.00 and intensity ranged from 1.80 to 5.20 per cent. The incidence of mealy bug was ranged from 10.20 to 22.60 per cent, whereas intensity ranged from 1.60 to 4.0 per cent.

10. Vasantdada Sugar Institute (VSI), Pune (M.S.)

The data revealed that per cent incidence of early shoot borer was ranged from 0.00 to 36.36 per cent, while it was maximum 36.36 per cent in variety VSI 08005. The per cent incidence of internode borer was ranged from zero to 40.00 per cent, while it was maximum 40 per cent in variety CoM 10001. The per cent incidence of mealy bug was ranged from 0.00 to 20.00 per cent, while it was maximum 20.00 in Co 86032.

11. ZARS, JNKVV, Powarkheda (M.P.)

The pyrilla and early shoot borer were key insect pests, while the top shoot borer, root borer, pink stem borer, whitefly, mealy bug and scale insect were minor insect pests of sugarcane. The highest infestation of early shoot borer and pyrilla was recorded at Bankhedi sugar factory area.

12. MSRS, NAU., Navsari (Gujarat)

The incidence of early shoot borer and top borer was ranged from 5.0 to 10.0 per cent in Co 86032, Co 97009 (MC 707), Co 86032, Co 86002 and CoM 0265, respectively. Whitefly incidence varied from 8.0 to 60.0 per cent in plant sugarcane and in ratoon it was about 90.0 per cent. The incidence of root borer was increased in the area and varied from 5.0 to 18.0 per cent. The rodent damage was ranged from 5.0-10.0 per cent.

13. ZARS, UAS, Mandya (Karnataka)

The internode borer and woolly aphid registered highest level of incidence. Overall insect pest activity was moderate to high during the year.

14. ICAR-SBI, Coimbatore (T.N.)

The incidence of internode borer was ranged from 15.0 to 20.0 per cent (Av. 17.5%) (M/s Amravathi Sugars, Udumalpet factory zone) in Co 86032. The per cent incidence of mealy bug was recorded as 10.0 to 20.0 per cent (Av. 15.0%).

EAST COAST ZONE

15. RARS, ANGRAU, Anakapalle (A.P.)

The incidence of early shoot borer was ranged between 4.0-47.0% in different sugarcane growing areas due to high day temperatures coupled with low relative humidity during the months of March and April. The incidence of internode borer was relatively low to moderate (5-50%). The moderate to severe incidence of whitefly (10-39N and P/2.5cm^2) was observed in many ratoon planted crops in Chodavaram division of Visakhapatnam district. The incidence of red mite was ranged between 5-36% and termite incidence was 12-40% in different sugarcane growing areas.

Insect-pest	Location	Incidence (%)	Varieties affected	Any other information
1. Kaputhala (Punjab)				
Termite	Mukerian, Dasuya, Gurdaspur and Fazilka	1-2	CoH 89003, CoJ 64 , Co 238	In sandy soil termite attack was more
Early shoot borer	Faridkot,Phagwara,Bhogpur, Dasuya,Dhuri,Fazilka	4-5	Co 238,CoJ 85,Co 89003,CoJ 88	-
Top borer	Budhewal,Gurdaspur,Nakodar, Batala,Amloh,Nawanshahar	3-4	Co 238,CoJ 85,Co 89003	-
Root borer	Mukerian,Dasuya,Dhuri, Kapurthala,Gurdaspur Batala	4-5	Co 238,CoJ 88,CoJ 85	-
Stalk borer	Ajnala,Budhewal,Nawanshahar,Gurdaspu, Amloh, Nakodar,Morinda,Phagwara	6-7	Co 238,CoJ 85, CoJ 64,Co 89003	-
Pyrilla	Dasuya,Mukerian,Phagwara,Batala,Gurdas pur,Ajnala,Nakodar	3-4/leaf (7-8%)	CoJ 85,Co 238	-
White fly	Morinda,Dhuri	Traces	CoJ 85,Co 238	-
Mite (*Oligonychus indicus*)	Dhuri,Amloh,Fazilka,Mukatsar,Faridkot	5-6/cm square (5-6%)	CoJ 85, Co 238, Co 119	-
Black bug	Budhewal,Ludhiana,Phagwara,Ajnala,Dhu ri,Morinda	3-4/Plant (7-8%)	Co 238,CoJ 85, CoJ 88,Co 89003	Black bug incidence more in sugarcane ratoon crop

2. Haryana				
Termite Pink stem borer Thrips Shoot borer Black bug Top borer	Mill zone of Karnal	4.5 -12.4 2.0-8.0 6-11 2.8-12.4 4-12 bugs/whorl 2-3	Co J 85, Co 89003, Co 0118,CoH 160,Co 0238, Co 05011, CoS 8436 & CoP 84212	Pre-monsoon
Top borer Stalk borer Black bug Webbing mite Root borer White grub	-do-	3-8 12.5-22.3 8-36 bugs/whorl 10-74% leaves infested 8-17 1-4 grub/m^2	Co 0238,Co 89003,CoH160, Co05011,CoS8436, & CoP 84212	Monsoon
Stalk borer Root borer Whitefly White grub Pyrilla Black bug Top borer	-do-	8.5-27.4 7.2-20.4 0-14.6 nymphs & puparia/2.5 cm^2 3-7 grubs/m^2 0.1-1.0 nymphs/ adults/leaf 16-43 bugs/whorl 2-5	- Co 89003, Co 0238,CoH 160, Co 05011, CoP 84212 Co J 85, CoH 119 & Co 0118	Post monsoon
Webbing mite Whitefly Black bug	Mill zone of Yamuna Nagar	14-52 leaves infested 2-5 nymphs & puparia/2.5 cm^2 12-39 bugs/whorl	Co 89003, Co 0238 & Co 05011	Monsoon
3. Uttar Pradesh				
Early shoot borer Top shoot borer Stalk borer Pyrilla	Nawabganj (Bareilly)	5.50 6.50 12.50 9.00/leaf	Co 0238, Co 98014, CoSe 01434 CoS 08279	-
Early shoot borer Top shoot borer Stalk borer Pyrilla	Hargaon (Sitapur)	7.00 6.00 10.50 7.50/leaf	Co 0238, Co 0118, CoS 08272, CoS 8436 CoLk 94184	-
Early shoot borer Top shoot borer Stalk borer Pyrilla	Kumbhi (Kheri)	6.50 5.50 13.50 9.50/leaf	Co 0238 CoSe 01434 CoS 08279 Co 0118	-
Early shoot borer Top shoot borer Stalk borer Pyrilla	Rosa (Shahjahanpur)	4.50 6.50 17.50 9.00/leaf	Co 0238 Co 0118 CoS 08279 CoLk 94184, Co 98014	-
Early shoot borer Top shoot borer Stalk borer Pyrilla	Khambarkhera (Kheri)	7.50 7.00 15.00 8.50/leaf	Co 0238, Co 0118, Co 98014, CoLk 94184, CoS 08279	-
Early shoot borer Top shoot borer Stalk borer Pyrilla	Maqsudapur (Shahjahanpur)	6.00 5.50 11.00 8.50/leaf	Co 0238, Co 0118, Co 98014, CoS 8436	-
Early shoot borer Top shoot borer Stalk borer Pyrilla	Tilhar (Shahjahanpur)	9.00 11.00 17.00 11.00/leaf	Co 0238, Co 0118, CoS 8436, CoS 767	-

Early shoot borer Top shoot borer Stalk borer Pyrilla	Sultanpur	7.00 9.00 13.50 9.50/leaf	Co 0238, Co 0118, CoSe 98231 CoS 767	-
Early shoot borer Top borer Stalk borer Root Borer	Seorahi	6.00 8.50 11.00 4.00	Co0238,0118,98014 ,CoS08272, 08279, CoSe01434, 08452,92423 , CoLk 94184	-
Early shoot borer Top borer Stalk borer Root Borer	Mankapur	5.00 9.00 7.00 5.00	Co 0238, 0118,5011, 0239, UP 05125	-
Early shoot borer Top borer Stalk borer Root Borer	Balrampur	3.50 10.00 9.50 7.00	Co 0238,0239,CoLk 94184, CoS.88230,767,8436,9 7261CoSe 01434,92423 CoJ 88	-
Early shoot borer Top borer Stalk borer Root Borer	Ramkola	4.00 7.00 17.50 12.50	Co 0238,0118 CoP 9301, UP 9530, CoSe 92423, CoSe 01434, CoS 8432&, CoLk 94184 BO 110	-
4. Bihar				
Root borer Shoot borer Top borer Pyrilla	Kalyanpur	3.0 11.50 17.50 12.50/leaves	BO 130, CoSe 95422, CoP 2061, Co 238	-
Pyrilla Shoot borer Root borer	Masina	19.00/leaves 9.50 6.00	CoP 9301, Co 235, BO 153	-
Pyrilla Army warm	Chhatneshwar	15.00/leaves 9.00	Co 239, BO 91, CoP 12436	-
Pyrilla Top borer Army warm Shoot borer Stalk borer Root borer	SRI, Pusa	6.50/leaves 15.00 6.50 7.50 2.50 3.50	BO 91, Co 238, CoVS 13102, BO 130, CoP 2061, CoP 9301	-
Army warm Top borer Shoot borer	Jatmalpur	15.5 12.0 7.50	BO 91, BO 130, CoVS 13102, Co 235	-
5. Maharashtra				
Internode borer Pyrilla	Jalgaon Tal. Arvi Dhanoli Tal. Karanja Talegaon Farm Tal. Talegaon	12-16 7.48/leaf	Co-265	-
White fly	Chikali Tal. Darvha Dist. Yavatmal	20-24/cm^2	Co 86032	
Pyrilla Internode borer	Sawali Tal. Kamthi Dist. Nagpur	13.35/leaf 12.00		
Internode borer Pyrilla	Wadoda Tal. Kamthi Dist. Nagpur	8-16 13.88/leaf	Co-265 Co86032	
Internode borer Pyrilla	Devhada Tal. Tumsar Dist. Bhandara	8-12 4.40/leaf	Co-03102 Co-92005 NR-9805 Co-86032	

