

**All India Coordinated Research Project on Sugarcane**  
(Indian Council of Agricultural Research)

**TECHNICAL REPORT**  
**PLANT PATHOLOGY**  
(2020 – 2021)

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**Summary**

About 17 centres participated in the Plant Pathology programme and contributed their progress in 10 projects. Differential host studies to identify variation in red rot were conducted at 12 centres in all the zones with 97 new isolates along with designated pathotypes on the 20 host differentials. The new isolates from the cvs BO 128, Co 89003, Co 0238, CoC 24, CoSe 95422, CoJ 85, CoJ 88, CoLk 94184 and CoS 8436 exhibited a deviant behaviour especially from North West and North Central zones and the newly emerged isolates are capable of knocking down the popular variety Co 0238 in large areas in the subtropical region. The virulent isolate(s) capable of knocking down the cv Co 0238 has been designated as a new pathotype CF13 and this will replace the pathotypes CF09 and CF07 for red rot screening in North West and North Central zones, respectively. Epidemic occurrence of red rot in the Co 238 is a serious concern and there is a need to tackle the menace through disease-free seed and other disease management strategies. Prevalence of red rot has been reported at moderate level mostly in Tamil Nadu. Scientists in various centers have done excellent job in the screening front. About 14 centres have carried out red rot testing, 12 centres for smut testing, six for wilt resistance and 12 centres for YLD. Large numbers of entries were identified as R/MR to red rot, smut and wilt from all the zones. During the season, many centres have evaluated ISH and IGH clones for red rot resistance. Survey for natural incidence of diseases across the country revealed that still red rot continues to occupy prime importance in Uttar Pradesh and Bihar there is growing importance of smut in subtropical region. In addition, occurrence of wilt, YLD, grassy shoot, rust, *pokkah boeng* and brown spot at varying proportions were recorded in different states. This season, many centres recorded YLD resistance in the ZVT entries and reported moderate to severe occurrences of YLD under field conditions. Impact of YL disease on sugarcane was demonstrated from the trials by comparing virus-free and virus-infected seed canes at Uchani, Coimbatore, Cuddalore and Anakapalle; however this major area of work to address varietal degeneration is not given due importance by the centres. Due to lack of Pathology posts in the regular centres, disease scenarios are not known from Maharashtra and Karnataka. The centres Shahjahanpur, Seorahi, Anakapalle and Cuddalore centres optimized mechanized delivery of fungicides through setts to manage red rot and smut and the results are encouraging to manage the diseases from primary sources of inocula.

I compliment all the scientists for their hard work and for submitting the report in time. I profusely thank Dr A. D. Pathak, Director, ICAR-IISR, Lucknow & Project Coordinator and his team for supporting the work. I personally thank my colleagues Dr. V. Jayakumar and Dr. R. Selvakumar, Principal Scientists for their help in compilation. I am also grateful to Dr. Hemaprabha, Director of the Institute for her valuable support.

**(R. Viswanathan)**



## 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** (19): Co 419, Co 975, Co 997, Co 1148, Co 7717, Co 62399, CoC 671, CoJ 64, CoS 767, CoS 8436, BO 91, Baragua (*S. officinarum*), Kakhai (*S. sinense*) and SES 594 (*S. spontaneum*), Co 7805, Co 86002, Co 86032, CoS 95422, CoV 92102 and Co 0238.

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

**Method of inoculation:** Plug method of inoculation is to be used (Details vide PP 17). Inoculations with each isolate to be done on all the differentials with freshly prepared spore suspension. All inoculations are to be completed in 2 days by last week of August.

**Observation:** One observation at 60<sup>th</sup> day after inoculation

**Evaluation:** The canes are to be split open longitudinally. Inoculated canes free from borer infestation and other damages are taken for evaluation. Based on parameters *viz.* nodal transgression, lesion width, white spots, top yellowing/drying, rind infection and sporulation over the rind, the host reaction is categorized into three groups *viz.*, Resistant (R), Susceptible (S) and Intermediate (I) as follows:

R: Lesion width laterally restricted, nodal transgression up to 2 nodes, white spots, rind infection, sporulation over the rind and yellowing/drying of tops absent.

S: Lesion width laterally spreading, nodal transgression more than 2 nodes, white spots progressive or restricted, in case of progressive white spots rind infection, sporulation over the rind and yellowing/drying of tops absent or present.

I: Lesion width laterally restricted or spreading, nodal transgression more than 2 nodes, white spots absent or present (restricted type), rind infection, sporulation over the rind and yellowing/drying of tops absent.

## **RESULTS OF THE PREVIOUS YEAR**

### **NORTH WEST ZONE**

#### **LUCKNOW**

Thirteen new isolates *i.e.* twelve isolates from the popular cv Co 0238 and one isolate from CoLk 8102 (IR-183) were evaluated for their virulence along with CF07, CF08 and CF09 on 19 designated differentials by plug method of inoculation. The virulence pattern of IR-183 matched more or less with the existing pathotypes of this zone as reported earlier (2018-19). The red rot virulence pattern of Co 0238 isolates (IR-178 to IR-182) did not match with the existing pathotypes of the Sub-tropical zone. It was observed that Co 0238 isolates giving I reaction on Co 7717, CoJ 64, Co 419, CoSe 95422, Baragua and Khakai and S reaction on Co 975, Co 62399, CoC 671, Co 86002 and CoV 92102. The virulence pattern of Co 0238 isolates did not match with the isolate of CoLk 8102 and also with designated pathotypes namely CF07, CF08 and CF09, clearly indicating the existence of specific virulence of Co 0238 isolates on its host which is different from the existing pathotypes of this zone.

#### **SHAHJAHANPUR**

Seven designated pathotypes and 10 isolates including seven isolates of Co 0238 were tested for their pathogenic variability. The higher aggressiveness was exhibited by CF11. Among the seven designated pathotypes CF11 exhibited more virulence. Out of 10 isolates, Cf 0238 VI found virulent and exhibited eight S and three I reactions. Of the seven isolates of Co 0238, six *viz.*, Cf0238 I, II, III, IV and V expressed less virulence on the set of host differentials. The differential CoS 8436 succumbed only to the self-originated isolate Cf8436. The differential Co 997 displayed S reaction to Cf8436, Cf07250 and Cf97264 isolates. Two differentials such as CoC 671 and Co 86032 showed S behaviour to all isolates except Cf97264 isolate. The differential Co 62399 showed universal S reaction to the all 7 isolates of Cf0238 (I to VII). Five differentials namely CoS 767, CoS 8436, CoSe 95422, BO 91 and SES 594 consistently showed R reactions to all 7 isolates of Co 0238. Three old isolates Cf8436, Cf07250 and Cf97264 exhibited universal R reaction on Baragua and SES 594. All local isolates namely Cf8436, Cf07250 and Cf0238 (I-VII) exhibited pathogenic variability on host differentials. Based on this pathogenic behaviour, the isolates of Cf0238 were found as an emergence of new strain in sub-tropical India.

#### **KAPURTHALA**

Nine isolates *viz.*, Cf89003-2, Cf89003-1-Chunni Kamal, Cf89003-2-Chunni Kamal, Cf89003-Pathankot, Cf89003-Nakodar and Cf89003-Ajnala from Co 89003, Cf85-Ajnala and Cf85-Batala from CoJ 85, Cf88-Bhogpur from CoJ-88 along with two pathotypes (CF08 and CF09) were inoculated on 19 differentials. Among the isolates, Cf89003-1-Chunni Kamal and Cf89003-2-Chunni Kamal showed similar reaction and were found as virulent as pathotype CF08 except intermediate reaction on host differentials Co 7717. Cf89003-Pathankot and Cf85-Batala were found similar to pathotype CF08. Isolates Cf89003-Ajnala, Cf85-Ajnala and Cf88-Bhogpur were less virulent than pathotype CF08 by exhibiting intermediate to S reaction on 10 host differentials. The disease development by isolate Cf89003-2 showed pathogenic variation by showing I reaction on host differentials CoV 92102 compare to tested isolates and pathotypes and was found most virulent.

#### **UCHANI**

All the designated pathotypes *viz.*, CF01, CF02, CF03, CF07, CF08, CF09 and CF11 along with seven isolates *viz.*, XXXVIII (CoJ 85), RR XXXVIII (CoJ 85), RR XXXX (CoJ 64) and RR XXXXI (Co 89003) and RR XXXXII (Co 89003), RR XXXXIII (CoS 8436) RR XXXXVII (CoS 8436) collected from different mill zone areas were used for pathogenic variability. Observations indicated that all the pathotypes/isolates exhibited R reaction on



BO 91, SES 594 and CoV92102, whereas S reaction on Co 997 and CoC 671. Isolates RR XXXVIII, RR XXXVIII and RR XXXX showed R reaction on CoS 767, CoS 8436, BO 91, Baragua, SES 594, CoSe 95422, CoV 92102 and Co 86032 and S reaction on Co 419, Co 975, Co 997, Co 1148, Co 62399, CoC 671, CoJ 64 and Khakai and were more virulent and showed similarity with CF08 pathotype. Isolates RR XXXXI and RR XXXXII were also virulent and showed pathogenic variation and exhibited I to S reactions on several differentials, which may be the possibility of emergence of new pathotype in the subtropics. However, the isolates RR XXXXIII and RR XXXVII from CoS 8436 showed S and R reaction respectively on CoS 8436.

#### **KARNAL**

Twelve *C. falcatum* isolates comprising of seven established pathotypes and five isolates collected from CoS 8436 (2), Co 89003 (1), CoJ 88 (1) and CoLk 94184 (1) were inoculated on 19 sugarcane differentials by plug method of inoculation. The pathogenic reaction on differential hosts shown that designated pathotype CF11 found to be most virulent followed by CF02, CF09, CF01, CF08, CF07 and CF03. Both the isolates from variety CoS 8436, i.e., (Cf8436-Karnal) and Cf8436 (Bihar) exhibited I/S reactions on differential CoS 8436. The isolate Cf89003 collected from variety Co 89003 was also virulent and expressed I to S reactions on 11 host differentials, suggests the possible emergence of new pathotype in the subtropics. Further, isolate Cf88 (UP) showed S to nine host differentials, whereas new isolate CfLk94184 from variety CoLk 94184(UP) also showed S to seven host differentials.

#### **NORTH CENTRAL ZONE**

##### **PUSA**

Eighteen sugarcane differentials were inoculated with two pathotypes CF07, CF08 and 13 isolates collected from different cane growing areas of Bihar. Differentials Co 1148, Khakai, CoJ 64 and Co 997 showed S reaction, differentials, BO 91, Baragua and SES 594 showed R reaction whereas, differentials CoS 8436, Co 419, Co 62399, CoSe 95422, Co 975, CoV 92012, CoC 671, Co 7717, CoS 767, Co 86002 and Co 7805 produced differential reaction against all the test isolates. Pathotype CF07 and isolates RR<sub>4</sub>, RR<sub>7</sub>, RR<sub>8</sub>, RR<sub>9</sub>, RR<sub>10</sub> and RR<sub>13</sub> produced R reaction on differentials Co 419, Co 975 and Co7805, whereas the pathotypes CF07 and above mentioned isolates produced I reaction on differentials CoS 8436, Co 62399, CoSe 95422, CoV 92012, CoC 671, Co 7717, CoS 767 and Co 86002. Hence, on the basis of results, pathotype CF07 and isolates RR<sub>4</sub>, RR<sub>7</sub>, RR<sub>8</sub>, RR<sub>9</sub>, RR<sub>10</sub> and RR<sub>13</sub> exhibited similar pathological behaviour. The pathotype CF08 and isolates RR<sub>1</sub>, RR<sub>2</sub>, RR<sub>3</sub>, RR<sub>5</sub>, RR<sub>6</sub>, RR<sub>11</sub> and RR<sub>12</sub> showed S reaction on CoS 8436, Co 62399, CoSe 95422, CoV 92102, CoC 671, CO 7717, CoS 767 and Co 86002. Therefore, pathotype CF08 and isolates RR<sub>1</sub>, RR<sub>2</sub>, RR<sub>3</sub>, RR<sub>5</sub>, RR<sub>6</sub>, RR<sub>11</sub> and RR<sub>12</sub> exhibited similar pathological behavior.

##### **SEORAH**

Seven pathotypes along with 7 isolates *viz.*, R1701Seo (Co 0238), R1801Seo (Co 0238), R1802Seo (Co 0238), R1803Seo (Co 0238), R1804Seo (Co 0238), R1805Seo (Co 0238) and R1806Seo (Co 0238) were inoculated on 19 differentials. Except the isolates obtained from Co 0238, the virulence pattern of the other isolates were more or less matched with the existing pathotypes of this zones. It was observed that Co 0238 isolates have specific virulence, thus the development of a new specific virulent isolate at this area that is capable of knocking down the popular variety Co 0238.

#### **EAST COAST ZONE**

##### **ANAKAPALLE**

Six isolates collected from CoV 89101, Co 62175, 99A 53, 93V 297, CoA 89085 and 2017T 275 were tested for pathogenic variability on a set of 19 host differentials. Most of

the isolates were unable to infect the differentials *viz.*, Co 975, Co 1148, Co7717, Co 62399, CoJ 64, CoS 767, CoS 8436, BO 91, Baragua, SES 594, Co 86002 and CoSe 95422. Most of the isolates produced I to S reaction on Co 419, Co 997, CoC 671, Co 7805 and Co 86032. The isolates, CoA 89085 and 2017T 275 and 99A 53 from Chittoor district have produced I reaction on CoC 671, while isolate collected from Visakhapatnam (CoV 89101) produced S reaction. Among all the isolates tested for pathogenic variability, the isolates, 99A 53 and 93V 297 from Chittoor district were found to be less aggressive compared to the other test isolates. The reaction of the six isolates collected from various genotypes was found similar to the existing pathotype, CF06 with minor variations.

#### **CUDDALORE**

Sugarcane differentials were inoculated with isolates collected from CoM 0265, CoC 24, CoV 09356 and Co 86032 along with the designated pathotypes. In the differential CoJ 64 the isolate from CoC 24 showed S reaction while it was I in reaction to CF06. In BO 91, the isolates from CoC 24 and CoV 09356 had showed I reaction, while all other isolates registered R. In Co 7717 the isolates from CoC 24 and CoV 09356 recorded S reaction, while it was I for designated pathotypes CF06 and CF12. All these reaction indicated the isolate from CoC 24 and CoV 09356 exhibited limited variations from designated pathotype CF06. The isolate from Co 86032 behaved similar to designated pathotype CF06.

#### **PENINSULAR ZONE**

##### **NAVSARI**

Six new isolates collected from different cane growing areas of south Gujarat along with two designated pathotypes CF06 and CF12 were tested on 19 differentials. The results revealed that the differentials CoJ 64, CoS 8436, Baragua and SES 594 showed R reaction, Co 997, Co 1148, CoS 767, Khakai, Co 7805 and CoSe 95422 showed I reaction, while CoC 671 showed S reaction to all isolates whereas Co 419, Co 975, Co 7717, Co 62399, BO 91, CoV 92102, Co 86002 and Co 86032 showed different reaction against all isolates. All the reactions indicated that the local isolates *viz.*, Cj0265, Cj97009 (Mahuva), Cj671 (Gandevi), Cj97009 (Gandevi), Cj86002 (Gandevi) and Cj86032 (Chalthan) exhibited least variation from designated pathotypes CF06 and CF12.

##### **COIMBATORE**

Two new isolates (Cf86027-Vellalalayam and Cfc24-Mandagapattu) along with 6 old isolates (Cf2001-13-Perambakkam, Cf06022-Kuthalam, Cf99006-Mundiampakkam, Cfc24-Thandavarayanpatti, Cf06022-Pennadam and Cf0265 RK pet) and 2 designated pathotypes (CF06 and CF12) were inoculated and disease intensity was rated. Among these, two old isolates *viz.*, Cf06022-Kuthalam and Cf06022-Pennadam exhibited more virulence followed Cf2001-13-Perambakkam and Cfc24-Mandagapattu. Another new isolate Cf86027-Vellalalayam exhibited least virulence. The isolate Cfc24-Thandavarayanpatti showed distinct differential reaction on two varieties, i.e., R reaction on Co 975 and S reaction on Baragua. The isolates Cf99006-Mundiampakkam and Cfc24-Thandavarayanpatti showed distinct R reaction on CoJ 64, while all other isolates showed I reaction. The isolate Cf06022-Kuthalam exhibited I reaction on CoS 8436 while all other isolates exhibited R reaction and Cf06022-Pennadam exhibited S reaction on CoSe 95322 while other isolates exhibited I reaction.

##### **THIRUVALLA**

Two new isolates *viz.*, Cf86027 (Vellalalayam), Cfc24 (Mandagapattu) and six old isolates along with the designated pathotypes for Peninsular zone CF06 and CF12 were inoculated and tested for red rot resistance against nineteen differentials by plug method. The disease development indicated that, all the isolates, except Cf86027 (Vellalalayam) and Cfc24 (Thandavarayanpattu) behaved differently from the standard pathotypes CF06 and

CF12. They showed more susceptibility on the differentials Co 1148, Co 7717, Co 62399, Khakai and Co7805.

## **RESULTS OF THE CURRENT YEAR**

### **NORTH WEST ZONE**

#### **LUCKNOW**

Eleven new isolates *i.e.* eight from Co 0238 (IR-184, IR-185, IR-186, IR-187, IR-188, IR-189, IR-190 and IR-193); two from CoS 8436 (IR-191 and IR-192) and one from CoLk 8102 (IR-194) were evaluated for their virulence along with CF07, CF08 and CF09 on 20 differentials *viz.*, BO 91, Co 419, Co 975, Co 997, Co 1148, CoS 8436, Co 7717, Co 62399, CoC 671, CoJ 64, CoS 767, Co 7805, Co 86002, Co 86032, CoSe 95422, CoV 92102, Co 0238, Khakai (*S. sinense*), SES 594 (*S. spontaneum*) and Baragua (*S. officinarum*) 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. The Co 0238 isolate exhibited I reactions on BO 91, Co 7717, CoJ 64, Co 419, CoSe 95422, Baragua and Khakai; S reaction on Co 975, Co 62399, CoC 671, Co 86002 and CoV 92102 and Co 0238 and R on CoS 8436, CoS 767, Co 997, Co 1148, Co 86032 and SES 594, thus indicating the gained virulence on BO 91, Co 975, Co 62399, Co 86002 and CoV 92102 and loss of virulence on CoJ 64, CoS 767, Co 997, CoS 8436, Co 1148, Khakai and Co 86032. The virulence pattern of Co 0238 isolates did not match with the designated pathotypes such as CF07, CF08 and CF09 of sub-tropical zone, thus clearly indicating the existence of gained specific virulence of Co 0238 isolates on its host which is different from the existing pathotypes of this zone (Table 1).

#### **SHAHJAHANPUR**

Seven designated pathotypes and 14 other isolates including eight isolates of Cf0238, two isolates of Cf05191, one isolate of Cf08279, Cf08436, Cf07250 and Cf97264 were examined for their pathogenic variability on 20 host differentials. Results on pathogenic virulence indicated that the CF11 pathotypes was more virulent on the 20 host differentials as compared to other pathotypes/isolates. Remaining pathotypes displayed almost more or less similar virulence behaviour. The differentials Co 419, Co 1148, Co 7717, CoJ 64, CoS 767, CoS 8436, CoSe 95422, BO 91, Co 86002 and Baragua Co 94012 exhibited almost universal resistance to all the isolates, whereas Co 62399, CoC 671, Co 86032 and Co 0238 exhibited universal susceptibility to all the isolates of Cf0238, Cf05191 and Cf08279. The designated pathotypes CF07, CF08 and CF09 exhibited a contrast pathogenic behaviour with the varieties Co 975, Co 1148, Co 62399, CoC 671, Co 86002, Co 86032, CoJ 64, CoS 767, Khakai and Co 0238 to Cf0238 isolates. The results revealed that the other new isolates such as Cf05191, Cf08279 and Cf0238 and showed almost similar pathogenic pattern on host differentials. The results clearly expressed that the isolate Cf0238 is not originated from old prevalent pathotypes (CF07, 08, 09) and this indicated emergence of new variants in subtropical area of UP (Table 2).

#### **KAPURTHALA**

Six red rot pathotypes along with one isolate Cf0238 received from IISR-Lucknow and nine new isolates collected from sugarcane growing areas of Punjab were inoculated on 20 differentials. The results revealed that among pathotypes, CF08 was found most virulent followed by pathotypes CF01 and CF09. Pathotypes CF02, CF03 and CF07 showed X to S reaction on nine differentials. New isolate Cf0238 was highly virulent with pathogenic variation as unlike other tested pathotypes, only Cf0238 showed S reaction on differential host Co 0238 which is generally categorized under resistant category. Isolate Cf0238 also showed intermediate reaction on host CoJ 64 and was avirulent on differential host Co 997.

The virulence pattern of Cf0238 isolate clearly indicated the existence of pathogenic variation from the existing pathotypes of this zone. Newly tested isolate Cf89003-3 was found highly virulent by showing I to S reaction on 13 differentials. Only isolate Cf89003-3 showed some virulence (X) on differential host Baragua among all the tested isolates and reference pathotypes. Isolates Cf85-1 and Cf89003-2 were least virulent among others tested isolates. Isolates Cf64, Cf88, Cf85-2, Cf85-3, Cf89003-1 and Cf89003-4 showed virulence pattern more or less similar to existing pathotypes. None of the newly collected isolates showed any disease reaction on differentials host Co 0238 and all the isolates were virulent on CoJ 64 unlike isolate Cf0238. The isolate Cf89003-3 was highly virulent among all the tested isolates as well as pathotypes and showed some pathogenic variation but it also showed no virulence on Co 0238. In Punjab state, no disease incidence of red rot was noticed on the variety Co 0238 and most of the collected isolates were from the variety Co 89003 which is not recommended and S to red rot in Punjab state. From this study, we can conclude that Punjab state is still free from any new emerging isolate of red rot which can knockdown variety Co 0238 unlike other states of NW zone, where it is showing up to 100 per cent susceptibility by clear emergence of new pathotypes of red rot (Table 3).

### **UCHANI**

All the designated pathotypes *viz.*, CF01, CF02, CF03, CF07, CF08 CF09 and CF11 along with nine isolates *viz.*, XXXXIII (CoJ 85), RR XXXXIII ( CoJ 85), RR XXXXV (CoS 89003) , RR XXXXVI (CoS 89003) and RR XXXXVII CoS (CoS 89003) , RR XXXXVIII (CoS 8436) , RR XXXXVI (CoS 8436) ,RR XXXXX (Co 0238 ) andRR XXXXXI (Co 0238) collected from different mill zone areas of Haryana were used for pathogenic variability. Observations recorded indicate that all the pathotypes/isolates exhibited R reactions on SES 594 whereas S reactions on Co 997 and CoC 671, Observations recorded indicate that Co 419, Co 975, Co 1148, Co 7717, CoJ 64, CoS 767, Co 7805, Co 86002 and CoV92102 exhibited differential reaction (S/R/I). Isolates RR XXXXV, RR XXXXVI and RR XXXXVII were virulent and showed pathogenic variation among them and exhibited I to S reactions on several differentials which may be the possibility of emergence of new pathotype. However isolates RR XXXXVIII and RR XXXXIX from CoS 8436 showed S and R reactions, respectively on CoS 8436 differential but both isolates showed S reaction on Co 0238 differential. Isolates RR XXXXX and RR XXXXXI from Co 0238 showed I reaction on CoJ 64 and S reaction on Co 419, Co 997, Co 62399, CoC 671, Khakai, Co 86002 and Co 0238 differentials but R reaction on Co 975, CoS 767, CoS 8436, BO 91, SES 594, CoSe 95422 and Co 7805 differentials. However, Co 1148, Co 7717, CoV92102 and Co 86032 differentials exhibited R /S reaction (Table 4).

### **KARNAL**

Fourteen red rot isolates comprising seven reference pathotypes and seven isolates collected from Co 0238 (4), Co 89003(1), CoS 8436(1) and CoLk 94184(1) were inoculated independently on a set of 21 sugarcane by plug method of inoculation. The overall disease reactions indicated that there was a clear pathogenic variation on test host differentials. The pathogenic reaction on differential hosts shown that reference pathotype CF11 found to be most virulent followed by CF01, CF02, CF08, CF07, CF09 and CF03. The four new Cf0238 isolates collected from variety Co 0238 in UP state found to be more virulent and exhibited S reaction on eight to ten host differentials indicating a different origin in the region. The isolate Cf8436 (Karnal) succumbed to differential CoS 8436 with I to S reactions, whereas, isolate Cf89003 (Karnal) was too virulent and showed S reactions on 12 host differentials, suggests the possible emergence of new pathotype in sub-tropics. Further, isolate CfLk94184 from variety CoLk 94184(UP) also showed S to eight host differentials (Table 5).

## **NORTH CENTRAL ZONE**

### **PUSA**

Eighteen host differentials were planted during 2020-21 season, but due to heavy rainfall and water stagnation in the field most of the differentials were damaged.

### **SEORAH**

Seven pathotypes *viz.*, CF01, CF02, CF03, CF07, CF08, CF09 and CF11 along with 6 isolates *viz.*, R1702Seo (Source-CoS 8436), R1801Seo (Source-Co 0238), R1802Seo (Source-Co 0238), R1803Seo (Source-Co 0238), R1904Seo (Source-Co 0238) and R1905Seo (Source-Co 0238) were inoculated on 20 differentials by plug method of inoculation. Except the isolate obtained from Co 0238, the virulence pattern of the other isolates were more or less matched with the existing pathotypes of this zone. It was observed that Co 0238 isolates have specific virulence that is capable of knocking down the popular variety Co 0238. These isolates may be new emerging isolates in eastern UP, by which has the more chance to damage to other upcoming sugarcane variety. It may be declared that a new pathotypes from eastern UP may be used in the screening of PP 17 entries (Table 6).