Internode borer	Madgi Tal. Tumsar	12-16	Co-92005	
Pyrilla	Sukdi Tal. Tumsar	27.90-29.43/leaf		
Internode borer Pyrilla	Mahakal Tal Wardha	12.00 4.40-5.35/leaf	Co-86032	
Internode borer Pyrilla	Jamni Tal. Deoli	8.0 2.45/leaf	CoVSI- 8005 Co-265	
Early shoot borer	Pune	0- 36.36	VSI 08005	
Internode borer		0-40.00	CoM 10001	
Mealy bug		0-20.00	Co 86032	
Early shoot borer Top shoot borer Internode borer Root borer	HOL (Baramati), Padegaon (Phaltan), Padegaon (Khandala), Katewadi (Baramati), Pimpre	11.00 0.10 15.40 2.50	Co 86032 CoM 0265 MS 10001	Katewadi
6. Gujarat				
White fly	Ganpatpara, Vebhardi, Mangrol, Karmal,Nishaliya,Alampuraand Karjan, (Vadodara sugar factory)	40 - 60	Co 86032 Co 86002 Co M 265 MC 707	April-2016
		> 90	Co 86032 CoM 0265 (ratoon)	
	Other villages surrounding to Vadodara sugar factory	30 -35	Co 86032 CoM 0265	April-2016
	Valvada,Butwada and Vanskui, Mahuva Sugar factory	8-15	Co 86032 Co 86002	Feb-2016
	Dungar, Chikhali, Ten,Movasa and Kharvasa village, Bardoli sugar factory	20 - 40	CoM 0265 Co 86032 Co86002	Aug-2016
	Mohni,Kharvasa,Magob and surrounding villages of Chalthan Sugar factory	10 - 20	Co 86032 CoM 0265	Jan-2016
Early shoot borer & Top borer	Kachholi, Gandevi, Vanzana and Surkhai. Gandevi sugar factory	5 - 10	Co 97009 (MC- 707) CoC 671 Co 86032 CoN 07072 CoM 0265	Jan-2016
Root borer	Chalthan sugar **:**Mohni,Niyol,Magob and surrounding villages Vihan, Rundh Vaktana, Vanz and Vav. Kamrej sugar **:** Kanyasi, Navi Pardi, Karjan, Ghala and Bodhan.	10 - 18 5 - 10	CoM 0265 Co 86002 Co86032	May-2016
Woolly aphid	Valvada,vanskui and Butwada Madhi sugar factory	2 - 3	Co 86032 (R)	-
7. Madhya Pradesh				
Early shoot borer	Bankhedi, Hoshangabad, Kareli and Gadarwara	9.80-14.20	Co 86032, Co J 64, Co M 265 Co 0238 , CoVSI 3102, Co 7318, Co 6304, CoC 671, CoJN 86 141, CoJN 86-600 and Co 99004	
Pyrilla	Bankhedi, Hoshangabad, Kareli and Gadarwara	4.34-11.42		
8. Karnataka				
Early Shoot Borer	Mandya	2.90 – 37.80	-	-
Top Shoot Borer		0.63 – 13.50	-	-
Internode borer		19.25 – 57.25	-	-
Pyrilla		<0.50 adult / nymph / clump	-	-
Mealy bug		24.50 setts	-	-
Woolly aphid		20-50%leaf area	-	-
Mite		16 – 48	-	-
Root grub		2- 3 grubs/clump	-	-

9. Andhra Pradesh			
Early shoot borer Root borer Top shoot borer Internode borer *Pyrilla* Scale insect Mealy bug) Red Mite Termite	Navabharat Ventures Pvt., Ltd., Samalkot, East Godavari district	17.00 3.00 5.00 22.50 7.50/leaf 25.00 10.00 16.00 10.00 5.00	87 A 298, 86 V96, 2003 V 46 Co 86032
Early shoot borer Internode borer *Pyrilla* Whitefly (per 2.5sq.cm.) Mealy bug Woolly aphid Scale insect Red mite Termite	Chodavaram sugar factory operational area, Visakhapatnam dt.	21.00 30.00 4.00/leaf 24.50 7.50 1.00 12.50 21.00 27.50	Co7219, 87 A 298 , Co 62175, 2001 A 63 & Co7805
Early shoot borer Internode borer *Pyrilla* Whitefly Termite Derbid plant hoppers Mealybug scale insect Red mite	Thummapala Sugar factory area, Anakapalle, Munagapaka villages of Visakhapatnam district	30.00 22.50 6.00/leaf 16.00 16.00 6.00/leaf 7.00 17.50 20.50	87 A 298, 2001 A 63, 93 A 145, Co7219, 81 V 48, Co 62175 &Co7805
Early shoot borer Top shoot borer Internode borer *Pyrilla* Whitefly Woolly aphid Scale insect (incidence)	Sri Sarvaraya sugars Ltd., Chelluru, East Godavari dt.	16.50 2.00 30.00 9.50/leaf 12.50 1 12.50	87 A 298, Co 7805, 2003 V46, Co 86032, 2001 A 63
9. Tamil Nadu			
Mealybug	Annur M/s Bannari Amman Sugars, Sathyamangalam	5-10 15.0	
Top borer	Telungupalayam	2.5	
INB RB	M/s Amravathi Sugars, Udumalpet M/s Bannari Amman Sugars, Sathyamangalam	5-17.5 7.5	Co 86032

Project E. 30 : Monitoring of insect-pests and bio-agents in sugarcane agro-ecosystem

NORTH WEST ZONE

1. Regional Research Station, PAU., Kapurthala (Punjab)

The early shoot borer incidence started from 2nd week of April and reached its peak level (12.6%) in 2nd week of May which thereafter, declined to 1.8 per cent in the 2nd week of July. The parasitoid *viz.*, *Trichogramma sp*. and *Stenobracon sp*. were recorded as 2.0 and 3.6 per cent, respectively in the month of April and 4.0 and 4.9 per cent, respectively in the month of May. The top borer incidence started from month of May and reached to its peak level of 13.0 per cent in 2nd week of July. Thereafter, top borer incidence decreased to 1.0 per cent in the 1st fortnight of September. The bio-agents *viz.*, *Rhaconotus sp*., *Isotima javensis* and *Stenobracon sp*. were recorded as 3.6, 3.1 and 5.0 per cent in the month of June, respectively; 5.5, 4.2 and 6.0 per cent in the month of July, respectively and 2.0, 2.1 and 3.1 per cent in the month of August, respectively. The stalk borer incidence started from 2nd week of September and reached to its peak level of 11.0 per cent in the month of November and thereafter stalk borer incidence declined. The parasitization by bio-agents *viz.*, *Sturmiopsis inference* and *Cotesia flavipes* were

observed as 2.0 and 1.0 per cent in the month of September, respectively and again *Sturmiopsis inference* and *Cotesia flavipes* were observed as 3.5 and 2.0 per cent in the month of October and 5.0 and 3.5 per cent in the month of November, respectively. The activity of pyrilla on sugarcane initiated from 2nd week of July and continued up to first fortnight of October. The activity of bio-agent *viz.*, *Epiricania melanoleuca* was 4.8 per cent parasitization observed in the month of August, 6.0 per cent was observed in the month of September, and 3.5 per cent observed in month of October.

2. Regional Research Station, Uchani Dist- Karnal (Haryana)

The infestation by pink stem borer pest ranged from 1.2 to 7.9 per cent during March to April, 2016. During formative phase of crop (April-June), early shoot borer, *Chilo infuscatellus* was the major pest sugarcane variety Co 0238 during pre-monsoon period. The damage occurrence of shoot borer was started in first fortnight of April, its incidence being relatively low in end April (1.4%). During month of May, shoot borer incidence increased to a maximum of 5.6 per cent. During month of June, shoot borer incidence reached to a maximum of 7.8 per cent. The incidence of shoot borer species was noticed to decline subsequently and was recorded 6.8 per cent (cumulative incidence). Top borer infestation was observed to begin in mid May with an infestation level reaching 6.3 per cent in end October. The infestation was raised with second brood as 4.7 per cent in end July and it increased (5.4%) by end August (third brood) and 6.2 per cent in last week of September (fourth brood). The infestation of this borer species in variety Co 0238 was 6.2 per cent during September when the pest reached the fifth brood. During month of September, stalk borer incidence started increasing and reached to a maximum of 1.8 infestation index during months of February-March. The incidence of root borer was noticed during month of July (12.8 %). During August its population reached to 13.6 per cent and thereafter population of root borer increased gradually and reached to a maximum of 24.5 per cent during month of March. The parasitism by *Trichogramma chilonis* of top and stalk borer eggs by egg parasitoid was recorded as 2.1 and 2.4 per cent, respectively. The parasitism by *Isotima javensis, Cotesia flavipes and Beauveria bassiana* of top borer larvae was 5.2, 5.6 and 7.4 per cent, respectively. In case of stalk borer, parasitism by *Sturmiopsis inferens, Cotesia flavipes* and *Beauveria bassiana* was 5.8, 6.2 and 5.8 per cent, respectively during post monsoon season. The larvae of root borer collected from field showed parasitism to the extent of 4.8 per cent by *Beauveria bassiana* during month of September. A natural parasitism (4.6%) of whitefly nymphs by *Encarsia sp.* was also observed.

3. ICAR-SBI Coimbatore Regional Centre, Karnal (Haryana)

The root borer and termite incidence was 27.0 and 12.0%, respectively. The population of pyrilla was recorded as 7.0/ leaf. Pink borer emerged as a major insect pest of sugarcane. The cumulative incidence of pink borer was seen from shoot stage to harvest of the crop (80.0%). It was also observed that black bug; an insect pest of sugarcane ratoon, infest the sugarcane crop during May to October. The population of black bug was up to 117.0 /tiller/cane. Stalk borer incidence, intensity and infestation index were 76.3%, 10.0% and 7.7, respectively. The bio agent's *viz.*, *Epiricania melanoleuca*, identified as an effective parasitoid of pyrilla nymphs and adult's with 71.2 per cent parasitization. *Tetrasticus pyrillae* identified as an egg parasitoid of pyrilla with 43.3 per cent parasitization of pyrilla egg masses. *Isotima javensis* and *Stenobracon deesae* were identified as top borer larval parasitoids with 4.3 and 4.8 per cent parasitism, respectively. *Cotesia flavipes* identified as a parasitoid of stalk borer with 12.3 per cent stalk borer larvae during the month of February to April month.

4. U.P. Council of Sugarcane Research, Shahjahanpur (U.P.)

The incidence of early shoot borer was recorded as maximum 8.50 per cent during 24th SMW followed by 7.62 per cent, 5.10 per cent and 4.15 per cent during 20th, 16th and 29th SMW, respectively. The incidence of top borer was recorded as maximum 7.30 per cent during 35th SMW followed by 5.80 per cent, 4.85 per cent, 3.60 per cent and 2.00 per cent during 31st , 26th, 22nd and 38th SMW, respectively. The per cent incidence of stalk borer (on cane basis) was observed to be maximum 26.50 per cent during 43rd followed by 18.20% during 38th SMW, respectively. The bio-agents *viz.*, *Telenomus beneficiens, Isotima javensis, Rhaconotus scirpophagae* and *Stenbracon deesae* were recorded as major parasitoids of top borer. *Cotesia flavipes*, a larval parasitoid of stalk borer was also recorded from fields. The parasitisation of top borer by *Rhaconotus scirpophagae* was recorded minimum (2.65%) during 26th SMW which increased up to 7.00 per cent during 35th SMW thereafter decreases up to 3.50 per cent during 38th SMW. The parasitisation of *Stenobracon deesae* was ranged from 3.62 per cent during 31st SMW to 6.35 per cent during 38th SMW. The parasitisation of stalk borer larvae by *Cotesia flavipes* was recorded maximum 13.20 per cent during 43rd SMW.