### **EAST COAST ZONE**

#### **ANAKAPALLE**

Nine isolates of *C. falcatum* collected from sugarcane cultivars, CoV 89101 (2 isolates), Co 62175 (3 isolates), 93V 297 (1 isolate), CoA 89085 (1 isolate), 99A 53 (1 isolate) and 2017T 275 (1 isolate) were tested for pathogenic variability on a set of 19 host differentials along with standard pathotype CF06. Most of the isolates were unable to infect the differentials, *viz.*, Co 975, Co 997, Co 1148, Co7717, Co 62399, CoJ 64, Co S 767, CoS 8436, BO 91, Baragua, SES 594, Co 86002 and CoSe 95422. Most of the isolates have produced S to I reaction on Co 419, CoC 671, Kakhai and Co 7805. All the isolates have produced S reaction on the host differential CoC 671, except the isolate, 99A 53 collected from Pichatoor, Chittoor district. Among all the isolates tested for pathogenic variability, the isolates 99A 53 was found to be less aggressive compared to the other test isolates. The reaction of the six isolates collected from various genotypes was found similar to the existing pathotype, CF06 with minor variations (Table 7).

#### **CUDDALORE**

Sugarcane differentials were inoculated with nine *C. falcatum* isolates *viz.*, Cf23Sogathur, Cf24 Natham, Cf24 Keelkuppam, Cf09356 T.Edayar, Cf6 T.Edapalayam, Cf06022 Arumkurikhai, Cf24 Pillayarkuppam, Cf09356 Kanthalavadi and Cf6 Sithanur along with the designated pathotype CF06 and CF12. In the differential variety Co 7717 the isolates Cf24 Natham, Cf24 Keelkuppam and Cf09356 T.Edayar had showed S reaction while designated pathotypes CF06 and CF12 registered I reaction. In the differential CoJ 64, the isolates Cf24 Natham and Cf09356 Kanthalavadi had showed S reaction while all other isolates registered I reaction. In BO 91 the isolates Cf24 Keelkuppam and Cf24 Pillayarkuppam had registered I reaction, while all the other isolates registered R reaction. In Co 7805 the isolate Cf24 Pillayarkuppam recorded S reaction, while all the other isolated recorded I /R reaction. In Co 86032 the isolates Cf24 Keelkuppam and Cf24 Pillayarkuppam recorded S reaction, while it was I in reaction to the designated pathotype CF06. All these reactions indicated that the isolates from CoC 24 and CoV 09356 exhibit limited variations from designated pathotype CF06 (Table 8).

### **PENINSULAR ZONE**

#### **NAVSARI**

Seven new isolates collected from different cane growing areas of south Gujarat along with two reference pathotypes CF06 and CF12 were tested on 19 differentials. The results revealed that the differentials CoJ 64, CoS 8436, Baragua and SES 594 showed R

reaction, Co 997, Co 1148, CoS 767, Khakai, Co 7805 and CoSe 95422 showed I reaction, while CoC 671 showed S reaction to all isolates, whereas Co 419, Co 975, Co 7717, Co 62399, BO 91, CoV 92102, Co 86002 and Co 86032 showed different reaction against all isolates. The data showed that, Co 419 showed S reaction to CF06, CF12, Cf0265, Cf671(Gandevi) and Cf0265 (Shayan) while I reaction to other isolates. Co 975 showed R reaction to CF06, S reaction to Cf0265 and Cf0265 (Shayan), I reaction to CF12 and other local isolates. Co 62399 showed R reaction to Cf86002(Gandevi) and Cf86032 (Chalthan) while I reaction to CF06, CF12 and other local isolates. BO 91 showed I reaction to CF06 and CF12 and R reaction to other local isolates. CoV 92102 showed R reaction to CF12, Cf0265, Cf97009(Mahuva), Cf97009(Gandevi) and Cf0265 (Shayan) isolates while I reaction to CF06, Cf671(Gandevi), Cf86002 (Gandevi) and Cf86032 (Chalthan). Co 86002 showed R reaction to CF12, I reaction to Cf0265 and Cf0265 (Shayan) while S reaction to CF06 and other local isolates. Co 86032 showed I reaction to CF12, Cf0265 and Cf0265 (Shayan) while S reaction to CF06 and other local isolates. All these reaction indicated that the local isolates *viz.*, Cf0265, Cf97009 (Mahuva), Cf671(Gandevi), Cf97009(Gandevi), Cf86002(Gandevi), Cf86032(Chalthan) and Cf0265 (Shayan) exhibited least variation from designated pathotypes CF06 and CF12 (Table 9).

### **COIMBATORE**

Three new isolates (Cf86032- NKM, CfM0265-Palapatti and Cf86027-Amaravathi) along with 5 old isolates and 2 reference pathotypes (CF06 and CF12) were inoculated on 19 sugarcane differentials and disease intensity was rated. The reference pathotypes CF12 was more virulent followed by an old isolate Cf86027-Vellalapalayam. Among the new isolates Cf86032-NKM and CfM0265-Palapatti exhibited moderate level of virulence, while Cf86027- Amaravathi exhibited least virulence among all the tested isolates. Among the old isolates CfC24-Thandavarayanpatti showed distinct differential reaction from standard isolates on five varieties and the isolates CfM0265-RK Pet and CfC24- Mandagapattu also showed differential reaction from reference pathotypes on few host differentials. The new isolates exhibited more or less similar reactions of reference pathotypes on all the host differentials (Table 10).

### **THIRUVALLA**

Three new isolates *viz.*, Cf 86032 (NKM), CfM0265 (Palapatti), Cf 86027 (Amaravathi Co-op Sugars) and five old isolates *viz.*, CfC24 (Thandavarayanpattu), Cf06022 (Pennadam), Cf0265 (RK Pet), Cf 86027 (Vellalapalayam) and CfC24 (Mandagapattu) along with the designated pathotypes CF06 and CF12 were inoculated and tested for red rot resistance. The disease development on different differentials indicated that, the isolate CfC24 (Mandagapattu) exhibited a differential reaction as against the standard CF06 with respect to the variety Co 419. The same isolate was found to be the most virulent one with more number of susceptible reactions in twenty differentials. It showed susceptible reactions in Co 62399, Khakai, CoV 92102 and Co 7805 whereas the other isolates except Cf0265 (RK Pet) showed either 'R' or 'I' reactions in those genotypes. Next virulent isolate observed was Cf0265 (RK Pet). All other isolates showed more or less similar reactions as that of the standard pathotypes (Table 11).

## PP17: EVALUATION OF ZONAL VARIETIES FOR RED ROT, SMUT, WILT, YLD, AND RUST

### PP 17A: EVALUATION OF ZONAL VARIETIES FOR 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 and Seorahi

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)

Peninsular Zone : CF06 & CF12 (To be inoculated separately)

(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.

**Methods of inoculation:**

**1. Plug Method:** Two canes in each of the 20 clumps to be inoculated. Inoculation is to be done in the middle of the 3rd exposed internode from bottom and two drops of the spore suspension are to be placed with a large syringe in each cane and sealed with plastic clay (plasticine) or modeling clay.

**2. Cotton Swab Nodal Method:** (All the centres) Two canes in each of 20 clumps will be inoculated by removing leaf sheath (lower most green leaf sheath) and immediately placing cotton swab (dipped in freshly prepared inoculum suspension) around the cane covering nodal region. The cotton swab should be held in place by wrapping parafilm<sup>®</sup> over the swab.

**Evaluation**

**Cotton Swab Nodal method:** One observation at the end of 60 days after inoculation. Observe for spindle infection i.e. presence of mid rib lesions with or without conidia, presence of acervuli at nodes specially on leaf scar, root primordial and growth ring. Record the intensity of the acervuli at node. Scrap the node and see if lesions are developing into

stalks. Wherever lesions are progressive towards susceptibility the entries are rated as susceptible. If the lesions are dark and restricted to rind tissues, the clones are rated as resistant. Atleast 15 stalks are to be evaluated to assess disease reaction.

**Plug method:** The canes to be split open longitudinally sixty days after inoculation along the point of inoculation. Inoculated canes free from borer infestation and other damages are taken for evaluation. This is graded on the international scale of 0-9 as follows:

Variety/ genotype ----- Method of inoculation -----

No. of canes evaluated	Condition of tops*	Lesion width**	White spot (WS)***	Nodal transgression (NT)****	Total score	Remarks
1.						
2 to						
15						

\*1. Condition of top: Green (G) – 0, Yellow (Y)/Dry (D)-1

\*\*2. Lesion width above inoculated internode is assigned the score of 1, 2 or 3

\*\*\*3. White spot assigned score of 1 or 2 according to whether it is restricted or progressive

\*\*\*\*4.N.T. No. of nodes crossed above the inoculated internode and given the score as:

1 if one node is crossed

2 if two nodes are crossed

3. if three nodes are crossed (maximum) or more

Average Score = Total Score/No. of canes evaluated

Disease reaction: 0-9 Scale

0.0 to 2.0 -R

2.1 to 4.0 -MR

4.1 to 6.0 -MS

6.1 to 8.0 -S

8.0 to 9.0 -HS

Note: Average score is taken into account for assigning the disease reaction.

The varieties which show susceptibility by plug method, but have not shown nodal susceptibility are to be retested by nodal method. If these are not susceptible by the nodal method, they may be considered for release.

## RESULTS OF THE PREVIOUS YEAR

### NORTH WEST ZONE

#### LUCKNOW

In IVT (Early) out of 9 genotypes tested, one genotype CoLk 16201 was found R by both the method of inoculation against both the pathotypes. Seven genotypes *viz.*, Co 15025, Co 16029, CoLk 16202, CoPb 16181, CoPant 16221, CoPant 16222 and CoS 16231 were rated as MR by plug method and R by nodal method of inoculation against both the pathotypes. In AVT (Early)-I Plant, out of 6 genotypes, five genotypes *viz.*, Co 15023, Co 15027, CoLk 15201, CoLk 15205 and CoPb 15212 were rated as MR by plug method and R by nodal method of inoculation against both the pathotypes. One genotype *viz.*, Co 15024 was rated MS by plug method and S by nodal method against both the pathotypes. In Advanced Varietal Trial (Early)-II Plant, out of 4 genotypes tested, three *viz.*, CoLk 14201, CoPb 14181 and CoPb 14211 were rated as MR by plug method and R by nodal method of inoculation against both the pathotypes. One genotype Co 14034 were rated MS by plug method and R by nodal method against both the red rot pathotypes. In IVT (Mid late), out of



7 genotypes tested, five *viz.*, CoLk 16203, CoLk 16204, CoPant 16223, CoS 16232 and CoS 16233 were rated MR by plug method and R by nodal method of inoculation against both the pathotypes. One genotype Co 16030 was rated as MS against pathotype CF08 and S against CF09 by plug method, whereas rated as S by nodal method against both the pathotypes. In AVT (Mid late)-I Plant, out of 7 genotypes 7, one 7 CoLk 15206 was found R by both the methods against both the pathotypes. The others 6 genotypes *viz.*, Co 15026, CoLk 15207, CoLk 15209, CoPb 15213, CoS 15232 and CoS 15233 were rated MR by plug method and R by nodal method against both the pathotypes. In AVT (Mid late)-II Plant, out of 7 genotypes, 6 clones *viz.*, Co 14035, CoH 14261, CoLk 14203, CoLk 14204, CoPb 14184 and CoPb 14185 were rated MR by plug and R by nodal method against both the pathotypes. One genotype CoSe 14233 was MS against both the pathotypes by plug method of inoculation, whereas as R by nodal method against both the pathotypes.

### **SHAHJAHANPUR**

Forty entries were tested for red rot resistance in six trials.

IVT Early: Of nine entries, 7 entries *viz.*, Co 15025, Co 16029, CoLk 16201, CoLk 16202, CoPant 16221, CoPant 16222 and CoS 16231 were evaluated as R/MR to both the pathotypes (CF08 and CF09) by plug and nodal cotton swab method. One entry CoPb 16181 was graded as MS to CF08 and MR to CF09 by plug and R by nodal cotton swab method. One entry CoPb 16211 was found S/HS to CF08 and CF09 by both the methods.

IVT Mid late: All the seven entries *viz.* Co 16030, CoLk 16203, CoLk 16204, CoPb 16212, CoPant 16223, CoS 16232 and CoS 16233 were recorded as R/MR to CF08 and CF09 by plug and nodal cotton swab method of inoculation.

AVT Early (I plant): Six entries were tested, in that Co 15023, Co 15027 and CoLk 15205 exhibited R/MR reaction by plug and R by nodal cotton swab method. Two entries Co 15024 and CoPb 15212 exhibited MS behaviour to CF08 whereas it was MR and MS to CF09, respectively. CoLk 15201 was found MR to CF08 and MS to CF09 by plug and R to both pathotypes by nodal cotton swab method.

AVT Early (II Plant): Out of 4 entries, two *viz.* CoLk 14201, CoPb 14181 were screened as MR/R to both pathotypes and remaining two entries i.e. Co 14034 and CoPb 14211 were rated as MS to CF08; MS and MR to CF09, respectively, and R by nodal method.

AVT Mid late (I Plant): All seven entries were assessed as R/MR by plug and R by nodal cotton swab method against both the pathotypes.

AVT Mid late (II Plant): All seven entries were graded as R/MR by plug and R by nodal cotton swab method against CF08 and CF09.

### **KAPURTHALA**

In IVT (Early), five entries *viz.*, Co 16029, CoLk 16201, CoPb 16181, CoPant 16222 and CoS 16231 behaved as MR/R by plug and nodal cotton swab methods against both the pathotypes. In AVT (Early) Plant I, four entries *viz.*, Co 15023, Co 15027, CoLk 15201 and CoLk 15205 behaved as MR/R by both the methods. In AVT (Early) Plant II, three entries CoLk 14201, CoPb 14181 and CoPb 14211 showed MR/R reaction. In IVT (Mid late), all the entries *viz.*, Co 16030, CoLk 16203, CoLk 16204, CoPb 16212, CoPant 16223, CoS 16232 and CoS 16233 were found MR/R by both the methods against both the pathotypes. In AVT (Mid late) Plant I, the genotypes *viz.*, Co 15026, CoLk 15206, CoLk 15207, CoLk 15209, CoPb 15213 and CoS 15233 behaved as MR/R. In AVT (Mid late) Plant II, entries Co 14035, CoH 14261, CoLk 14203, CoLk 14204, CoPb 14184 and CoPb 14185 behaved as MR/R by plug and nodal cotton swab methods with both the pathotypes.

### **UCHANI**

In AVT (early) Plant- I the entries *viz.*, Co 15023, Co 15024 and CoLk 15205 showed MR reaction by plug and R reaction by nodal cotton swab methods against CF08 and CF09

pathotypes. However, Co 15027, CoLk 15201 and CoPb 15212 were found MR by plug against CF08 and MS against CF09 and R by nodal cotton swab methods. Among standards CoJ 64 behaved as HS/S by both plug and nodal cotton swab methods but Co 0238 and Co 05009 showed MR reaction by plug and R by nodal cotton swab methods against CF08 and CF09. In AVT (early) Plant-II the entries viz., CoLk 14201, CoPb 14181 showed MR reaction by plug and R reaction by nodal cotton swab methods against CF08 and CF09 pathotypes. However, Co 14034 and CoPb 14211 exhibited MR/MS reaction by plug and R reaction by nodal cotton swab methods against CF08 and CF09 pathotypes. In AVT (Midlate) Plant-I, all the entries viz., Co 15026, CoLk 15206, CoLk 15207, CoLk 15209, CoPb 15213, CoS 15232 and CoS 15233 showed MR reaction by plug and R reaction by nodal cotton swab methods of inoculations to both CF08 and CF09 pathotypes. In AVT (Midlate) Plant-II all the seven entries viz., Co 14035, CoH 14261, CoLk 14203, CoLk 14204, CoPb 14184, CoPb 14185 and CoS 14233 showed R/MR reaction by plug and R by nodal cotton swab methods against CF08 and CF09. In IVT (early) 5 entries viz., Co 16025, Co 16029, CoPb 16181, CoPb 16222 and CoS 16231 showed MR reaction by plug and R reaction by nodal cotton swab methods against CF08 and CF09 pathotypes, whereas CoLk 16201, CoLk 16202 and CoPant 16221 showed MR/MS reaction against CF08 and CF09 by plug and R reaction by nodal cotton swab methods against CF08 and CF09. However, CoPb 16211 was found S by plug and nodal cotton swab methods against both the pathotypes. In IVT (Midlate) 4 entries viz., CoLk 16203, CoLk 16204, CoS 16232 and CoS 16233 showed MR reaction by plug and R reaction by nodal cotton swab methods to both CF08 and CF09 pathotypes. The entries Co 16030, CoPb 16212, CoPant 16223 showed MR/MS reaction by plug against CF08 and CF09 and R reaction by nodal cotton swab methods of inoculations to both CF08 and CF09.

#### **KARNAL**

Forty IVT entries were evaluated for red rot resistance by plug and cotton swab methods of inoculation against CF08 and CF09. One IVT (E) entry CoPb 16211 exhibited HS reaction with CF08 and CF09 by both plug and cotton swab methods, whereas, entry CoLk 15201 (AVT (E)–I Plant) rated as MS to both the isolates by plug method. However, remaining entries were found R or MR to both the inocula and methods.

#### **PANTNAGAR**

In nodal cotton swab method, among 46 genotypes 40 showed R whereas 3 genotypes showed S reaction against both the pathotypes. In plug method, 3 genotypes were found R, 29 were MR and 10 were MS, 1 was S and 2 were HS for CF08, whereas 2 genotypes were found R, 30 were MR and 10 were MS, 1 was S and 2 were HS reaction for CF09 pathotype. Disease reaction data was not available for the genotype Co 15023 because all the plants of this entry were destroyed by the wild animal.

#### **NORTH CENTRAL ZONE**

##### **PUSA**

In plug method of inoculation, one entry CoP 16439 showed R reaction against CF07 and CF08, whereas, 3 entries viz., CoLk 16468, CoP 16439 and CoP 9301 were R against CF08, 18 entries showed MR reaction against both the pathotypes. Two entries viz., CoSe 16453 and CoLk 16466 showed MS and one entry CoLk 16469 showed S reaction against CF07. One entry CoLk 16469 showed MS reaction to CF08, three entries viz., CoLk 16466, CoLk 16467 and BO 156 showed S reaction to CF07 and two entries CoSe 16451 and CoLk 16469 were found S. Rest of the entries showed R to both the pathotypes in cotton swab method of inoculation.

## **MOTIPUR**

In IVT (Early) out of 8 genotypes tested, six *viz.*, CoP 16436, CoP 16437, CoLk 16466, CoLk 16467, CoLk 16468 and CoBln 16501 were rated as MR by plug method and R by nodal method against both the pathotypes. Genotype CoP 16438 was rated as MR against pathotype CF07 and MS against CF08 by plug method, whereas R against CF07 and S against CF08 by nodal method. In AVT (Early)-I Plant, out of five genotypes, 3 genotypes *viz.*, CoLk 15466, CoLk 15467 and CoSe 15455 were rated as MR by plug method and R by nodal method against both the red rot pathotypes. Two genotypes CoP 15436 and CoSe 15452 were rated as MR against pathotype CF07 and MS against CF08 by plug method.

In AVT (Early)-II Plant, out of 4 genotypes tested, CoLk 14206 was recorded as R by both the method of inoculation. Three genotypes *viz.*, CoP 14437, CoSe 14451 and CoSe 14454 were rated as MR by plug method and R by nodal method against both pathotypes. In IVT (Mid late) out of 9 genotypes tested, one genotype CoLk 16470 was recorded as R by both the method of inoculation against both the pathotypes. Seven genotypes *viz.*, CoP 16439, CoP 16440, BO 156, CoLk 16469, CoLk 16471, CoSe 16452 and CoBln 16502 were rated as MR by plug method and R by nodal method against both the pathotypes.

In AVT (Mid late)-I Plant out of 7 genotypes tested, CoP 15439 was rated as R against both the pathotypes. Five genotypes namely CoLk 15468, CoLk 15469, CoP 15438, CoP 15440 and CoSe 15454 were rated as MR by plug method and R by nodal method of inoculation against both the pathotypes. In AVT (Mid late)-II Plant all five genotypes tested were rated as MR by plug method and R by nodal method of inoculation.

## **SEORAH**

IVT (Early): In plug method out of eight genotypes none of them were found R against red rot. Five genotypes were rated as MR, one genotype (CoP 16438) was rated as MS to CF07 and MR to CF08, while CoLk 16466 was rated as MS to both pathotypes. Six genotypes were rated MR, while genotype CoBln 16501 was rated as S to CF07 and HS to CF08. In nodal cotton swab method 7 genotypes were found R and rest was S.

Initial Varietal Trial (Mid late): In plug method out of nine genotypes five were rated as MR to both designated pathotypes, while four *viz.*, BO 156, CoLk 16470, CoLk 16469 and CoBln 16502 were rated as S to both pathotypes. In cotton swab method 6 genotypes were rated as R, 2 *viz.*, BO 156 and CoLk 16469 were S and CoBln 16502 was rated as R to CF07 and S to CF08.

AVT (Early): In plug method out of 5 genotypes none was found R. Of these, 4 genotypes were rated as MR to CF08 and 1 genotype (CoLk 15467) was rated as MR to CF07 and MS to CF08, while all genotypes were found MR to CF07. In cotton swab method all were rated as resistant to both designated pathotypes.

AVT (Mid late): In Plug method out of 7 varieties tested none was found R, 5 genotypes were found MR to both pathotypes, one genotype (CoLk 15469) was rated as MS to CF08 and S to CF07, while genotype (CoP 15440) was rated as MS to CF07 and S to CF08. In nodal method all were rated as resistant to both designated pathotypes.

## **NORTH EAST ZONE**

### **BURALIKSON**

In IVT early group, all the entries except CoLk 16466 and CoLk 16467 showed MR reactions to CF07. The entries CoLk 16468 and CoBln 16501 showed R reactions to CF08, others were MR. In cotton swab method, all entries showed R reactions except CoP 16436 and CoLk 16466 which showed S reaction against CF07. In IVT (Mid late), CoP 16439 showed R reaction against both the isolates in both the method. In AVT early group, CoLk 15467 showed MR to CF07 in plug method but R to CF08 to both the isolates in cotton swab method. In AVT early second plant, CoP 14437 was rated as R in CF07 in plug and

cotton swab method, but moderately susceptible to CF08 in plug method. In AVT Midlate CoLk 15469 showed R reaction to CF07 in plug method but MR to CF08.

### **EAST COAST ZONE**

#### **ANAKAPALLE**

Thirty four entries were tested for their reaction to the pathotype CF06 by plug and cotton swab methods of inoculation. In plug method, fourteen entries viz., CoA 17321, CoA 17322, CoA 17323, CoC 17336, CoA 17324, CoC 17337, CoOr 17346, PI 17337, CoA 16321, CoV 16357, CoC 15336, CoOr 15346, CoA 92081 and Co 86249 showed R to CF06. In the cotton swab method, out of 34 entries tested, four entries viz., Co 419, CoC 671, Co 997, and Co 6907 showed S and the remaining entries reacted as R.

#### **CUDDALORE**

Among the 21 clones screened for resistance to red rot by plug method using CF06 pathotype the clones viz., CoA 17321, CoA 17322, CoA 17323, CoC 17336, CoA 16321, CoC 16337, CoV 16356, CoC 15338, CoV 15356, CoA 17324, CoC 17337, CoOr 17346, PI 17376, PI 17377, CoC 15339, CoOr 15346, CoC 16339 and CoV 16357 were found to be MR, 3 clones viz., CoC 16336, CoC 15336 and CoC 16338 were MS to red rot. In cotton swab method all 21 clones were found to be R.

### **PENINSULAR ZONE**

#### **NAVSARI**

In plug method 47 genotypes were tested using CF06 and CF12. In IVT out of 15 genotypes tested Co 16006, Co 16010, Co 16017, CoN 16071, CoM 16082 and CoR 16142 showed R reaction, 7 genotypes showed MR reaction and 2 showed MS reaction. The clones Co 16006, Co 16017, CoN 16071 and CoM 16082 exhibited R reaction, 10 genotypes showed MR reaction and CoVC 16062 showed MS reaction against CF12. In AVT-I plant out of 15 genotypes tested only one genotype i.e. Co14004 found with R reaction, 12 genotypes were rated MR reaction, Co 14027 and CoSnk 14102 were rated with MS reaction against CF06. Against CF12, Co 14004 showed R reaction, 13 genotypes were MR and CoSnk 14102 was rated as MS. In AVT-II plant, 12 genotypes were recorded as MR and 5 were MS against CF06 whereas two entries viz., Co 13009 and Co 13013 were R, 11 genotypes were MR and 4 genotypes were MS against CF12 pathotype. In cotton swab nodal method all 47 entries exhibited R reaction against both CF06 and CF12.

#### **THIRUVALLA**

Out of the 17 entries tested in AVT (II Plant) MR reaction was recorded in eleven varieties viz., Co 13003, Co13009, Co 13013, Co 13020, CoN13073, CoN13072, MS 13081, CoSnk 13101, CoSnk 13103, CoSnk 13106, PI 13132. Against CF12, ten entries viz., Co 13008, Co13009, Co 13013, Co 13020, CoN13073, CoN13072, CoSnk 13101, CoSnk 13103, CoSnk 13106, PI 13132 recorded MR reaction, six clones viz., Co13002, Co 13003, Co 13004, Co 13006, Co 13014, MS 13081 recorded MS reaction and one variety viz., Co 13018 recorded S reaction in plug method of inoculation. In Nodal cotton swab method, all entries except Co 13004, Co 13006, Co 13014 and Co 13018 showed R reaction. In AVT (I Plant), out of the 15 entries, two viz., Co 14012, CoT114111 exhibited MR reaction, ten entries viz., Co 14002, Co 14004, Co 14016, Co 14030, Co 14032, CoN14073, CoSnk14103, CoT14367, CoVc 14062, MS14082 exhibited MS reaction, one entry Co 14027 exhibited S reaction against CF06 in plug method of inoculation. In plug method against CF12, three entries viz., Co 14002, Co 14012, CoT114111 showed MR reaction, nine entries viz., Co 14004, Co 14016, Co 14030, Co 14032, CoN 14073, CoSnk 14103, CoT 14367, CoVc14062, MS14082 showed MS reaction and one entry Co 14027 showed S reaction. In Nodal cotton swab method, eight entries viz., Co 14002, Co 14012, Co 14016, CoSnk 14103, CoT 14367, CoT114111, CoVc 14062 and MS14082 showed R reaction to both CF06 and CF12. In IVT, out of the fifteen

entries, one *viz.*, CoR16141 exhibited MR reaction, seven entries *viz.*, Co 11015, Co 16006, Co 16010, Co 16018, CoM 16081, CoM16082, PI16131 exhibited MS reaction, six entries *viz.*, Co 16009, Co 16017, CoVc 16061, CoVc 16062, CoN 16071, CoVSI16121 exhibited S reaction against CF06 in plug method. Out of the fifteen entries tested against CF12, by plug method of inoculation, one *viz.*, CoR16141 showed MR reaction, eleven entries *viz.*, Co 11015, Co 16006, Co 16009, Co 16010, Co 16017, Co 16018, CoN 16071, CoM 16081, CoM 16082, CoVSI16121, PI16131 showed MS reaction. In Nodal cotton swab method, six entries *viz.*, Co 11015, Co 16006, Co 16018, CoM 16082, CoVSI 16121, CoR16141 showed R reaction to CF06, and against CF12, all these six entries and PI16131 showed R reaction.