5. ICAR- IISR, Lucknow (U.P.)

The incidence of termite was in traces. The incidence of top borer II, III and IV brood was 0.16 -1.33, 1.11 - 16.67 and 6.09 - 12.00 per cent, respectively. The incidence of root borer

was 26.67 to 58.82 per cent in July and in the month of September with 50.00 to 88.89 per cent. The incidence of internode borer was 14.11 to 40.00 per cent. The incidence of stalk borer was 0.0-5.00%. The incidence of *Pyrilla perpusilla* was low and its parasitoid *Fulgoraesia* (*Epiricania) melanoleuca* was active in nature. The incidence of mealy bug was 100 per cent. No incidence of whitefly was seen in the field. The population of black bug varied from 2-17/cane. The parasitisation (in parentheses) by *Telenomus beneficiens* 25.58-63.88 (Av. 39.03% on egg mass basis), *Stenobracon sp*. (1.66-5.00%), *Rhaconotus sp*. (28.33-1.6%), *Isotima javensis* (10.00-12.5%) was observed. The cocoons of *Epiricania melanoleuca* on per leaf basis varied from 1-5 in the month of August and 5-10 in the month of October. Predatory fauna comprising of Coccinellids, spiders and ants were noticed in the field at different stages of the crop.

NOTH CENTRAL & EASTERN ZONES

6. SRI, RAU, Pusa (Bihar)

The data on monitoring of insect pests and their bio-agents revealed that the mean per cent incidence of root borer, shoot borer, top borer and stalk borer were varied from 1.8 to 10.2%, 2.0 to 14.3%, 1.0 to 16.7% and 2.0 to 5.3% respectively. The incidence of sugarcane pyrilla was varied from 1.0 to 17.9/leaf. The bio-agents of root and early shoot borer were not observed during cropping season. The parasitization of bio-agents such as, *Apantelis flavipes, Rhanconotus scirpophagae and Stenobracon deesae* were recorded against top borer. The data further revealed that population of *S. deesae* varied from 5 to 11.5 per cent during May to November and its peak (11.5%) was noticed in September month. The population of *Apantelis flavipes* was ranged in between 2.5 to 12.7 per cent during May to November with its highest population (12.7%) was recorded in month of September. The activity of *R. scirpophagae* was recorded from July to November with its peak (8.2%) in month of September. The parasitization of *T. pyrillae* and *E. melanoleuca* were recorded from July to November and May to November, respectively. Their peaks were noticed in the month of November (70.2%) and September (29.2%), respectively. In case of stalk borer, the parasitization of *Apantalis flavipes* was recorded from 5.8 to 15.3% during August to November.

7. G.S. Sugarcane Breeding and Research Station, Seorahi (U.P.)

The incidence of shoot borer was recorded maximum 9.08 per cent during 24th SMW followed by 8.35, 4.50 and 2.30 per cent during 20th, 16th and 29th SMW, respectively. The incidence of top borer was recorded maximum (7.89%) during 31st SMW followed by 4.70, 3.44, 2.67 and 1.62 per cent during 35th, 26th, 22nd and 38th SMW, respectively. The per cent incidence of stalk borer (on cane basis) was observed to be maximum (15.25%) during 43rd SMW followed by 10.40 per cent during 38th SMW, respectively. The bio-agents *viz*., *Isotima javensis, Stenobracon sp., Elasmus zehnteri* and *Rhaconotus scirpophagae* were recorded as major parasitoid of top borer and *Cotesia flavipes*, a larval parasitoid of stalk borer was also recorded from the field. A parasitisation of larvae by *Isotima javensis* was recorded minimum (2.22%) during 22th SMW and increased up to 18.18 per cent during 35th SMW there after decreased up to 4.41 per cent during 38th SMW. The parasitisation of *Stenobracon sp.* was observed with minimum (3.22%) during 22nd SMW and increased up to 14.28 per cent during 35th SMW there after decreased up to 5.00 per cent during 38th SMW. The parasitisation of top borer by *Elasmus zehnteri* was observed with 4.44 per cent during 26th SMW and increased up to 12.00 per cent during 35th SMW there after decreased up to 5.00 per cent during 38th SMW. *Rhaconotus scirpophagae* was observed minimum (3.33%) during 26th SMW and increased up to 10.71 per cent during 35th SMW thereafter decreased up to 5.00 per cent during 38th SMW. The parasitization by *Cotesia flavipes* was maximum (10.50%) on stalk borer larvae during 43th SMW followed by 6.20 parasitizes during 38th SMW.

PENINSULAR ZONE

8. SRS, Dr. PDKV, Akola (M.S.)

The seasonal incidence data revealed that the damage due to early shoot borer was initiated during the 7th SMW (12.96% dead hearts) and it was continued up to 30th SMW. The maximum damage due to early shoot borer was observed during 7th SMW (12.96% dead hearts) during which meteorological parameters were ranged from 15.9 to 33.9^{0}C temperature, 21 to 51% RH and 0.0 mm rainfall. The incidence of scales insect was initiated during 37th SMW (40% incidence and 4.96% intensity) and it was continued up to 52nd SMW. The per cent incidence and per cent intensity increased at 37th SMW and then per cent intensity decreased but the per cent incidence of scales increased during last meteorological week and was the maximum on 52nd SMW (44%). The incidence of pyrilla was initiated during 30th SMW (0.90/ leaf) and it was continued up to 42nd SMW. The maximum pyrilla per leaf was observed on 33rd SMW (1.60/ leaf). The meager population of aphid was noticed. The incidence started from 27th SMW and it was continued up to 47th SMW the maximum incidence was noticed on 33rd SMW (28 aphids/ 3 leaves). The meager population of whitefly was noticed. The incidence started from 27th SMW and it was continued up to 45th SMW with maximum incidence

was noticed on 41st SMW (10 whiteflies/3 leaves). The bio-agents such as ladybird beetles, spiders and *Apanteles* spp. were in traces against early shoot borer and *Epiricania* was also seen against pyrilla. Spiders were also observed to feeding on nymphs of pyrilla during 7th SMW and continued up to 52nd SMW.

9. CSRS, MPKV, Padegaon (M.S.)

During this year (2016-17), the incidence of early shoot borer ranged from 0.44 to14.73 per cent. The peak incidence of early shoot borer was observed in 17th SMW (14.73%). The parasitism of *T. chilonis* was observed as 13th to 23rd SMW. The incidence of pyrilla per leaf was ranged from 1 to 3 per cent. The parasitoids, *T. pyrillae* and *E. melanoleuca* were also observed. The first incidence of woolly aphid was observed in 31st SMW with 0.11 woolly aphids per leaf. However, the peak incidence was observed in 49th SMW (34.78 woolly aphids/ leaf) and it was continued up to 5th SMW. The parasitoid, *Encarsia flavoscutellum* was ranged from 7 to 133 per 150 leaves and peak was observed in 48 SMW. The predator, *Micromus igorotus* was ranged from 5 to 63 per 150 leaves and peak was observed in 43rd SMW. The peak predation of *D. aphidivora* on woolly aphid was observed in 43rd and 48th SMW (39 larvae of *Dipha/* 150 leaves). The predator, *Syrphids* was observed since 43rd SMW with a peak activity recorded in 50th and 52nd SMW. The Chrysoperla were also observed in traces. The mealy bug incidence was ranged from 1 to 2 per cent and incidence was observed since 37 to 42 SMW.

10. Vasantdada Sugar Institute (VSI), Pune (M.S.)

The per cent incidence of early shoot borer was maximum (7.59%) in April 2016, while in May 2016 it was minimum 1.98 per cent. The per cent incidence of internode bore was maximum (14.0%) in November 2016. The per cent intensity and infestation index of internode borer was maximum 1.51 and 0.20 per cent, respectively in August 2016. The incidence of mealy bug was maximum (13%) in August 2016 and November 2016. Intensity of mealy bug was observed as maximum (2.49%) in June 2016.

11. ZARS, JNKVV, Powarkheda (M.P.)

The infestation of early shoot borer initiated (0.2%/week) at 5th SMW (1st week of Feb.). Thereafter, it increased gradually and reached to the seasonal peak activity (>2.5%/week) at 13th to 15th SMW (last week of March to 2nd week of April). Afterwards, ESB observed decline trend and its activity declined after 22nd SMW (last week of May). The maximum temperature of 40 to 42^{0}C, minimum of 20^{0}C, morning and evening RH of 93% and 61 %, respectively found to be conductive to induce the peak activity of ESB.

The 1st phase of pyrilla activity initiated at 12th SMW (2nd last week of March), the peak activity of more than 3 pyrilla individuals/leaf observed during 17th to 19th SMW (Last week of April to 2nd week of May) and pest remain active up to 23rd SMW i.e, 1st week of June. The second phase observed to initiate from the 26th SMW (last week of June), reached to the peak infestation (>4 pyrilla individuals/leaf) during 31st to 33rd SMW (1st fortnight of August). Maximum Epiricania parasitism (28.0%) observed after a week, while, maximum Epiricania egg masses/ cocoon and *T. pyrillae* (65%) observed at 36th SMW i.e. after 2 weeks of pyrilla peak activity. The maximum and minimum temperature of 30-32^{0}C and 22-23^{0}C and morning and evening RH of 92 to 99% and 77 to 98% seems to be favorable for peak pest activity in rainy season.

12. MSRS, NAU., Navsari (Gujarat)

Incidence of early shoot bore in 7, 11 and 16 SMW was 2.34, 1.43 and 0.98 respectively. During period of study only *T. chilonis* was found to parasitized early shoot borer. Parasitism ranged from 2.43 to 9.73 per cent. Incidence of top shoot bore in 20, 28 and 50 SMW was 1.68, 1.42 and 2.53 respectively. During period of study per cent parasitism by *T. japonicum* was 5.69, 3.25 and 1.63, respectively. Whereas *T. chilonis* found to be parasitizing at the rate of 1.48, 2.42 and 1.19 per cent, Parasitism done by *Apanteles flavipes* was ranged from 1.25 to 2.34 per cent. Fungus parasitism ranged from 1.18 to 1.32 % caused by *B. bassiana*.

13. ZARS, UAS, Mandya (Karnataka)

The cumulative incidence of ESB in Co 86032 sugarcane variety was 17.46 per cent in the first four months after planting. Thereafter, at seven months after planting the incidence of TSB was 21.42 per cent and the incidence of INB was 24.67 per cent. Aphid, whitefly and pyrilla appeared in very small numbers though failed to establish and spread. Encarsia (3-7 adults/leaf) kept the woolly aphid under control. More rainfall during the months of August to October resulted higher incidence of woolly aphid and INB in Mandya area.

14. Regional Sugarcane & Jaggery Research Station (MPKV), Kolhapur (M.S.)

The results were not submitted by concern centre.

15. ICAR-SBI, Coimbatore (T.N.)

The maximum incidence of early shoot borer was 82.2 per cent during May month. The other pests peak incidence *viz.*, top borer (0.44%) in July, internode borer (82.51%) in September, woolly aphid (1.77/leaf) in November, mealy bug (1.79%), whitefly (0.77%), termite (traces) were reported during the present investigation. *Encarsia flavoscutellum*

and *Micromus* were reported to feed on sugarcane woolly aphid during November month.

EAST COAST ZONE

16. RARS, ANGRAU, Anakapalle (A.P.)

During 2016-17, the major insect pests and their bio-agents in sugarcane variety 93 A 145 (Co A 99082) were monitored. The incidence of early shoot borer (ESB) ranged between 1.6 to 21.0 per cent with peak incidence during the month of May (21.0%). The parasitisation of *Trichogramma chilonis* (0.2-3.8%), *Sturmiopsis inferens* (1-2%) were observed on early shoot borer during the present investigation. The internode borer incidence ranged between 6.0 to 32.0 per cent with maximum incidence (32.0%) during the month of October and parasitisation of *T. chilonis* (0.2-4.0%), *S. inferens* (1-2%), *Cotasia flavipes* (0.4-2.2%). Red mite incidence (6.0-28.0%) was noticed during the months of May-August with maximum incidence during the month of June (28.0%). Mealy bug incidence was very meager and predatory coccinellids *viz.*, *C. septempunctata* and *C. sexmaculata* were also observed on mealy bugs. The peak population of *Pyrilla* (10-18/leaf) was observed during the month of October. The parasitisation of *Epiricania melanoleuca* on *Pyrilla* nymphs and adults was ranged between 2.0 to 9.0 per cent with maximum parasitisation during November month (9.0%). The parasitisation by *Tetrastichus pyrillae* on *Pyrilla* eggs was also observed (1.0-4.0%). The prevalence of effective parasitoids of major insect pests of sugarcane was identified *viz.*, *Trichogramma chilonis, Sturmiopsis inferens, Cotesia flavipes* parasitizing on early shoot borer and internode borer eggs, larvae and *Tetrastichus pyrillae, Epiricania melanoleuca* parasitizing on *Pyrilla* eggs and nymphs, adults, respectively. A new insect pest, spittle bug, *Poophilus costalis* (Walker) incidence was traces during the months of August to November, 2016 on sugarcane leaves.

Insect–pest prevalence and incidence vis-à-vis natural enemies, their prevalence and extent of parasitization in the country during 2016-17

E 34 : Standardization of simple and cost effective techniques for mass multiplication of sugarcane bio-agents

NORTH WEST ZONE

1. Regional Research Station, Uchani Dist- Karnal (Haryana)

An experiment was carried at Bio-control laboratory, CCSHAU, RRS, Uchani on mass multiplication of egg parasitoid, *Trichogramma sp. viz.*, *Trichogramma chilonis* and *Trichigramma japonicum* on eggs of *Corcyra cephalonica*. Corcyra larvae diet was prepared from coarsely milled maize grains. The bio-control laboratory produced and supplied 782 Trichocards of *Trichogramma japonicum* to the 81 cane growers for top borer and *Trichogramma chilonis* for stalk borer management. Nymphal and adult parasitoid, *Epiricania melanoleuca* of sugarcane leaf hopper, *Pyrilla perpusilla* was also mass multiplied in laboratory and supplied to cane growers for release in sugarcane fields. The bio-control laboratory produced and supplied 418 egg masses and 4766 cocoons of nymphal and adult parasitoid, *Epiricania melanoleuca* to 59 cane growers for pyrilla management.

2. ICAR-IISR, Lucknow (U.P.)

Biology and rearing of *Eumicrosoma sp*. was developed at IISR, Lucknow. Nucleus culture of the parasitoid was collected from the sugarcane fields. *Eumicrosoma sp*. was a black shiny Sceilionid wasp. Eggs of black bug, *D. gibbus* were used as laboratory host. Fresh eggs (one day old) were offered to the gravid female in homoeopathic vials for parasitization. Parasitized eggs became blackish in colour from one end and in few days and turned completely black to shiny black just before hatching. Parasitization ranged from 21.48 to 72.50 per cent at 75% RH. The parasitization of single gravid female ranged from 5-22 eggs with an average of 15.67 eggs.

PENINSULAR ZONE

3. CSRS, MPKV, Padegaon (M.S.)

The allotted bio-agent for multiplication was *Chrysoperla zastrowi sillemi*. This bio-agent was tried to multiply on sugarcane woolly aphid in field. An experiment was planted on 10.02.2016 with regular variety Co 86032. During the year 2016-17, the incidence of woolly aphid was occurred in 31st SMW i.e. July 30-Aug 05 of 2016 (0.11 woolly aphid/leaf). However, it was continued up to 5th SMW of 2017. The green shade net (50.0%) of 5 m x 5m x 5m was erected for mass multiplication of *Chrysoperla zastrowi sillemi*. The inundative (repeated) releases of woolly aphids were done since 32nd to 35th SMW for more development of woolly aphid culture in shade net. The honey and water solution in Petri-plates were also kept in shade net. The caster flowers were also kept for alternate days to enhance the fecundity of *Chrysoperla*. The average 1-7 neonate larvae were observed per stool since 45th SMW of 2016 to 2nd SMW of 2017. However, the bio agents, *viz.*, *Micromus igorotus, Dipha aphidivora* and *Encarsia flavoscutellum* were also observed in shade net.

4. Vasantdada Sugar Institute (VSI), Pune (M.S.)

The data revealed that centre had produced 1758.30 cc (351.66 lac) eggs of Corcyra with a monthly average of 146.52

cc eggs (29.30 lac). Further, centre had also produced 1464 Trichocards (292.80 lac parasites) of *Trichogramma chilonis* with a monthly average of 122 cards (24.40 lac parasites) and supplied 505.5 Trichocards for the management of borers on 33.70 ha area and 5.00 cc *Corcyra* eggs as a nucleus culture.

5. ICAR-SBI, Coimbatore

The parasitoid, *Cotesia flavipes* was multiplied by group-exposure method. Parasitoid adults emerged in the early hours from cocoon masses held in glass tubes. Adutls were confined based on antennal length. The generally female-biased parasitoid adults were transferred from the glass tubes to glass chimneys with wider end on one side and narrow end on the other side at 50-60 per chimney (»1 lit) and provided with honey: water (50:50) solution impregnated on a cotton swab. After 2 hours of mating period, third to fourth instar larvae of internode borer or sorghum borer were placed in the chimney at 1:1 host larvae: parasitoid female ratio. A few shoots of the host were provisioned and both the ends of the chimney were secured with a double layer of white muslin and black coarse cloth. The chimneys were placed in plastic trays and covered with black cloth. The larvae were collected 24 hours later and transferred to small rearing boxes lined with filter paper and provisioned with shoot bits which were changed every other day. Cocoon masses of the parasitoid generally emerged on around 12th day and these were collected from the boxes at changing and held in glass tubes for release in the field or continuation of laboratory culture.

EAST COAST ZONE

6. RARS, ANGRAU, Anakapalle (A.P.)

The treatment of par boiled rice was found significant with highest spore count of 21.10 X 10^8 per ml with less biomass (0.38g/100g) and exhibited suitable media for mass culturing of *Beauveria bassiana* followed by rice (20.8 X 10^8/ml). Around 200 kg of rice based *B. bassiana* culture was produced and supplied to farmers for the management of root grub in sugarcane cultivation area through sugar factories on cost basis.

E.36 : Management of borer complex of sugarcane through lures

NORTH WEST ZONE

1. Regional Research Station, PAU., Kapurthala (Punjab)

The incidence of early shoot borer in treated and control plots was 7.45 and 12.33 per cent, respectively with reduction of 39.58 per cent. The highest numbers of top borer were trapped in second week of July. The incidence of top borer in treated and control plots was 8.84 and 13.75 per cent, respectively with reduction of 35.70 per cent. The incidence of stalk borer in treated and control plots was 5.78 and 9.67 per cent, respectively with reduction of 40.22 per cent.

2. Regional Research Station, Uchani Dist- Karnal (Haryana)

The infestation by shoot borer ranged from 1.8 to 2.2 per cent in trap installed field as compared to 2.1 to 6.8 per cent in without trap installed field. The infestation by top borer ranged from 1.2 to 3.5 per cent in trap installed field as compared to without trap installed field. The infestation by stalk borer ranged from 0.2 to 1.1 infestation index in trap installed field as compared to 0.6 to 2.8 infestation index in without trap installed field.

3. U.P. Council of Sugarcane Research, Shahjahanpur (U.P.)

The present investigation revealed that highest number of shoot borer (6.33 moths/trap) was recorded during 19th SMW followed by 18th SMW (5.67 moths/trap). Top borer moth catches were recorded maximum (6.67 moths /trap) during 28th SMW followed by 19th SMW (5.33 moths/trap), 18th SMW (4.67 moths/trap) and 27th SMW (3.33 moths/trap). The highest moth catches (4.67 moths/trap) of stalk borer was observed during 36th SMW followed by 24th SMW (3.33 moths/trap). The per cent incidence of shoot borer (11.20%), top borer 2nd brood (4.10%), 3rd brood (7.32%) and at harvest (12.00%) and infestation index of stalk borer was recorded 1.32 in treated plot while the corresponding parameters were 15.61, 6.28, 9.42, 15.69 per cent and 2.20 infestation index in untreated plots, respectively.

4. ICAR-IISR, Lucknow (U.P.)

The total number of male moths of top borer (II brood) caught in traps was 98 (16.33 moths/trap), total catch of top borer moth (III brood) was 134 (22.33 moths /trap) and of IV brood was only 43(1.17/trap). The incidence of top borer (II brood) in plot with traps ranged from 3.33 to 6.67 % (Av. 5.00%) as against 4.39-7.67 % (Av. 6.74%) in without traps. The incidence of top borer (III brood) in plots with traps and without traps were 2.00 - 3.57 per cent (Av. 2.55 %) and 1.11-16.67 % (Av. 5.6 %), respectively. The incidence of IV brood in plots with traps was 2.50-12.346 (Av. 6.77%). The incidence in plot without trap was 9-11.42 per cent (Av. 9.42 %).

NORTH CENTRAL & NORTH EASTERN ZONES

5. SRI, RAU, Pusa (Bihar)

The data revealed that the activity of ESB started from 2nd fortnight of March to 1st fortnight of July and the maximum

(7.33) moths per trap were catch in 1st fortnight of May. The incidence of ESB in treated plot and untreated plots were 9.73 and 14.25 per cent, respectively. The incidence of stalk borer in treated and untreated plots were 3.85 and 5.95 per cent, respectively.