### **COIMBATORE**

About 15 IVT entries were evaluated for red rot resistance by plug and nodal methods against pathotype CF06. Based on disease severity and rating score, 13 and 15 entries were identified as R in plug and nodal methods, respectively. Two entries behaved as MS in plug method and all entries behaved as R in nodal method of inoculation.

## **RESULTS OF THE CURRENT YEAR**

### **NORTH WEST ZONE**

#### **LUCKNOW**

In Initial Varietal Trial (Early), out of seven entries tested six *viz.*, CoLk 17201, CoLk17202, CoLk17203, CoPb17211, CoPb 17212, CoPant 17221 and CoS 17231 were rated as MR by plug method and R by nodal method of inoculation against both the pathotypes (CF08 and CF09). In Advanced Varietal Trial (Early)-I Plant, out of six entries tested, one *viz.*, CoLk 16201 was rated as R by both the method of inoculation (plug and nodal) against both the pathotypes. Five entries *viz.*, CoLk 14201, Co 15025, Co 16029, CoLk 16202 and CoPb 16181 were rated as MR by plug method and R by nodal method of inoculation against both the pathotypes. In Advanced Varietal Trial (Early)-II Plant, out of six entries tested, four *viz.*, Co 15023, Co 15027, CoLk 15201 and CoLk 15205 were rated as MR by plug method and R by nodal method of inoculation against both the pathotypes. Two genotypes *viz.*, Co 15024 and CoPb 15212 were rated as MS by plug method of inoculation and R by nodal method of inoculation against both the pathotypes.

In Initial Varietal Trial (Midlate), out of 15 entries tested, 11 *viz.*, CoLk 17204, CoLk 17205, CoPb 17215, CoPant 17223, CoS17233, CoS 17234, CoS 17235, CoS 17236, CoS 17237, CoH 17261 and Co 17018 were rated MR by plug method of inoculation and R by nodal method of inoculation against both the pathotypes. One entry CoPb 17214 was rated as MS against both the pathotypes by plug method of inoculation, whereas rated as R by nodal method of inoculation. Two entries namely CoPb 17213 and CoH 17262 were found S by both the method of inoculation and one entry CoPant 17224 was rated as HS by plug method of inoculation and S by nodal method of inoculation against both the pathotypes. In Advanced Varietal Trial (Mid late)-I Plant, out of 5 entries tested, one *viz.*, CoLk 16204 was found R by both the method of inoculation and one entry Co 16030 was rated as MS by plug method of inoculation and R by nodal method of inoculation against both the pathotypes. The others three entries *viz.*, CoLk 16203, CoS 16232 and CoS 16233 were rated MR by plug method of inoculation and R by nodal method of inoculation against both the pathotypes. In Advanced Varietal Trial (Mid late)-II Plant, all the 7 entries *viz.*, Co 15026, CoLk 15206, CoLk 15207, CoLk 15209, CoPb 15213, CoS 15232 and CoS 15233 were rated as MR by plug method and R by nodal method of inoculation against both the pathotypes (Table 12).

## SHAHJAHANPUR

Forty six entries were tested for red rot resistance in six trials (Table 13).  
IVT Early: Of seven entries, three *viz.*, CoLk 17201, CoLk 17202, and CoS 17231 were rated as R/MR to both the pathotypes (CF08 and CF09) by plug and nodal cotton swab method. One entry CoPb 17211 was graded as MS to CF08 and MR to CF09 by plug and R by nodal cotton swab method. Two entries such as CoLk 17203 and CoPb 17212 were evaluated as S to CF08 by plug and nodal cotton swab method, and MS to CF09 by plug and R by nodal cotton swab method. One entry CoPb 17221 was rated as MS to both pathotypes by plug method and R to both pathotypes by nodal method of inoculation.

IVT Midlate: Of 15 entries, 10 *viz.*, Co 17018, CoLk 17204, CoLk 17205, CoH 17262, CoPb 17215, CoPant 17223, CoS 17233, CoS 17234, CoS 17235 and CoS 17236 were recorded as MR to CF08 and CF09 by plug and R to nodal cotton swab method. Three entries such as CoH 17261, CoPb 17213 and CoPb 17214 were recorded as MR to CF08 and MS to CF09 by plug method and R to both pathotypes by nodal cotton swab method. Two entries *viz.*, CoPant 17224 and CoS 17237 were evaluated as S/HS to both pathotypes by plug method and by nodal cotton swab method.

AVT Early (I Plant): Among five entries tested four entries such as Co 15025, Co 16029, CoLk 14201, CoLk 16201 and CoLk 16202 exhibited R/MR reaction by plug and R by nodal cotton swab method to CF08 and CF09. One entry CoPb 16181 exhibited MS behaviour to CF08 whereas it was evaluated MR to CF09 and R to both pathotypes by nodal cotton swab method.

AVT Early (II Plant): Out of 6 entries, three *viz.*, Co 15023, Co 15027 and CoLk 15205 were rated as MR to both pathotypes by plug and R by nodal cotton swab method. One entry Co 15024 was recorded as MS to CF08 and MR to CF09 and R by nodal cotton swab method. One entry CoLk 15201 was rated as MR to CF08 and MS to CF09 by plug method and R to both pathotype by nodal cotton swab method. Another entry CoPb 15212 was recorded as MS by plug method and R by nodal cotton swab method against both the pathotypes.

AVT Mid late (I Plant): All five entries such as Co 16030, CoLk 16203, CoLk 16204, CoS 16232 and CoS 16233 were assessed as R/MR by plug and R by nodal cotton swab method against both the pathotypes.

AVT Mid late (II Plant): All seven entries *viz.*, Co 15026, CoLk 15206, CoLk 15207, CoLk 15209, CoPb 15213, CoS 15232 and CoS 15233 were graded as R/MR by plug and R by nodal cotton swab method against CF08 and CF09.

## KAPURTHALA

Forty six genotypes along with standard checks were tested against red rot pathotypes CF08 and CF09 separately by plug and nodal cotton swab methods. In IVT (Early), four entries *viz.*, CoLk 17201, CoLk 17202, CoPb 17211 and CoS 17231 behaved as MR/R by plug and nodal cotton swab methods against both the pathotypes. In AVT (Early) Plant I, all the entries behaved as MR/R by plug and nodal cotton swab methods by both the pathotypes. In AVT (Early) Plant II, four entries Co 15023, Co 15027, CoLk 15201, CoLk 15205 behaved as MR/R by plug and nodal cotton swab methods by both the pathotypes. In IVT (Mid late), among tested genotypes, 13 entries namely Co 17018, CoLk 17204, CoLk 17205, CoPb 17213, CoPb 17214, CoPb 17215, CoPant 17223, CoS 17233, CoS 17234, CoS 17235, CoS 17236, CoH 17261 and CoH 17262 found MR/R by plug and nodal cotton swab methods against both the pathotypes. In AVT (Mid late) Plant I, all genotypes namely Co 16030, CoLk 16203, CoLk 16204, CoS 16232 and CoS 16233 behaved as MR/R. In AVT (Mid late) Plant II, the entries Co 15026, CoLk 15206, CoLk 15207, CoLk 15209, CoPb

15213 and CoS 15233 behaved as MR/R by plug and nodal cotton swab methods with both the pathotypes (Table 14).

### **UCHANI**

AVT (early) Plant-I: Of the 6 entries five *viz.*, Co 15025, Co 16029, CoLk 14201, CoLk 16201 and CoPb 16181 showed MR reaction by plug and R reaction by nodal cotton swab methods against both the pathotypes. However, CoLk 16202 found MS by plug against CF08 and MR by CF09 and R by nodal cotton swab methods against CF08 and CF09.

AVT (early) Plant-II: Of the six entries 4 entries *viz.*, Co 15023, Co 15027, CoLk 15205 and CoPb 15212 showed MR reaction by plug and R reaction by nodal cotton swab methods against both pathotypes. However, Co 15024 exhibited MR /MS reaction by plug and R reaction by nodal cotton swab methods against CF08 and CF09 pathotypes. CoLk 15201 entry was MS by plug and R by nodal cotton swab methods.

AVT (midlate) Plant-I: All the five entries *viz.*, Co 16030, CoLk 16204, CoS 16232 and CoS 16233 showed MR reaction by plug and R by nodal cotton swab methods of inoculations to both the pathotypes. CoLk 16203 exhibited MR /MS reaction by plug and R reaction by nodal cotton swab methods.

AVT (midlate) Plant-II: Of the seven entries five *viz.*, Co 15026, CoLk 15206, CoLk 15207, CoLk 15209 and CoS 15233 were rated as R/MR by plug and R by nodal cotton swab methods against CF08 and CF09. Two entries *viz.*, CoPb 15213 and CoS 15232 exhibited MR/MS reaction by plug and R by nodal cotton swab methods.

IVT (early): Of the seven genotypes four entries *viz.*, CoLk 17201, CoLk 17202, CoLk 17203 and CoS 16231 showed MR reaction by plug and R reaction by nodal cotton swab methods. CoPb 17211 and CoPant 17221 showed MR/MS reaction against CF08 and CF09 and R reaction by nodal cotton swab methods. However, CoPb 17212 found S by plug and nodal cotton swab methods against both the races.

IVT (midlate): Of the fifteen entries eight *viz.*, CoLk 17205, CoPb 17215, CoS 17233, CoS 17235, CoS 17236, CoH 17261, CoH 17262 and Co 17018 showed MR reaction by plug and R reaction by nodal cotton swab methods to both the pathotypes. CoLk 17204 and CoPb 17213 showed MR/ MS reaction by plug and R reaction by nodal cotton swab methods to both pathotypes. Entries CoPb 17214 and CoS 17234 were MS by plug and R by nodal cotton swab method of inoculation and CoS 17237 showed HS reaction by plug and S by nodal cotton swab method of inoculation (Table 15).

### **KARNAL**

Forty five IVT entries along with eight standard varieties were evaluated for red rot resistance by plug and cotton swab methods of inoculation with CF08 and CF09 pathotypes. One IVT(E) entry CoPb 17212 and two IVT(ML) entries CoPant 17224 and CoS 17237 expressed S with CF08 and CF09 by both plug and cotton swab methods. Five entries *viz.*, CoPant 17221, CoLk 15201, CoPb 15212, CoPb 17214 and CoS 17234 showed MS reaction with both pathotypes. However, remaining entries exhibited R or MR reactions with both the inocula and methods. Trace incidence of wilt was also recorded in three entries namely CoPb 17211, CoPb 17214 and CoS 17231 (Table 16).

### **PANTNAGAR**

Among 50 genotypes inoculated by plug method, 1 was found R, 30 were MR and 17 were MS and 2 susceptible reaction for CF08 pathotype whereas, 5 genotypes were found R, 32 were MR and 11 were MS and 2 were S to CF09 pathotype. In nodal cotton swab method, all the genotypes showed R for both the pathotypes. Disease reaction data was not available for the genotype CoPb 17211 and CoS 17231 because they were not planted due to unavailability of seed (Table 17).

## **NORTH CENTRAL ZONE**

### **PUSA**

Twenty entries were tested with pathotypes CF07 and CF08 by plug and cotton swab methods of inoculation. By plug method, single entry (CoP 17446) showed R reaction against CF07 pathotype, five entries showed R reaction against CF08, whereas five and three exhibited MS against CF07 and CF08, respectively. Single entry (CoSe 17452) observed S against CF07 isolate, while rest of the entries were observed MR against both the isolates. In nodal cotton swab method six entries showed S to CF07 and two entries showed S against CF08 pathotype and rest of the entries exhibited R against both the pathotypes (Table 18).

### **MOTIPUR**

In IVT (Early) out of eight entries tested, seven *viz.*, CoSe 16454, CoP 17436, CoP 17438, CoP 17440, CoP 17441, CoSe 17451 and CoBln 17501 were rated as MR by plug method and R by nodal method of inoculation against both the pathotypes. Entry CoP 17437 was rated as MS by plug method and S by nodal method of inoculation against both the pathotypes. In IVT (Midlate), out of 6 entries, two *viz.*, CoSe 16456 and CoP 17446 were rated as MR by plug method and R by nodal method of inoculation. Two genotypes namely CoSe 16455 and CoP 17444 were rated as MS by plug method of inoculation and S by nodal method of. Genotype CoSe 17452 was rated as MS by plug method and R by nodal method.

In AVT (Early)-I Plant, out of 5 entries tested, 4 *viz.*, CoP 16437, CoP 16438, CoLk 16466 and CoLk 16468 were rated as MR by plug method and R by nodal method of inoculation against both the pathotypes. Genotype CoSe 16451 was rated as MS by plug method of inoculation and S by nodal method of inoculation against both the red rot pathotypes. In AVT (Early)-II Plant, all 5 entries tested *viz.*, CoLk 15466, CoLk 15467, CoP 15436, CoSe 15452 and CoSe 15455 were rated as MR by plug method and R by nodal method of inoculation against both the pathotypes.

In AVT (Midlate)-I Plant, all 4 entries *viz.*, CoP 16439, CoLk 16470, CoSe 16452 and CoBln 16502 were rated as MR by plug method and R by nodal method against both the pathotypes. In AVT (Midlate)-II Plant all the seven entries *viz.*, CoLk 15468, CoLk 15469, CoP 15438, CoP 15439, CoP 15440, CoSe 15453 and CoSe 15454 were rated as MR by plug method of inoculation and R by nodal method against both the pathotypes (Table 19).

### **SEORAH**

Initial Varietal Trial (Early): Out of eight entries evaluated all were found R in cotton swab method. Initial Varietal Trial (Midlate): Six entries were evaluated and in that five were rated as MR to both the pathotypes, while one (CoBln 17502) was rated as S to CF07 and MS to CF08. In nodal method 5 were R, while CoBln 17502 was found S to both pathotypes.

Advanced Varietal Trial (Early): Out of five entries none was found R, 4 were rated as MR to CF07 and one CoP 16438 was rated as MS to CF07, while all entries were MR to CF08. In nodal method all were rated as R to both designated pathotypes. Advanced varietal trial (Midlate): Out of four entries tested in plug method none was found R, two CoSe 16452 and CoP 16439 were MR to both pathotypes, while two CoBln 16502 and CoLk 16470 were rated as MS. In nodal method all were rated as R to both designated pathotypes (Table 20).

## **NORTH EAST ZONE**

### **BURALIKSON**

In IVT, CoBln 17501 showed MR reaction, while CoBln 17502 showed MS reaction to both the pathotypes in plug method. In AVT early I plant, CoP 16437 showed MR to both CF07 and CF08 in plug method, but R to both the pathotypes in cotton swab method. CoLk 16468 showed MR to CF07 and R to CF08 in plug method and R to both the pathotypes in cotton swab method. CoLk 16466 showed MS and S reaction to CF07 while it



showed MR and R to CF08 in plug and cotton swab method, respectively. In AVT early II plant, CoSe 15455 rated as MR to CF07 but MS to CF08 in plug method and R and S to CF07 and 08, respectively in cotton swab method. CoSe 15452 showed MS reaction to both pathotypes in plug method and S to both pathotypes in cotton swab method. In AVT Midlate (I plant), CoP 16439 showed R to both isolates in both methods of inoculation, while CoLk 16470, CoSe 16452 and CoBlN 16502 showed MR reaction. In AVT Midlate (II plant), CoLk 15469 showed R reaction to CF07 and MR reaction to CF08 in plug method and R to both isolates in cotton swab method. The rest of the entries showed MR reaction to both pathotypes in plug and R to both the isolates in cotton swab method (Table 21).

### **EAST COAST ZONE**

#### **ANAKAPALLE**

Twenty nine entries were tested for their reaction to the pathotype CF06 individually by cotton swab and plug methods of inoculation. In the cotton swab method, out of 29 entries tested four *viz.*, Co 419, CoC 671, Co 997 and Co 6907 manifested top drying indicating their susceptibility and the remaining entries reacted as R to CF06. In plug method of inoculation 12 entries *viz.*, CoA 11321, CoA 16321, CoA 17321, CoA 17323, CoA 17324, CoA 92081, CoC 17336, CoOr 15346, CoOr 18346, CoV 16357, CoV 18356 and CoV 18357 showed R, while 7 entries *viz.*, Co 06030, CoC 15339, CoC 16339, CoC 01061, CoOr 03151, CoV 16356 and CoV 92102 showed MR to CF06 (Table 22).

#### **CUDDALORE**

Among the 15 clones screened by plug method using CF06 pathotype 13 clones *viz.*, CoA 17321, CoA 17323, CoC 15339, CoC 16339, CoC 17336, CoA 16321, CoC 16337, CoOr 15346, CoOr 18346, CoV 18356, CoV 18357, CoV 16356 and CoV 16357 were found MR and two clones *viz.*, CoC 16336 and CoC 16338 were MS. In nodal cotton swab method all the 15 clones screened for red rot resistance was found to be R (Table 23).

### **PENINSULAR ZONE**

#### **NAVSARI**

In plug method out of 18 entries tested in IVT four *viz.*, Co 17001, Co 17003 and Co 17008 were identified as R, 10 entries were rated as MR, 2 were MS and one was HS against both the pathotypes, whereas CoVc 17061 showed MS and MR reaction against CF06 and CF12, respectively and MS 17082 showed HS and S reaction against CF06 and CF12 pathotypes. In AVT-I plant, out of 12 genotypes tested 6 were MR, whereas 4 entries were MS against both the pathotypes. Out of 15 entries in AVT-II plant, 2 were recorded as R and 10 entries were rated as MR and 3 were MS against CF06, whereas 11 entries showed MR reaction, 3 were identified as MS and one was S to CF12 pathotype. In cotton swab method among the 45 entries, 42 were rated as R against CF06 and 43 were R against CF12. The genotype CoVSI 17021 showed S reaction against both the pathotypes, whereas entries MS 17082 and CoSnk 15102 were S to CF06 (Table 24).

#### **THIRUVALLA**

Out of the 15 entries tested in AVT (II Plant) with the designated pathotype CF06, one entry *viz.*, CoTl 14111 showed R reaction, MR reaction was recorded in ten entries *viz.*, Co14002, Co14004, Co14012, Co14016, Co14032, CoSnk14103, CoT 14367, CoVc 14062, MS14081, MS14082 and MS reaction in four varieties *viz.*, Co14027, Co14030, CoN14073, CoSnk14102 by plug method of inoculation. Against CF12, the entries *viz.*, CoTl 14111 showed R, 10 entries *viz.*, Co14004, Co14012, Co14016, Co14030, Co14032, CoSnk14103, CoT 14367, CoVc 14062, MS14081, MS14082 recorded MR and four entries *viz.*, Co14002, Co14027, CoN14073, CoSnk14102 recorded MS in plug method of inoculation. In nodal cotton swab method all entries showed R reaction to both the pathotypes.

In Advanced Varietal Trial (I Plant), out of 12 entries, 6*viz.*, Co15005, Co15006, Co15007, Co15009, Co15017 and Co15021 exhibited MR reaction, four entries*viz.*, Co11015, Co14005, Co15010, PI15131 exhibited MS reaction, two entries*viz.*, CoSnk15102, CoN15071 exhibited S against the reference pathotype CF06. Out of the 12 entries tested against CF12, by plug method of inoculation, five *viz.*, Co14005, Co15005, Co15006, Co15007, Co15017 showed MR reaction, five entries*viz.*, Co11015, Co15009, Co15010, Co15021, PI15131 showed MS reaction and two *viz.*, CoSnk15102, CoN15071 showed S reaction. In Nodal cotton swab method of inoculation, one entry*viz.*, CoSnk15102 showed S reaction to CF06 whereas all other entries showed R reaction to both CF06 and CF12.

In Initial Varietal Trial, out of the 18 entries, two *viz.*, Co 17001, CoVc 17061 exhibited R reaction, nine entries*viz.*, Co17002, Co17003, Co17005, Co17006, Co17010, Co17013, Co17014, MS 17081, CoT 17366 exhibited MR reaction, one entry*viz.*, CoN17072 exhibited MS reaction and three entries *viz.*, Co17004, CoN17071, CoVSI 17121 exhibited S reaction against the CF06 in plug method of inoculation. Out of 18 entries tested against CF12, by plug method of inoculation, two *viz.*, Co 17001, CoVc 17061 exhibited R reaction, nine entries*viz.*, Co17002, Co17003, Co17005, Co17006, Co17010, Co17013, Co17014, MS 17081, CoT 17366 exhibited MR reaction, two entries*viz.*, CoN17072, Co17004 exhibited MS reaction and two *viz.*, CoN17071, CoVSI 17121 exhibited S reaction. In Nodal cotton swab method of inoculation, except two *viz.*, CoN17071 and CoVSI 17121 all other entries showed R reaction to CF06 and CF12. Due to insufficient growth of the canes three entries *viz.*, Co17008, Co17012, MS17082 could not be inoculated in time (Table 25).

## COIMBATORE

About 12 AVT entries were evaluated for red rot resistance under field conditions and among them 5 were found to be R/MR by plug method and 11 were R under nodal method against CF06 pathotype. Among the 18 IVT entries evaluated for red rot resistance under field conditions, 14 were found to be R/MR by plug method and 16 were R under nodal method against CF06 pathotype (Table 26).

## SUMMARY

The entries showing R or MR to red rot by plug & nodal cotton swab method of evaluation are listed below

### NORTH WEST ZONE (Table 12 to 17)

#### LUCKNOW

IVT (Early)	:	CoLk 17201, CoLk 17202, CoLk 17203, CoPb 17211, CoS 17231
IVT (Midlate)	:	Co 17018, CoLk 17204, CoLk 17205, CoPb 17215, CoPant 17223, CoS 17233, CoS 17234, CoS 17235, CoS 17236, CoS 17237, CoH 17261
AVT (Early) I Plant	:	Co 15025, Co 16029, CoLk 14201, CoLk 16201, CoLk 16202, CoPb 16181
AVT (Early) II Plant	:	Co 15023, Co 15027, CoLk 15201, CoLk 15205
AVT (Midlate) I Plant	:	CoLk 16203, CoLk 16204, CoS 16232, CoS 16233
AVT (Midlate) II Plant	:	Co 15026, CoLk 15206, CoLk 15207, CoLk 15209, CoPb 15213, CoS 15232, CoS 15233

#### SHAHJAHANPUR

IVT (Early)	:	CoLk 17201, CoLk 17202, CoS 17231
IVT (Midlate)	:	Co 17018, CoLk 17204, CoLk 17205, CoH 17262, CoPb 17215, CoPant 17223, CoS 17233, CoS 17234, CoS 17235, CoS 17234
AVT (Early) I Plant	:	Co 15025, Co 16029, CoLk 14201, CoLk 16201, CoLk 16202
AVT (Early) II Plant	:	Co 15023, Co 15027, CoLk 15205
AVT (Midlate) I Plant	:	Co 16030, CoLk 16203, CoLk 16204, CoS 16232, CoS 16233

AVT (Midlate) II Plant : Co 15026, CoLk 15206, CoLk 15207, CoLk 15209, CoPb 15213, CoS 15232, CoS 15233

### **KAPURTHALA**

IVT (Early) : CoLk 17201, CoLk 17202, CoPb 17211, CoS 17231  
IVT (Midlate) : Co 17018, CoLk 17204, CoLk 17205, CoPb 17213, CoPb 17214, CoPb 17215, CoPant 17223, CoS 17233, CoS 17234, CoS 17235, CoS 17236, CoH 1726, CoH 17262  
AVT (Early) I Plant : Co 15025, Co 16029, CoLk 14201, CoLk 16201, CoLk 16202, CoPb 16181  
AVT (Early) II Plant : Co 15023, Co 15027, CoLk 15201, CoLk 15205  
AVT (Midlate) I Plant : Co 16030, CoLk 16203, CoLk 16204, CoS 16232, CoS 16233  
AVT (Midlate) II Plant : Co 15026, CoLk 15206, CoLk 15207, CoLk 15209, CoPb 15213, CoS 15233

### **UCHANI**

IVT (Early) : CoLk 17201, CoLk 17202, CoLk 17203, CoS 17231  
IVT (Midlate) : Co 17018, CoLk 17205, CoPb 17215, CoS 17233, CoS 17235, CoS 17236, CoH 17261, CoH 17262  
AVT (Early) I Plant : Co 15025, Co16029, CoLk 14201, CoLk 16201, CoLk 16202, CoPb 16181  
AVT (Early) II Plant : Co 15023, Co 15027, CoLk 15205, CoPb 15212  
AVT (Midlate) I Plant : CoLk 16204, CoS 16232, CoS 16233  
AVT (Midlate) II Plant : Co 15026, CoLk 15206, CoLk 15207, CoLk 15209, CoS 15233

### **KARNAL**

IVT (Early) : CoLk 17201, CoLk 17202, CoLk 17203, CoPb 17211, CoPant 17221, CoS 17231  
IVT (Midlate) : Co 17018, CoLk 17205, CoPb 17215, CoPant 17223, CoS 17233, CoS 17235, CoS 17236, CoH 17261, CoH 17262  
AVT (Early) I Plant : Co 15025, Co 16029, CoLk 16201, CoLk 16202, CoPb 16181  
AVT (Early) II Plant : Co 15023, Co 15024, Co 15027, CoLk 15205  
AVT (Midlate) I Plant : Co 16030, CoLk 16203, CoLk 16204, CoLk 16203, CoLk 16204  
AVT (Midlate) II Plant : Co 15026, CoLk 15207, CoLk 15209, CoPb 15213, CoS 15232, CoS 15233