6. G.S. Sugarcane Breeding and Research Station, Seorahi (U.P.)

The present investigation revealed that highest number of shoot borer (10.66 moths/ trap) was recorded during 17th SMW followed by 16th and 23th SMW (7.66 moths/ trap and 7.33 moths/ trap) and 22nd SMW (4.33moths/trap). The top borer moth catches were recorded maximum (10.33 moths / trap) during 11th SMW followed (6.66 moths /trap) during 19th SMW and 6.33moths/trap during 27th SMW. The stalk borer moth catches were observed (7.00 moths /trap) during 25th SMW followed by (6.33 moths /trap), (6.00 moths /trap), (5.00 moths /trap) during 19th, 24th and 31st SMW, respectively. The per cent incidence was also observed in treated (application of pheromone trap) and untreated plot (without pheromone trap).The per cent incidence of shoot borer was recorded as 4.70 per cent. Top borer 2nd brood was 1.73 per cent and at harvest it was 5.12 per cent. The infestation of stalk borer on cane basis was observed (6.12%) in treated plot. While the corresponding parameters were 9.50%, 3.55%, 8.15%, 8.02% and 9.08% in untreated plots, respectively.

PENINSULAR ZONE

7. SRS, Dr. PDKV, Akola (M.S.)

The results of experiment were not submitted by concern centre.

8. CSRS, MPKV, Padegaon (M.S.)

The highest number of moth catches in case of early shoot borer (8 numbers/ 3 traps in 20 SMW), internode borer (5 numbers per 3 traps in 34 and 37 SMW) and top shoot borer (2 numbers/3 traps in 25, 27 and 30 SMW) were trapped, respectively. The installation of pheromone traps @ 15 per ha reduced the incidence of 50.12 and 47.96 per cent of early shoot borer and internode borer, respectively and increased 6.65 per cent sugarcane yield over untreated control.

9. Vasantdada Sugar Institute (VSI), Pune (M.S.)

In pheromone traps, negligible adults of early shoot borer were reported. The internode borer and top shoot borer were captured. The per cent incidence of ESB was maximum 10.59 per cent in May 2016 in treated plot. The per cent incidence of internode borer was noticed as maximum 16.0 per cent in November 2016 in treated plot, while it was 24.0 per cent in August 2016 in control plot. Both treated and control plots were free from top borer infestation.

10. ZARS, JNKVV, Powarkheda (M.P.)

During the season, early shoot borer (ESB dead hearts) and EBS moth captures at pheromone traps observed from 4th and 5th standard meteorological week (SMW), respectively (last week of January and 1st week of February). The maximum ESB infestation in control block (3.2%/week) and lure managed block (2.8%/week) recorded at 14th SMW (2nd week of April) while maximum moth captures at pheromone trap (0.67 moths/trap/day) was recorded after a week 15th SMW (3rd week of April). The cumulative ESB infestation in the control block remained 25.00 per cent, while it was 20.00 per cent in lure managed block i.e. 20.00 per cent lower as compared to control block.

EAST COAST ZONE

11. RSRS, NAU., Navsari (Gujarat)

The maximum number of moths of early shoot borer (20) caught during 46th SMW.

12. ZARS, UAS, Mandya (Karnataka)

The cumulative ESB incidence in the control block remained at 16.47 per cent while it was 11.50 per cent in the lure managed block. The top shoot borer incidence was 9.50 per cent in lure managed block and it remained at 15.25 per cent in the control block. The incidence of internode borer was 18.50 per cent in lure managed block whereas it was 29.50 per cent in control plot. The peak activity of ESB (3.0 moths/ trap/week), TSB (4.00moths/trap/week) and INB (2.00moths/ trap/week) was observed during 23nd, 32th and 24 and 37th SMW, respectively.

13. RARS, ANGRAU, Anakapalle (A.P.)

The maximum number of early shoot borer moths was captured during 23rd SMW (31 moths/ trap/week) where maximum and minimum temperatures were 31.9^{0}C and 27^{0}C and morning and evening RH were 71 and 89 per cent, respectively. The maximum internode borer moth catches (23 moths/ trap/week) were recorded in 36 SMW where maximum, minimum temperatures were 30.8^{0}C and 26.3^{0}C and morning and evening RH were 90 and 77 per cent, respectively. The plot with pheromone traps @ 25 traps/ha reduced the incidence of early shoot borer to an extent of 44.83 per cent and internode borer to an extent of 50.79 per cent over control and recorded high per cent sucrose (21.0%) and cane yield (82.0 t/ha) compared to control plot.

E 37: Bio-efficacy of new insecticides for the control of sugarcane early shoot borer

NORTH WEST ZONE

1. Regional Research Station, PAU., Kapurthala (Punjab)

The efficacy of different insecticidal treatments tested against sugarcane early shoot borer revealed that cumulative per cent incidence of early shoot borer observed at 30, 60, 90 and 120 days after planting was least for the treatment of chlorantraniliprole 18.5 SC @ 375 ml/ha thereby increase in other economic parameters like cane yield (89.52 t/ha), total cane height (283.17 cm), sucrose (17.51% in juice) and CCS (12.23%) which was at par with chlorantraniliprole 0.4G @ 22.5 kg exhibited 88.68 t/ha cane yield.

2. U.P. Council of Sugarcane Research, Shahjahanpur (U.P.)

Among the tested insecticides, spraying of chlorantraniliprole 18.5 SC @ 375 ml/ha at 30 and 60 DAP recorded least cumulative incidence of ESP (3.74%) followed by soil application of chlorantraniliprole 0.4G @ 22.5 kg/ha at the time of planting and 60 DAP (4.20%) as compared to untreated control (5.91%). The maximum cane yield was recorded in spraying of chlorantraniliprole 18.5 SC @ 90 ml/ha (154 t/ha) which was at par with soil application of phorate 10 G @ 15 kg/ha at the time of planting and 60 DAP (145 t/ha) and soil application of fipronil 0.3G @ 25 kg/ha at the time of planting and 60 DAP (143 t/ha).

NORTH CENTRAL & NORTH EASTERN ZONES

3. SRI, RAU, Pusa (Bihar)

The data revealed that chlorantraniliprole 18.5 SC @ 375 ml/ha was superior when it was sprayed at 30 DAP and 60 DAP as recorded least cumulative incidence of ESB (5.00%) with highest cane yield (86.20 t/ha) which was at par with chlorantraniliprole 0.4 G (5.95%) and fipronil 0.3 G (6.35%) with cane yield 85.0 and 81.90 t/ha, respectively.

4. G.S. Sugarcane Breeding and Research Station, Seorahi (U.P.)

Among the tested insecticides, spraying of flubendiamide @ 250 ml/ha at 30 and 60 DAP recorded least cumulative incidence of ESB (9.35%) followed by spraying of chlorantraniliprole 18.5 SC @ 375 ml/ha at 30 and 60 DAP (9.40%) as compared to untreated control (14.70%). The maximum cane yield was recorded in spraying of chlorantraniliprole 18.5 SC @ 375 ml/ha at 30 and 60 DAP (85.50 t/ha).

PENINSULAR ZONE

5. CSRS, MPKV, Padegaon (M.S.)

Soil application of chlorantraniliprole 0.4 G @ 22.5 kg / ha at the time of planting and 60 DAP was found most effective against early shoot borer on sugarcane with least cumulative incidence (7.47%) and recorded highest millable canes (82.31 thousand/ha) as well as highest cane yield (95.83 t/ha) which was at par with chlorantraniliprole 18.5 SC 375 ml/ha (91.67 t/ha).

6. Vasantdada Sugar Institute (VSI), Pune (M.S.)

The trial was vitiated at Vasantdada Sugar Institute (VSI), Pune.

7. ZARS, JNKVV, Powarkheda (M.P.)

The least cumulative per cent incidence of early shoot borer was observed at 30, 60, 90 and 120 days after planting with treatment of fipronil 0.3 G @ 25 kg /ha (3.22%) which was at par with chlorantraniliprole 0.4G @ 22.5 kg (3.03%). The maximum millable cane was recorded in spraying of chlorantraniliprole 0.4G @ 22.5 kg (79.63 thousand/ha) which was at par with fipronil 0.3 G @ 25 kg /ha (78.24 thousand/ha). The highest cane yield was observed in chlorantraniliprole 0.4G @ 22.5 kg (89.35 t/ha) and it was at par with fipronil 0.3 G @ 25 kg /ha (88.27 t/ha) when applied at the time of planting and 60 DAP.

8. MSRS, NAU., Navsari (Gujarat)

The treatment of soil application of chlorantraniliprole 0.4 G @ 22.5 kg/ha at the time of planting and 60 DAP recorded minimum cumulative per cent incidence (13.94%). The highest millable cane yield of sugarcane was recorded in chlorantraniliprole 0.4 G @ 22.5 kg/ha (132.21 t/ha) and it was at par with chlorantraniliprole 18.5 SC 375 ml/ha (128.61t/ha).

9. ZARS, UAS, Mandya (Karnataka)

Soil application of chlorantraniliprole 0.4G @ 22.5kg/ha at the time of planting and 60 DAP was found to be affective with least ESB incidence (2.79%). The maximum cane yield was recorded with chlorantraniliprole 0.4G @ 22.5kg/ha (87.51 t/ha) and it was at par with fipronil 0.3 G @ 25 kg /ha (77.45 t/ha).

EAST COAST ZONE

10. RARS, ANGRAU, Anakapalle (A.P.)

The soil application of chlorantraniliprole 0.4 G @ 22.5 kg / ha at the time of planting and 60 DAP was registered as effective against early shoot borer with least cumulative incidence (5.80%) with highest cane yield (114.94 t/ha) and it was at par with fipronil 0.3 G @ 25 kg /ha (113.88 t/ha) and chlorantraniliprole 18.5 SC 375 ml/ha (110.57t/ha).

Summary

The genotypes/varieties CoS 8436, CoPb 10182, CoS 10231, CoS 10261, CoH 11263 and CoLk 12205 showed highly susceptible to root borer and top borer, in North West Zone.

The varieties CoSnk 130102, Co13004, Co 85004, MS 13081, Co1001, CoM 11084, CoM 11082, Co1004, Co10026, Co13006, Co13008, Co 13009; MS 13081, CoSnk 13102, Co 1101, Co 1104, Co 11081, Co 10006, Co10027, Co13004, CoN 13071, CoN 13072, CoSnk 13101, CoSnk 13102, CoSnk 13106, PI13132; Co 13002,Co13003, Co13004, CoN 13071, CoN13072, CoSnk 13101, CoSnk 13102, CoM 11081, CoM 11082,CoM10084, Co10004, Co 10005, Co 10024, Co 10026, CoJ 10366 and Co 11001, Co 11004, CoM 11081, CoM 11082, CoM 11084,Co 10004,Co10005,Co 10006, Co 10024, Co 10026, Co 10027, CoT 10366, CoT 10367 showed highly susceptible to scale insect, ESB, INB and mealy bug, in Peninsular zones.

The high incidence of early shoot borer, root borer, internode borer, black bug, web mite, pyrilla, white fly, mealy bug, and white grub were reported in different varieties in different zones.

The egg parasitoid,*Trichogramma chilonis, Tetrastichus pyrillae;*larval parasitoid: *Isotima javensis, Rhaconotus scirpophagae, Stenobracon* sp., *Sturmiopsis inferens, Cotesia flavipes*; nymphal and adult parasitoid, *Epiricania melanoleuca* and fungus, *Beaveria bassiana* were observed on insect-pests.

Multiplication of parasitoids, *Eumicrosoma* sp., *Trichogramma chilonis, T.japonicum, Chrysoperla zastrowi sillemi, Epiricania melanoleuca* and fungus *Beauveria bassiana* was done on different host in the laboratory.

There was significantl reduction in the incidence of ESB, TB and INB in lure treated plot in all the zones. There was positive and negative correlation of temperature (max & min), relative humidity and rain fall with borers catches worked out.

The incidence of early shoot borer was significantly reduced by application of Chlorantraniliprole 18.5 SC @ 375 ml/ha and increased cane yield, cane height, sucrose and CCS in North western zone whereas, at Seorahi incidence of ESB reduced in Flubendiamide 39.35 SC @ 125 ml/ha . The soil application of chlorantraniliprole 0.4 G @ 22.5 kg /ha at time of planting significantly reduced the incidence in Peinsular zone and Anakapalle.

PERFORMANCE OF CENTRES IN CONDUCTING AICRP TRIALS (2016 - 2017)

S. No.	Name of the Centre	Discipline	Trials assigned	Trials conducted	
				YES	NO
PENINSULAR ZONE					
1.	Akola	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, AVT (M)-II P, AVT (M)-R	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, AVT (M)-R	AVT (M)-II P
		Agronomy	AS 68, AS 69, AS 70, AS 71, AS 72	Nil	All
		Plant Pathology	PP 17 (D), PP 31	All	Nil
		Entomology	E 4.1, E 28, E 30, E 38	All	Nil
2.	Coimbatore	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, AVT (M)-II P, AVT (M)-R	All	Nil
		Agronomy	AS 68, AS 69, AS 70, AS 71, AS 72	AS 68, AS 72	AS 69, AS 70, AS 71
		Plant Pathology	PP 14, PP 14A, PP 17A, PP 17B, PP 17D, PP 22, PP 33	All	Nil
		Entomology	E 4.1, E 28, E 30, E 34, E 38	E 4.1, E 28, E 30, E 34	E 38
3.	Kolhapur	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, AVT (M)-II P, AVT (M)-R	All	Nil
		Agronomy	AS 68, AS 69, AS 70, AS 71, AS 72	AS 72, AS 68, AS 69	AS 70, AS 71
		Plant Pathology	PP 17B, PP 17D, PP 22, PP 28B, PP 31, PP 32	PP 17B, PP 17D, PP 22, PP 31, PP 32	PP 28B
		Entomology	E 4.1, E 28, E 30	E 4.1	E 28, E 30
4.	Mandya	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, AVT (M)-II P, AVT (M)-R	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (M)-II P	AVT (E)-R, AVT (M)-R
		Agronomy	AS 68, AS 69, AS 70, AS 71, AS 72	All	Nil
		Entomology	E 4.1, E 28, E 30, E 34, E 38	E 4.1, E 28, E 30, E 38	E 34
		Plant Pathology	PP 22	All	Nil
5.	Navsari	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, AVT (M)-II P, AVT (M)-R	All	Nil
		Agronomy	AS 68, AS 69, AS 70, AS 71, AS 72	All	Nil
		Plant Pathology	PP 14, PP 17A, PP 17B, PP 17C, PP 17D, PP 22, PP 23	All	Nil
		Entomology	E 4.1, E 28, E 30, E 34, E 38	E 4.1, E 28, E 30, E 38	E 34
6.	Padegaon	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, AVT (M)-II P, AVT (M)-R	All	Nil
		Agronomy	AS 68, AS 69, AS 70, AS 71, AS 72	All	Nil
		Plant Pathology	PP 17B, PP 17D, PP 22, PP 28(b), PP 32	All	Nil
		Entomology	E 4.1, E 28, E 30, E 34, E 38	All	Nil
7.	Perumalapalle	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, AVT (M)-II P, AVT (M)-R	All	Nil
8.	Powarkheda	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, AVT (M)-II P, AVT (M)-R	All	Nil
		Agronomy	AS 68, AS 69, AS 70, AS 71, AS 72	AS 68	AS 69, AS 70, AS 71, AS 72
		Plant Pathology	PP 17A, PP 17B, PP 17D, PP 22	All	Nil
		Entomology	E 4.1, E 28, E 30, E 38	All	Nil
9.	Pravaranagar	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, AVT (M)-II P, AVT (M)-R	All	Nil
10.	Pugalur	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, AVT (M)-II P, AVT (M)-R	All	Nil

11.	Pune	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, AVT (M)-II P, AVT (M)-R	All	Nil
		Agronomy	AS 68, AS 69, AS 70, AS 71, AS 72	All	Nil
		Plant Pathology	PP 17B, PP 17D, PP 22, PP 28(b), PP 31, PP 32, PP 33	All	Nil
		Entomology	E 4.1, E 28, E 30, E 34, E 38	All	Nil
12.	Rudrur	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, AVT (M)- II P, AVT (M) –R	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (M)- II P	AVT (E)-R, AVT (M)-R
13.	Sameerwadi	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, AVT (M)-II P, AVT (M)-R	All	Nil
14.	Sankeshwar	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, AVT (M)-II P, AVT (M)-R	All	Nil
		Agronomy	AS 68, AS 69, AS 70, AS 71, AS 72	AS 68, AS 69, AS 70, AS 72	AS 71
		Plant Pathology	PP 17B, PP 17D, PP 22, PP 28(b), PP 31, PP 32, PP 33, PP 17C	PP 17B, PP 17D, PP 22, PP 28(b), PP 31, PP 32, PP 33	PP 17C
15.	Thiruvalla	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, AVT (M)-II P, AVT (M)-R	All	Nil
		Agronomy	AS 68, AS 69, AS 70, AS 71, AS 72	All	Nil
		Plant Pathology	PP 14, PP 14A, PP 17A, PP 17D, PP 22	All	Nil
East Coast Zone					
1.	Anakapalle	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, IVT (M), AVT (M)-I P, AVT (M)-II P, AVT (M)-R	All	Nil
		Agronomy	AS 68, AS 69, AS 70, AS 71, AS 72	All	Nil
		Plant Pathology	PP 14, PP 14A, PP 17A, PP 17B, PP 17C, PP 17D, PP 22, PP 23, PP 28(b), PP 31, PP 33	PP 14, PP 14A, PP 17A, PP 17B, PP 17C, PP 17D, PP 22, PP 31, PP 33	PP 23, PP 28(b)
		Entomology	E 4.1, E 28, E 30, E 34, E 38	All	Nil
2.	Cuddalore	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, AVT (M)-I P, IVT (M), AVT (M)-II P, AVT (M)-R	All	Nil
		Agronomy	AS 69, AS 70, AS 71, AS 72	All	Nil
		Plant Pathology	PP 14, PP 17A, PP 17B, PP 17C, PP 22, PP 23, PP 33	PP 14, PP 17A, PP 17B, PP 17C, PP 22, PP 23,	PP 33
3.	Nayagarh	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, AVT (M)-I P, IVT (M), AVT (M) – II P, AVT (M)-R	All	Nil
		Agronomy	AS 68, AS 69, AS 70, AS 71, AS 72	All	Nil
		Plant Pathology	PP 14, PP 14A, PP 17A, PP 17B, PP 17C, PP 17D, PP 22, PP 23, PP 31	PP 17A, PP 17D, PP 22, PP 17C, PP 31	PP 14, PP 17B,
4.	Nellikuppam	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (M)-I P, AVT (E)-R, IVT (M), AVT (M)-II P, AVT (M)-R	All	Nil
5.	Vuyyuru	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (M)-I P, AVT (E)-R, IVT (M), AVT (M)-II P, AVT (M)-R	All	Nil
North Central Zone					
1.	Bethuadahari	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, IVT (M), AVT (M)-II P, AVT (M)-R	All	Nil
		Agronomy	AS 68, AS 69, AS 70, AS 71, AS 72 (E), AS 72 (M)	Nil	All
2.	Motipur	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, IVT (M), AVT (M)-I P, AVT (M)-II P, AVT (M)-R	IVT (E), AVT (E)-I P, AVT (E)-R, IVT (M), AVT (M)-I P, AVT (M)-II P, AVT (M)-R	AVT (E)-II P
		Agronomy	Not assigned	AS 68, AS 69, AS 70, AS 71, AS 72 (E), AS 72 (M)	Nil
		Plant Pathology	PP 17A, PP 17B	All	Nil
4.	Pusa	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, IVT (M), AVT (M)-II P, AVT (M)-R	All	Nil
		Agronomy	AS 68, AS 69, AS 70, AS 71, AS 72(E), AS 72 (M)	All	Nil