### **PANT NAGAR**

IVT (Early) : CoLk 17203, CoPant 17221  
IVT (Midlate) : CoLk 17205, CoPant 17223, CoPant 17224, CoS 17233, CoS 17236, CoH 17261, CoH 17262  
AVT (Early) I Plant : Co 15025, Co 16029, CoLk 14201, CoLk 16202  
AVT (Early) II Plant : Co 15023, Co 15024, Co 15027, CoLk 15205, CoPb 15212  
AVT (Midlate) I Plant : Co 16030, CoLk 16203, CoLk 16204, CoS 16232, CoS 16233  
AVT (Midlate) II Plant : CoLk 15206, CoLk 15207, CoLk 15209, CoPb 15213, CoS 15233

### **NORTH CENTRAL ZONE(Table 18 to 20)**

#### **PUSA**

IVT (Early) : CoSe 17451, CoP 17441, CoP 17436, CoP 17437, CoP 17440, CoSe 01421  
IVT (Midlate) : CoP 2061, CoP 9301, CoP 16455, CoP 16456, CoP 17446

#### **MOTIPUR**

IVT (Early) : CoBln 17501, CoP 17436, CoP 17438, CoP 17440, CoP 17441, CoSe 16454, CoSe 17451  
IVT (Midlate) : CoP 17446, CoSe 16456

AVT (Early) I Plant : CoP 16437, CoP 16438, CoLk 16466,8  
 AVT (Early) II Plant : CoLk 15466, CoLk 15467, CoP 15436, CoSe 15452, CoSe 15455  
 AVT(Midlate) I Plant : CoBln 16502, CoLk 16470, CoP 16439, CoSe 16452  
 AVT (Midlate) II Plant : CoLk 15468, CoLk 15469, CoP 15438, CoP 15439, CoP 15440, CoSe 15453, CoSe 15454

**SEORAH**

IVT (Early) : CoBln 17501, CoP 17436, CoP 17437, CoP 17438, CoP 17440, CoP 17441, CoSe 16454, CoSe 17451  
 IVT (Mid late) : CoP 17444, CoP 17446, CoSe 17452, CoSe 16455, CoSe 16456  
 AVT (Early) I Plant : CoLk 16466, CoLk 16467, CoP 16437, CoSe 16451  
 AVT (Mid late) : CoP 16439, CoSe 16452

**NORTH EAST ZONE (Table 21)**

**BURALIKSON**

IVT (Midlate) : CoBln 17501  
 AVT (Early) I Plant : CoLk 16468, CoP 16437  
 AVT (Early) II Plant : Nil  
 AVT (Midlate) I Plant : CoBln 16502, CoP 16439, CoSe 16452  
 AVT (Midlate) II Plant : CoLk 15468, CoLk 15469, CoP 15438, CoP 15439, CoP 15440

**EAST COAST ZONE (Table 22 to 23)**

**ANAKAPALLE**

IVT (Early) : CoOr 18346, CoV 18356, CoV 18357  
 AVT (Early) I Plant : CoA 17321, CoA 17323, CoC 17336  
 AVT (Early) II Plant : CoA 16321, CoV 16356  
 AVT (Midlate) II Plant : CoC 15339, CoC 16339, CoOr 15346, CoV 16357

**CUDDALORE**

IVT (Early) : CoOR 18346, CoV 18356, CoV 18357  
 AVT (Early) I Plant : CoA 17321, CoA 17323, CoC 17336  
 AVT (Early) II Plant : CoA 16321, CoC 16337, CoV 16356  
 AVT (Midlate) I Plant : CoC 15339, CoC 16339, CoOr 15346, CoV 16357

**PENINSULAR ZONE (Table 24 to 26)**

**NAVSARI**

IVT (Early) : Co 17001, Co 17002, Co 17003, Co 17004, Co 17005, Co 17006, Co 17008, Co 17010, Co 17012, Co 17010,3, Co 170104, CoN 17072, CoT 17366  
 AVT (Early) I Plant : Co 14005, Co 15005, Co 15010, Co 15017, Co 15021, CoN 15071  
 AVT (Early) II Plant : Co 14004, Co 14012, Co 14016, Co 14030, Co 14032, CoN 14073, CoSnk 14102, CoSnk 14103, CoT 14111, CoVc 14062, MS 14081, MS 14082

**THIRUVALLA**

IVT (Early) : Co 17001, Co 17002, Co 17003, Co 17005, Co 17006, Co 17010, Co 17013, Co 17014, CoVc 17061, CoN 17071, MS 17081, CoT 17366  
 AVT (Early) I Plant : Co 15005, Co 15006, Co 15007, Co 15017  
 AVT (Early) II Plant : Co 14004, Co 14012, Co 14016, Co 14032, CoSnk 14103, CoT 14367, CoT 14111, CoVc 14062, MS 14081, MS 14082

**COIMBATORE**

IVT (Early) : Co 17001, Co 17002, Co 17003, Co 17004, Co 17005, Co 17006, Co 17008, Co 17010, Co 17012, Co 17013, Co 17014, CoVc 17061, MS 17081, CoT 17366  
 AVT (Early) : Co 14005, Co 15005, Co 15009, Co 15021, PI 15131

## PP 17B: EVALUATION OF ZONAL VARIETIES FOR 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, Navsari 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)
0.1 to 10 %	: Moderately Resistant (MR)
10.1 to 20 %	: Moderately Susceptible (MS)
20.1 to 30 %	: Susceptible (S)
Above 30%	: Highly susceptible (HS)

## RESULTS OF THE PREVIOUS YEAR

### NORTH WEST ZONE

#### LUCKNOW

Out of 40 genotypes tested, 20 entries *viz.*, Co 14034, Co 14035, Co 15023, Co 15024, Co 16025, Co 16029, Co 16030, CoLk 15201, CoLk 15205, CoLk 14201, CoLk 16203, CoS 16233, CoLk 15206, CoLk 15207, CoPant 16221, CoPant 16222, CoPb 14211, CoPb 15213, CoLk 14203 and CoS 15233 were rated as R and ten genotypes *viz.*, Co 15026, CoH 14261, CoLk 16202, CoS 16231, CoPb 14181, CoLk 16204, CoPant 16223, CoS 16232, CoPb 14184 and CoPb 14185 were rated as MR.

#### SHAHJAHANPUR

In IVT (Early), out of nine entries 7 exhibited R to MR reaction, 2 entries CoLk 16201 and CoPb 16211 were found as S and MS, respectively. In IVT (Mid late), four entries were screened as MR and 2 were identified as MS and one entry CoLk 16204 was rated as S. In AVT Early (I Plant), out of six entries 4 were R and two were MS. In AVT Early (II

Plant), out of four entries 2 were observed as Rtwo behaved as S and MS, respectively. In AVT Mid late (I Plant), out of seven, 3 entries *viz.* CoLk 15206, CoS 15232, CoS 15233 were rated as R/MR, whereas three entries showed MS and one was rated as S. In AVT Mid late (II Plant), three out of seven entries were identified as R/MR, 3 as MS and one as S.

#### **KAPURTHALA**

Out of 40 genotypes, three namely Co 15025, Co 16030 and CoPb 16181 were rated as R and 25 genotypes *viz.*, Co 15023, Co 15024, Co 15027, CoLk 14204, CoLk 15206, CoLk 15207, Co 16029, CoH 14261, CoLk 16201, CoLk 16202, CoLk 16203, CoPb 16211, CoPant 16221, CoPant 16222, CoPant 16223, CoPb 15212, CoPb 14211, CoPb 16212, CoS 16232, CoPb 15213, CoPb 14184, CoPb 14185, CoS 14233 CoS 15233 and CoS 16231 were rated as MR. Of the remaining entries, 11 were rated as MS and one entry was rated as S.

#### **UCHANI**

In IVT (early) out of nine 2 entries *viz.* Co 16029 and CoPant 16222 were found to be R and 5 namely Co 16025, CoLk 16202, CoPb 16211, CoPb 16181 and CoPant 16221 showed MR reaction. In IVT (midlate) out of Seven entries 1 entry Co 16030 showed R reaction and CoLk 16203, CoLk 16204, CoPb 16212, CoPant 16223, CoS 16232 and CoS 16233 exhibited MR reaction. In AVT (early) Plant I, out of 6 genotypes 4 entries *viz.* Co 15023, CoLk 15201, CoLk 15205 and CoPb 15212 were found MR. In AVT (early) Plant II, 4 genotypes were evaluated, in that only CoLk 14201 was found R and 2 entries Co 14034 and CoPb 14181 showed MR reaction. In AVT (Mid late) Plant I out of seven entries 4 entries *viz.*, CoLk 15206, CoLk 15207, CoPb 15213 and CoS 15233 showed MR reaction. In AVT (Midlate) Plant II, out of 7 entries CoH 14261 was found R and entries Co 14035, CoLk 14203, CoPb 14184, CoPb 14185 and CoS 14233 showed MR reaction.

#### **PANTNAGAR**

Out of 46 genotypes screened 22 were found R, 13 were MR, 4 were MS, 1 was S and 6 were HS.

#### **NORTH CENTRAL ZONE**

##### **PUSA**

Twenty three entries were evaluated and it was observed that eleven entries *viz.*, BO 91, CoBln 16501, CoBln 16502, CoLk 16470, CoLk 16468, CoLk 16471, CoLk 94184, CoP 16437, CoP 16439, CoP 9301, and CoSe 16451 were rated as R, whereas twelve entries *viz.*, BO 156, CoLk 16466, CoLk 16467, CoLk 16469, CoP 16438, CoP 16440, CoP 16436, CoP 2061, CoSe 01421, CoSe 16452, CoSe 16453 and CoSe 95422 were graded as MR.

##### **MOTIPUR**

Out of thirty eight genotypes tested, 22 genotypes *viz.*, CoBln 16501, CoBln 16502, CoP 16436, CoP 16437, CoLk 15466, CoLk 15467, CoLk 14206, CoP 14437, CoLk 16470, CoLk 16471, CoLk 15468, CoLk 15469, CoP 15438, CoP 15439, CoSe 15454, CoLk 14208, CoLk 14209, CoP 14438, CoP 14439 and CoSe 14451, CoSe 14455 and CoSe 16451 were rated as R. Thirteen genotypes *viz.*, BO 156, CoLk 16466, CoLk 16467, CoLk 16468, CoP 16438, CoP 16440, CoSe 14452, CoSe 15455, CoSe 14454, CoLk 16469, CoSe 16452, CoSe 16453 and CoSe 15453 were rated as MR. Three genotypes *viz.*, CoP 15440, CoP 16439 and CoP 15436 were rated as MS and 5 genotypes *viz.*, CoLk 16470, CoP 15440, CoP 16438, CoSe 15452 and CoSe 16452 and were rated as S.

##### **SEORAH**

In IVT (Early) 6 genotypes were found as R and 2 genotypes *viz.*, CoBln 16501 and CoLk 16466 were rated as S. In IVT (Mid late) out of 9 genotypes 3 were found as R, 3 genotypes were MS and 3 genotypes were S. In AVT (Early) out of five genotypes 2 were found R, while 3 were rated as S. In AVT (Mid-late) out of 7 genotypes 4 were found as R, 2 genotypes were MS, while one genotype was rated as S.

## **EAST COAST ZONE**

### **ANAKAPALLE**

Out of 34 genotypes tested, one genotype (Co 06030) was found R, while eight entries *viz.*, CoC 17337, CoOr 17346, CoC 16336, CoOr 15346, CoC 16339, CoC 01061, CoV 92102 and Co 86249 showed MR reaction and the remaining entries showed MS, S and HS reaction.

### **CUDDALORE**

Among 21 clones screened for resistance to smut six clones *viz.*, CoA 16321, CoA 17324, CoC 15338, CoC 16339, CoC 17337 and CoOr 15346 were MR, 10 clones *viz.*, CoA 17322, CoA 17323, CoC 17336, CoC 16336, CoC 16337, CoV 16356, CoC 15336, CoOr 17346, CoC 15339 and PI 17377 were MS, 3 clones *viz.*, CoA 17321, CoC 16338 and CoV 16357 were S and 2 clone *viz.*, PI 17376 and CoV 15356 were HS.

## **PENINSULAR ZONE**

### **NAVSARI**

Among 47 genotypes tested, 25 genotypes *viz.*, Co 11015, Co 13002, Co 13003, Co 13008, Co 13009, Co 13013, Co 13018, Co 14032, Co 16006, Co 16009, Co 16010, Co 16017, Co 16018, CoM 16081, CoN 13072, CoN 16071, CoN 14073, CoR 16142, CoSnk 13101, CoT 14367, MS 13081, CoN 13073, CoVc 16061, CoVc 16062 and PI 13132 were rated as R. Seven genotypes *viz.*, Co 13004 and Co 13020, Co 14002, Co 14030, CoSnk 14102, CoSnk 14103 and MS 14082 were rated as MR. Six genotypes *viz.*, Co 13006, CoR 16141, CoSnk 13103, CoSnk 13106, PI 16131 and MS 14082 were MS. Five genotypes *viz.*, Co 13014, Co 14004, CoM 16082, CoVSI 16121 and CoVc 14062 were found as S and 4 genotypes namely Co 14012, Co 14016, Co 14027 and CoTI 14111 were rated as HS.