		Plant Pathology	PP 14, PP 14A, PP 17A, PP 17B, PP 17C, PP 17D, PP 22, PP 23, PP 31	All	Nil
		Entomology	E 4.1, E 28, E 30, E 37	All	Nil
North Eastern Zone					
1.	Buralikson	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, IVT (M), AVT (M)-I P, AVT (M)-II P, AVT (M)-R	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, AVT (M)-I P, AVT (M)-II P, AVT (M)-R	IVT (M)
		Agronomy	AS 68, AS 69, AS 70, AS 71, AS 72 (E), AS (M)	AS 69, AS 70, AS 71, AS 72 (E), AS (M)	AS 68
		Plant Pathology	PP 17A, PP 22	PP 17A	PP 22
North West Zone					
1.	Faridkot	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, IVT (M), AVT (M)-I P, AVT (M)-II P, AVT (M)-R	All	Nil
		Agronomy	AS 67, AS 68, AS 69, AS 70, AS 71, AS 72(E), AS 72(M)	All	Nil
2.	Karnal (SBI)	Plant Breeding	IVT (E), AVT (M)-II P, AVT (M)-R, AVT (E)-I P	All	Nil
		Plant Pathology	PP 14, PP 14A, PP 17A, PP 17D, PP 22, PP 23	All	Nil
		Entomology	E 4.1, E 28, E 30, E 38	E 4.1, E 28, E 30	E 38
3.	Kota	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, IVT (M), AVT (M)-I P, AVT (M)-II P, AVT (M)-R	IVT (E), AVT (E)-I P, AVT (E)-II P, IVT (M), AVT (M)-I P, AVT (M)-II P	AVT (E)-R, AVT (M)-R
		Agronomy	AS 68, AS 69, AS 70, AS 71, AS 72(E), AS 72(M)	AS 69, AS 70, AS 71, AS 72(E), AS 72(M)	AS 68
4.	Lucknow	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, IVT (M), AVT (M)-I P, AVT (M)-II P, AVT (M)-R	All	Nil
		Agronomy	AS 67, AS 68, AS 69, AS 70, AS 71, AS 72(E), AS 72(M)	All	Nil
		Plant Pathology	PP 14, PP 14A, PP 17A, PP 17B, PP 17C, PP 17D, PP 22, PP 33	All	Nil
		Entomology	E 4.1, E 28, E 30, E 34, E 38	E 4.1, E 28, E 30, E 34	E 38
		Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, IVT (M), AVT (M)-I P, AVT (M)-II P, AVT (M)-R	All	Nil
5.	Kapurthala	Agronomy	AS 68, AS 69, AS 70, AS 71, AS 72(E), AS 72(M)	All	Nil
		Plant Pathology	PP 14, PP 14A, PP 17A, PP 17B, PP 17C, PP 22, PP 23, PP 31	All	Nil
		Entomology	E 4.1, E 28, E 30, E 38	All	Nil
6.	Muzaffar-nagar	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, IVT (M), AVT (M)-I P, AVT (M)-II P, AVT (M)-R	All	Nil
7.	Pantnagar	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, IVT (M), AVT (M)-I P, AVT (M)-II P, AVT (M)-R	AVT (E)-I P, AVT (E)-II P, AVT (E)-R, AVT (M)-I P, AVT (M)-II P, AVT (M)-R	IVT (E), IVT (M),
		Agronomy	AS 68, AS 69, AS 70, AS 72(E), AS 72(M)	All	Nil
		Plant Pathology	PP 17A, PP 17B, PP 17D, PP 22, PP 33	PP 17A, PP 17B, PP 17D, PP 22	PP 33
8.	Shahjahan-pur	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, IVT (M), AVT (M)-I P, AVT (M)-II P, AVT (M)-R	All	Nil
		Agronomy	AS 68, AS 69, AS 70, AS 71, AS 72(E), AS 72(M)	AS 68, AS 69, AS 70, AS 72(E), AS 72(M)	AS 71
		Plant Pathology	PP 14, PP 14A, PP 17A, PP 17B, PP 17D, PP 22, PP 23, PP 31	All	Nil
		Entomology	E 4.1, E 28, E 30, E 38	All	Nil
9.	Sriganganagar	Plant Breeding	IVT (E), AVT (E)-I P, AVT (E)-II P, AVT (E)-R, IVT (M), AVT (M)-I P, AVT (M)-II P, AVT (M)-R	All	Nil
		Agronomy	AS 68, AS 69, AS 70, AS 71, AS 72	AS 68, AS 69	AS 70, AS 71, AS 72
10.	Uchani	Plant Breeding	AVT (E)-II P, AVT (E)-R, IVT (M), AVT (M)- I P	All	Nil
		Agronomy	AS 68, AS 69, AS 70, AS 71, AS 72(E), AS 72(M)	All	Nil
		Plant Pathology	PP 14, PP14A, PP 17A, PP 17D, PP 22, PP 23, PP 31	All	Nil
		Entomology	E 4.1, E 28, E 30, E 38	All	Nil

Visit Schedule of the Monitoring Teams during 2017-18 Crop Season

Monitoring Teams for different zones	Centres monitored	Visit schedule
North West Zone		
Team Leader ▪ Dr A. Annadurai, Breeder, ICAR-SBI, Coimbatore **Members** ▪ Dr V. Gouri, Agronomist, RARS, Anakapalle ▪ Dr S.G. Raju, Pathologist, ARS, Sankeshwar ▪ Dr Arun Baitha, Entomologist, ICAR-IISR, Lucknow **Member Secretary** ▪ Dr Lalan Sharma, Scientist, AICRP (S), IISR, Lucknow	Lucknow, Shahjahanpur, Muzaffarnagar, Pantnagar, Karnal, Uchani, Kapurthala, Faridkot, Sriganganagar and Kota	August 16 to 27, 2017
North Central & North East Zone		
Team Leader ▪ Dr K.P. Salin, Entomologist, ICAR-SBI, Coimbatore **Members** ▪ Dr V.P. Singh, Agronomist, ICAR-IISR, Lucknow ▪ Dr V. Ravichandran, Pathologist, SRS, Cuddalore ▪ Dr Shajan V.R., Breeder, SRS, Thiruvalla **Member Secretary** ▪ Dr V.K. Gupta, Pr. Scientist, AICRP (S), IISR, Lucknow	Gorakhpur, Seorahi, Pusa, Motipur, Muzaffarpur, Bethuadahari and Buralikson	August 19 to September 01, 2017
Peninsular Zone-I		
Team Leader ▪ Dr Rakesh K. Mehra, Pathologist, RRS, Uchani **Members** ▪ Dr R.M. Garkar, Breeder, CSRS, Padegaon ▪ Dr V.N. Patel, Entomologist, ZARS, Mandya ▪ Dr Navnit Kumar, Agronomist, SRI, Pusa **Member Secretary** ▪ Dr S.K. Awasthi, CTO, AICRP(S), IISR, Lucknow	Coimbatore, Pugalur, Thiruvalla, Mandya Sankeshwar, Sameerwadi, Kolhapur and Perumalapalle	July 31 to August 12, 2017
Peninsular Zone-II		
Team Leader ▪ Dr A.S. Jeena, Breeder, GBPUA&T, Pantnagar **Members** ▪ Dr P. Thimme Gowda, Agronomist, ZARS, Mandya ▪ Dr (Ms.) Swagatika Mohanty, Pathologist, SRS, Nayagarh ▪ Dr S.K. Pandey, Entomologist, SBI RC, Karnal **Member Secretary** ▪ Shri Adil Zubair, ACTO, AICRP(S), IISR, Lucknow	Pune, Pravaranagar, Padegaon, Akola, Powarkheda, Navsari and Rudrur	July 31 to August 11, 2017
East Coast Zone		
Team Leader ▪ Dr S.B. Patil, Breeder, ARS, Sankeshwar **Members** ▪ Dr V.P. Jaiswal, Agronomist, ICAR-IISR, Lucknow ▪ Dr N. Raj Kumar Pathologist, RARS, Anakapalle ▪ Dr Rajinder Kumar, Entomologist, PAURRS, Kapurthala **Member Secretary** ▪ Dr S.K. Yadav, Scientist, AICRP(S), IISR, Lucknow	Nellikuppam, Cuddalore, Vuyyuru, Anakapalle and Nayagarh	August 17 to 27, 2017

Action Taken Report on the recommendations of the 31st Biennial Workshop of AICRP on Sugarcane held at the Vasantdada Sugar Institute, Pune (M.S.) on 16-17 November, 2016 are as under

S. No.	Recommendation	Action Taken
1.	Mechanized sett treatment device developed by SBI, Coimbatore should be provided to all the regular centres of AICRP on Sugarcane. Council may be requested to provide the funds to procure the device. **(Action : PC (Sugarcane)**	The required fund amounting to Rs. 11.40 lakhs for procurement of "Mechanized sett treatment device" has been demanded by the PC Unit and Council has informed that the proposal may be considered during allocation of Revised Eastimate (R.E.) 2017-18 vide letter F.No. CS/15/5/2017-IA.IV(Pt.) dated 11th July, 2017.
2.	IISR, Lucknow should supply the culture of pathotype of CF 08 and CF 09 to all the centres of North West Zone and North Central Zone for uniform testing of red rot in zonal varietal trials of AICRP on Sugarcane. **(Action : Head, Crop Improvement, IISR, Lucknow)**	IISR, Lucknow has supplied the culture of pathotype of CF 08 and CF 09 for uniform testing of red rot in zonal varietal trails of the concerned zones.
3.	A national monitoring team consisting of PI and scientists of various disciplines is requested to be constituted for monitoring of trails conducted at AICRP on Sugarcane centres in different zones. **(Action : PC (Sugarcane)**	A National Monitoring Team was constituted by the Project Coordinator (S) headed by Dr Bakshi Ram, Director & AICRP(S) P.I. (CI), SBI, Coimbatore and other P.Is. & Scientist for monitoring of AICRP(S) trials in different zones. Chairman desired to take up the work in ensuing crop season.
4.	Possibilities should be explored to provide funds for installation of sub-surface drip irrigation system at different AICRP (S) centres. **(Action : PC (Sugarcane)**	Request to provide funds for installation of sub-surface drip irrigation system at different AICRP (S) centres have been made to the Council vide letter no. 15-4/PCS/2017 dated 14.07.2017. The action is awaited.

Performance of AICRP(S) centres

In compliance of the action points/recommendations made during 31st Biennial Workshop of AICRP on Sugarcane held at VSI, Pune, performance of various AICRP(S) centres as per monitoring reports of field visit conducted during 2014-15, 2015-16 and 2016-17 (Table-1) have been compiled. Mean performance of three years has also been given in Table 2. Similarly, the performance of all the centres in experimentation during 2017-18 has also been appended (Table-3).

Table 1 : Performance of centers in conducting AICRP(S) trials during 2014-15 to 2016-17

Sl. No.	Centre	2014-15				2015-16				2016-17			
		Conduc-tance (%)	Grading % of conducted trials	Grading incorpo-rating conduc-tance %	Final grad-ing	Conduc-tance (%)	Grading % of condu-cted trials	Grading incorpo-rating conduc-tance %	Final grading	Conduc-tance (%)	Grading % of conducted trials	Grading incorpo-rating conduc-tance %	Final grading on the basis of conductance and field performance
		A	B	C	D	A	B	C	D	A	B	C	D
Peninsular Zone													
1	Coimbatore	73	68	49.64	Good	94.44	77.65	73.33	Very Good	88.00	90.00	79.20	Very Good
2	Kolhapur	93	66	61.38	Very Good	72.22	80.00	57.78	Good	81.82	58.89	48.18	Good
3	Mandya	85	73	62.05	Very Good	87.50	60.00	52.50	Good	100.00	58.89	58.89	Good
4	Navsari	100	63	63.00	Very Good	100.00	65.60	65.60	Very Good	100.00	84.80	84.80	Excellent
5	Padegaon	100	76	76.00	Very Good	91.30	72.38	66.08	Very Good	100.00	90.83	90.83	Excellent
6	Powarkheda	100	72	72.00	Very Good	95.00	52.63	50.00	Good	95.45	60.95	58.18	Good
7	Sankeshwar	90	80	72.00	Very Good	88.23	76.00	67.05	Very Good	95.00	85.26	81.00	Excellent
8	Thiruvalla	100	60	60.00	Good	92.31	61.67	56.93	Good	100.00	55.79	55.79	Good
East Coast Zone													
9	Anakapalle	93	65	60.45	Very Good	100.00	68.80	68.80	Very Good	86.21	83.20	71.73	Very Good
10	Cuddalore	94	55	51.71	Good	93.75	60.00	56.25	Good	94.44	95.29	89.99	Excellent
11	Nayagarh	100	57	57.00	Good	100.00	60.00	60.00	Good	75.00	81.33	61.00	Very Good
North Central Zone													
12	Bethuadahari	42	44	18.48	Poor	72.73	29.09	21.16	Average	64.29	46.67	30.00	Average
13	Pusa	100	72	72.00	Very Good	84.00	63.81	53.60	Good	100.00	88.15	88.15	Excellent
North Eastern Zone													
14	Buralikson	100	83	83.00	Excellent	100.00	60.00	60.00	Good	100.00	58.75	58.75	Good
North West Zone													
15	Faridkot	100	91	91.00	Excellent	100.00	80.00	80.00	Very Good	100.00	80.00	80.00	Very Good
16	Kota	83	68	56.44	Good	81.82	60.00	49.09	Good	84.61	56.36	47.69	Good
17	Lucknow	92	67	61.64	Very Good	95.65	76.36	73.04	Very Good	96.30	76.15	73.33	Very Good
18	Kapurthala	96	59	56.64	Good	100.00	60.00	60.00	Good	96.43	68.89	66.43	Very Good
19	Pantnagar	95	59	56.05	Good	93.33	57.14	53.33	Good	78.95	53.33	42.10	Good
20	Shahjahan-pur	92	76	69.92	Very Good	95.24	74.00	70.48	Very Good	92.59	88.80	82.22	Excellent
21	Sriganga-nagar	77	55.5	42.73	Good	90.90	60.00	54.54	Good	100.00	68.00	68.00	Very Good
22	Uchani	86	61	52.46	Good	94.44	62.35	58.88	Good	91.30	59.05	53.91	Good

$$A = \frac{\text{No. of trials conducted}}{\text{No. of trials allotted}} \times 100$$

$$B = \frac{\text{Numerical value of grades for experiments (as per D)}}{100}$$

$$C = \frac{A \times B}{100}$$

D = Final grading as per table given below:

Sl. No.	Score (%) obtained	Rating
1.	81-100	Excellent
2.	61-80	Very Good
3.	41-60	Good
4.	21-40	Average
5.	0-20	Poor

Table 2 : Mean performance of centres in conducting AICRP(S) trails during last three years (2014-15 to 2016-17)

Sl. No.	Centre	Conductance (%)	Grading % of conducted trials	Grading incorporating conductance %	Final grading on the basis of conductance and field performance
		A	B	C	D
1	Coimbatore	85.15	78.55	67.39	Very Good
2	Kolhapur	82.35	68.30	55.78	Good
3	Mandya	90.83	63.96	57.81	Good
4	Navsari	100.00	71.13	71.13	Very Good
5	Padegaon	97.10	79.74	77.64	Very Good
6	Powarkheda	96.82	61.86	60.06	Very Good
7	Sankeshwar	91.08	80.42	73.35	Very Good
8	Thiruvalla	97.44	59.15	57.57	Good
9	Anakapalle	93.07	72.33	66.99	Very Good
10	Cuddalore	94.06	70.10	65.98	Very Good
11	Nayagarh	91.67	66.11	59.33	Good
12	Bethuadahari	59.67	39.92	23.21	Average
13	Pusa	94.67	74.65	71.25	Very Good
14	Buralikson	100.00	67.25	67.25	Very Good
15	Faridkot	100.00	83.67	83.67	Excellent
16	Kota	83.14	61.45	51.07	Good
17	Lucknow	94.65	73.17	69.34	Very Good
18	Kapurthala	97.48	62.63	61.02	Very Good
19	Pantnagar	89.09	56.49	50.49	Good
20	Shahjahanpur	93.28	79.60	74.21	Very Good
21	Sriganganagar	89.30	61.17	55.09	Good
22	Uchani	90.58	60.80	55.08	Good

$$A = \frac{\text{No. of trials conducted}}{\text{No. of trials allotted}} X\,100$$

$$B = \frac{\text{Numerical value of grades for experiments (as per D)}}{100}$$

$$C = \frac{A \times B}{100}$$

D = Final grading as per table given below:

Sl. No.	Score (%) obtained	Rating
1.	81-100	Excellent
2.	61-80	Very Good
3.	41-60	Good
4.	21-40	Average
5.	0-20	Poor

Table 3 : Performance of centres in conducting AICRP(S) trails during the year (2017-18)

Sl. No.	Centre	Conductance (%)	Grading % of conducted trials	Grading incorporating conductance %	Final grading on the basis of conductance and field performance
		A	B	C	D
1	Coimbatore	82.61	78.95	65.22	Very Good
2	Kolhapur	85.36	75.00	64.02	Very Good
3	Mandya	82.35	61.43	50.59	Good
4	Navsari	95.65	73.64	70.44	Very Good
5	Padegaon	100.00	79.13	79.13	Very Good
6	Powarkheda	78.95	65.12	51.41	Good
7	Sankeshwar	89.47	68.23	61.04	Very Good
8	Thiruvalla	100.00	71.76	71.76	Very Good
9	Anakapalle	93.10	86.67	80.69	Very Good
10	Cuddalore	94.74	75.56	71.58	Very Good
11	Nayagarh	85.71	75.56	64.76	Very Good
12	Bethuadahari	53.85	62.86	33.85	Average
13	Pusa	96.15	60.80	58.46	Good
14	Buralikson	81.25	56.92	46.25	Good
15	Faridkot	100.00	78.67	78.67	Very Good
16	Kota	78.18	80.10	62.54	Very Good
17	Lucknow	96.43	79.26	76.43	Very Good
18	Kapurthala	100.00	85.38	85.38	Excellent
19	Pantnagar	88.46	69.33	61.33	Very Good
20	Shahjahanpur	96.15	83.20	80.00	Very Good
21	Sriganganagar	76.92	74.00	56.92	Good
22	Uchani	100.00	87.62	87.62	Excellent

$$A = \frac{\text{No. of trials conducted}}{\text{No. of trials allotted}} X\,100$$

$$B = \frac{\text{Numerical value of grades for experiments (as per D)}}{100}$$

$$C = \frac{A \times B}{100}$$

D = Final grading as per table given below:

Sl. No.	Score (%) obtained	Rating
1.	81-100	Excellent
2.	61-80	Very Good
3.	41-60	Good
4.	21-40	Average
5.	0-20	Poor

Visits of experimental fields by monitoring teams - *at a glance*

East Coast Zone

Peninsular Zone I

Peninsular Zone II

North Central & Eastern Zone

North Western Zone

Contact details of Regular and Voluntary Centres Under AICRP (Sugarcane) in Different Zones

Location of centre	Incharge / Address	Contact details
A. NORTH WEST ZONE		
1) Faridkot	Dr. Pankaj Rathore, Director, PAU Regional Station, Faridkot - 151 203 (Punjab) (PAU, Ludhiana)	Phone No.: 01639-251244; Fax : 01639-256949 Mob: 094640-51995 E-mail: rsdirector-faridkot@pau.edu; kuldeep@pau.edu
2) Kapurthala	Dr. Paramjit Singh, Director, PAU Regional Research Station, Kapurthala – 144 601(Punjab) (PAU, Ludhiana)	Mob: 098146-93189 E-mail: director-kapurthala@pau.edu
3) Karnal	Dr. N. Kulshreshtha, Pr. Scientist & Head, Sugarcane Breeding Institute Regional Centre, P.B.No. 52, Karnal (Haryana) – 132 001 (ICAR-SBI, Coimbatore)	Phone No.: 0184-2268096; Fax : 0184-2265723 Mob: 093153-82163 E-mail: headsbirc@gmail.com; kulshreshthan@yahoo.com
4) Shahjahanpur	Dr. B.L. Sharma, Director, U.P.Council of Sugarcane Research, Shahjahanpur – 242 001	Phone No.: 05842-222509 / 222102 Mob: 08795837151; 09451236266 Fax : 05842-222509 E-mail: dirupcsr@gmail.com
5) Pantnagar	Prof. S.P. Singh, Deptt. of Genetics & Plant Breeding, G.B. Pant University of Agriculture & Technology, Pantnagar – 263 145, Distt. U.S. Nagar	Phone No.: 05944-233075; Fax : 05944-233473 Mob: 094111-60075 (Dr. S.P. Singh): 075002-41511 (Dr. A.S. Jeena) E-mail: panwar588@gmail.com; dr.asjeena@gmail.com
6) Sriganganagar	Dr. B.R. Godara, Professor (Soil Science) & Incharge, Agricultural Research Station, Sriganganagar – 335 001 (Rajasthan) (SKRAU, Rajasthan)	Phone No.: 0154-2440619; Fax : 0154-2440703 Mob: 094131-55287 E-mail: balram.g.ars@gmail.com
7) Muzaffarnagar*	Dr. O.S. Joshiya, Joint Director, Sugarcane Research Station (UPCSR), Muzaffarnagar – 252 001 (U.P.)	Phone/Fax No.: 0131-2621143 Mob: 094504-76699 E-mail: osjoshiaupcsr@gmail.com
8) Kota	Dr. B.S. Meena, Agronomist & Project Incharge, Agricultural Research Station Ummedganj, P.B. No. 7, GPO – Nayapura, Kaithoon Road, Kota – 324 001 (Rajasthan) (AU, Kota)	Phone No.: 0744-2844369 (O); Fax : 0744-2844306 Mob: 094144-89121 E-mail: arskota@hotmail.com; bsmeena1970@yahoo.in
9) Lucknow	Dr. A.D. Pathak, Director, ICAR-Indian Institute of Sugarcane Research, Rae Bareli Road, Lucknow – 226 002	Phone No.: 0522-2480726; Fax : 0522-2480738 Mob: 094503-735650 E-mail: pathakashwani@ rediffmail.com; director.sugarcane@icar.gov.in
10) Uchani	Dr. Samar Singh, Regional Director, Regional Research Station, (CCSHAU), Uchani – 132 001, Karnal (Haryana) (CCSHAU, Hisar)	Phone 0184-2267857; Fax : 0184-2267499 Mob: 09991130914 Mob: 09896321453 (Dr. Mehar Chand, Agronomist) E-mail: rrsuchani@gmail.com; samar9149@rediffmail.com

*Voluntary Centre

Location of Centre	Incharge / Address	Contact No./ E-mail
B. NORTH CENTRAL & NORTH EASTERN ZONE		
1) Seorahi*	Dr. I.S. Singh, Joint Director, G.S. Sugarcane Breeding & Research Institute, Seorahi, Distt. Kushinagar (U.P.)	Mob: 08795837165; 09415383978 E-mail: gssbriseorahi@gmail.com; issingh56@gmail.com
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