### **PUNE**

Forty-eight entries were screened for resistance to smut disease and out of these 33 genotypes *viz.*, Co13008, Co13004, Co13003, Co13006, Co13020, Co14002, Co14005, Co14012, Co14032, Co15009, Co15010, Co16006, Co16010, CoM16081, CoM16082, CoN12073, CoN 14073, CoN16071, CoSnk 13106, CoSnk13103, CoSnk14103, CoT14367, CoSnk14102, Co14030, CoVc 15061, CoVc 16062, CoVSI16121, CoR16141, CoTL14111, MS 13081, MS14082 and PI16131 were reacted as R, 7 genotypes *viz.*, Co16017, Co16018, CoR 16142, CoVc 14062, CoVc 15063, CoVc 16061 and MS 14081 were MR, 2 genotypes *viz.*, Co14027 and Co14004 were MS, 5 genotypes *viz.*, Co14016, Co15021, Co16009, Co16015 and Co7219 were S and Co740 reacted as HS.

### **COIMBATORE**

Among the 15 IVT entries evaluated for smut, four entries *viz.*, Co 16018, CoM 16081, CoR 16142 and CoVc 16062 were identified as R, whereas one entry CoM 16082 was identified as MR.

## **RESULTS OF THE CURRENT YEAR**

### **NORTH WEST ZONE**

#### **LUCKNOW**

Out of 46 entries tested, 32 *viz.*, CoLk 17201, CoPb 17211, CoPb 17212, CoS 17231, CoLk 14201, Co 15025, CoLk 16202, CoPb 16181, Co 15023, Co 15024, Co 15027, CoLk 15201, CoLk 15205, CoPb 15212, CoLk 17204, CoLk 17205, CoPb 17215, CoS 17233, CoS 17234, CoS 17236, CoS 17237, CoH 17261, CoH 17262, Co 16030, CoLk 16203, CoLk 16204, CoS 16232, CoS 16233, Co 15026, CoPb 15213, CoS 15232 and CoS 15233 were rated as R and five entries namely CoPb 17214, CoPant 17223, CoS 17235, CoLk 15206 and CoLk 15207 were rated as MR (Table 12).

## **SHAHJAHANPUR**

Among the IVT (Early), all seven entries exhibited R to MR reaction. In IVT (Mid late) out of 15 entries, twelve entries were R to MR, one was evaluated as MS (CoH 17262) and one CoLk17205 evaluated as S. In AVT Early (I Plant), out of six entries three were observed as R to MR and three were evaluated as MS. In AVT Early (II Plant) four entries were rated R to MR and two were observed as MS. In AVT Midlate (I Plant), out of five entries, two were MR, two showed MS and one was S. In AVT Midlate (II Plant), four out of seven entries were identified as R/MR, two were MS and one was S (Table 13).

## **KAPURTHALA**

Out of 46 entries, 4 namely Co 15025, Co 16030, Co 17018, CoLk 17202 and CoLk 17204 were rated as R and 26 entries *viz.*, Co 15023, Co 15027, CoH 17262, CoLk 15206, CoLk 16201, CoLk 16202, CoLk 17201, CoLk 17203, CoLk 17205, CoPant 17223, CoPant 17224, CoPb 15212, CoPb 15213, CoPb 16181, CoPb 17211, CoPb 17212, CoPb 17213, CoPb 17214, CoPb 17215, CoS 15233, CoS 16232, CoS 17231, CoS 17234, CoS 17235 and CoS 17236 were rated as MR and the remaining entries behaved as MS (Table 14).

## **UCHANI**

In IVT (early) out of seven entries tested CoLk 17202 was found R, five entries namely CoLk 17201, CoLk 17203, CoPb 17211, CoPb 17212 and CoS 17231 showed MR reaction and one entry CoPant 17221 showed MS reaction to smut. In IVT (mid late) out of fifteen entries evaluated against smut three entries *viz.*, CoLk17204, CoH 17261 and CoH 17262 showed R reaction and five entries namely, CoPb 17213, CoPb 17214, CoPb 17215, CoPant 17224 and CoPant 17224 exhibited MR reaction. In AVT (early) Plant I out of six genotypes evaluated Co16029 showed R reaction and three entries *viz.* Co16025, CoLk16202 and CoPb16181 were found MR, however CoLk 14201 and CoLk16201 showed MS reaction. In AVT (early) Plant II out of six genotypes evaluated only Co 15024 was found R and three entries *viz.*, Co 15023, CoLk 15205 and CoPb 15212 showed MR reaction against smut. In AVT (Mid late) Plant I out of five entries evaluated all the entries *viz.*, Co 16030, CoLk 16203, CoLk 16204, CoS 16232 and CoS 16233 showed MR reaction. In AVT (Mid late) Plant II out of seven entries evaluated four entries *viz.*, CoLk 15206, CoPb 15213, CoS 15232 and CoS 15233 were found R and entries Co 15026, CoLk 15207 and CoLk 15209 exhibited MS (Table 15).

## **PANTNAGAR**

Out of 50 entries tested 10 were found R, 12 were MR and remaining 28 showed various degrees of susceptibility, i.e., 18 were MS, 3 were S and 7 were HS (Table 17).

## **NORTH CENTRAL ZONE**

### **PUSA**

Out of 20 sugarcane entries tested against smut, it was noticed that six entries *viz.*, CoP 17436, CoP 17437, CoP 2061, BO 91, CoP 17446 and CoP 16455 were R, whereas 14 entries showed MR reaction (Table 18).

### **MOTIPUR**

Out of 35 entries tested, 20 *viz.*, CoBln 16502, CoBln 17501, CoLk 15466, CoLk 16470, CoLk 15468, CoLk 15469, CoP 15438, CoP 15439, CoP 17436, CoP 17437, CoP 17438, CoP 17440, CoP 17444, CoP 17446, CoP 16437, CoSe 16451, CoSe 16454, CoSe 16455, CoSe 17452 and CoSe 15454 were rated as R, 10 *viz.*, CoSe 17451, CoP 16438, CoLk 16466, CoLk 16468, CoLk 15467, CoSe 15452, CoSe 15455, CoBln 17502, CoSe 16452 and CoSe 15453 were rated as MR. Five genotypes *viz.*, CoP 17441, CoP 15436, CoSe 16456, CoP 16439 and CoP 15440 were rated as MS against smut (Table 19).



## SEORAH

In IVT (Early) eight entries were evaluated against smut disease, out of which 6 were found as R and 2 entries were MR. In IVT (Midlate) six entries were evaluated, out of which 2 were found as R and 4 were MR. In AVT (Early) out of five entries 3 were found as R and 1 entry was rated as MS, while 1 entry (CoLk 16466) was rated as S. In AVT (Midlate) four entries were evaluated, out of which 1 was R, 2 entries (CoP 16439 and CoLk 16470) were rated as MS, while CoBln 16502 was rated as S (Table 20).

## EAST COAST ZONE

### ANAKAPALLE

Out of 29 entries tested, 11 showed MR reaction (Co 06030, Co 86249, CoA 11321, CoC 01061, CoC 16336, CoC 16339, CoOr 18346, CoOr 15346, CoV 18346, CoV 18357, CoV 92102, and) and the remaining entries showed MS, S to HS reaction (Table 22).

### CUDDALORE

Among the 15 clones screened for resistance to smut 6 clones *viz.*, CoA 16321, CoC 16339, CoOr 15346, CoOr 18346, CoV 18356 and CoV 18357 were rated as MR. Six clones *viz.*, CoA 17323, CoC 15339, CoC 16336, CoC 16337, CoC 17336 and CoV 16356 were MS and three clones *viz.*, CoA 17321, CoC 16338 and CoV 16357 were S to smut (Table 23).

## PENINSULAR ZONE

### NAVSARI

Among the 45 entries tested, 12 *viz.*, Co 17002, Co 17004, Co 17005, Co 17010, CoN 17071, CoN 17072, Co 15006, Co 15009, CoN 15071, Co 14032, CoN 14073 and CoT 14367 were rated as R. Fourteen genotypes namely Co 11015, Co 14002, Co 14030, Co 15010, Co 15017, Co 15021, Co 17013, CoT 17366, CoVSI 17021, PI 15131, CoVc 14062, MS 14081, MS 14082 and MS 17072 were rated as MR. Eleven genotypes *viz.*, Co 17001, Co 17003, Co 17008, Co 17012, Co 14005, Co 15005, CoSnk 14102, CoSnk 14103, CoTI 14111, CoVc 17061 and MS 17081, were exhibited as MS. Five entries *viz.*, Co 17006, Co 17014, Co 15007, Co 14004 and CoSnk 15102 were found as S. Three genotypes namely, Co 14012, Co 14016 and Co 14027 were rated as HS (Table 24).

### COIMBATORE

Totally, 30 IVT and AVT entries were evaluated against sugarcane smut reactions and among them six entries *viz.*, Co 15009, Co 15017, Co 17002, Co 17004, MS 17081 and MS 17082 were identified as R, whereas four entries, Co 15006, Co 15010, CoN 15071 and Co 17012 were identified as MR (Table 26).

### PUNE

Out of 35 entries tested, 16 *viz.*, Co 11015, Co 14005, Co 15006, Co 15009, Co 15017, Co 17002, Co 17004, Co 17005, Co 17010, Co 94004, CoN 17071, CoN 17072, CoT 17366, MS 17081, MS 17082 and PI 15131 were reacted as R, 12 entries *viz.*, Co 15010, Co 15021, Co 17003, Co 17008, Co 17012, Co 17013, CoVc 17061, CoVSI 17121, CoSNK 15102 and CoN 15071 were rated as MS, 4 were rated as S and 3 entries were HS (Table 27).

## SUMMARY

Entries showing R and MR against smut are as follows

### NORTH WEST ZONE (Table 12 to 16 and Table 17)

#### LUCKNOW

IVT (Early) : CoLk 17201, CoPb 17211, CoPb 17212, CoS 17231  
IVT (Midlate) : CoH 17261, CoH 17262, CoLk 17204, CoLk 17205, CoPb 17214, CoPb 17215, CoPant 17223, CoS 17233, CoS 17234, CoS 17235, CoS 17236, CoS 17237

AVT (Early) I Plant : Co 15025, CoLk 14201, CoLk 16202, CoPb 16181  
 AVT (Early) II Plant : Co 15023, Co 15024, Co 15027, CoLk 15201, CoLk 15205, CoPb 15212  
 AVT (Midlate) I Plant : Co 16030, CoLk 16203, CoLk 16204, CoS 16232, CoS 16233  
 AVT (Midlate) II Plant : Co 15026, CoLk 15206, CoLk 15207, CoPb 15213, CoS 15232, CoS 15233

**SHAJAHANPUR**

IVT (Early) : CoLk 17201, CoLk 17202, CoLk 17203, CoPb 17211, CoPb 17212, CoPant 17221, CoS 17231

IVT (Midlate) : Co 17018, CoH 17261, CoPb 17213, CoPb 17214, CoPb 17215, CoPant 17223, CoPant 17224, CoS 17233, CoS 17234, CoS 17235, CoS 17236, CoS 17237

AVT (Early) I Plant : Co 15025, Co 16029, CoLk 16202  
 AVT (Early) II Plant : Co 15023, Co 15024, Co 15027, CoPb 15212  
 AVT (Midlate) I Plant : Co 16030, CoS 16233  
 AVT (Midlate) II Plant : CoLk 15206, CoPb 15213, CoS 15233

**KAPURTHALA**

IVT (Early) : CoLk 17201, CoLk 17202, CoLk 17203, CoPb 17211, CoPb 17212, CoS 17231

IVT (Midlate) : Co 17018, CoH 17262, CoLk 17204, CoLk 17205, CoPb 17213, CoPb 17214, CoPb 17215, CoPant 17223, CoPant 17224, CoS 17234, CoS 17235, CoS 17236

AVT (Early) I Plant : Co 15025, CoLk 16201, CoLk 16202, CoPb 16181  
 AVT (Early) II Plant : Co 15023, Co 15027, CoPb 15212  
 AVT (Midlate) I Plant : Co 16030, CoS 16232  
 AVT (Midlate) II Plant : CoLk 15206, CoPb 15213, CoS 15233

**UCHANI**

IVT (Early) : CoLk 17201, CoLk 17202, CoLk 17203, CoPb 17211, CoPb 17212, CoS 17231

IVT (Midlate) : Co 17018, CoH 17261, CoH 17262, CoLk 17204, CoPb 17213, CoPb 17214, CoPb 17215, CoPant 17224, CoS 17235,

AVT (Early) I Plant : Co 16025, Co 16029, CoLk 16202, CoPb 16181  
 AVT (Early) II Plant : Co 15023, Co 15024, CoLk 15205, CoPb 15212  
 AVT (Midlate) I Plant : Co 16030, CoLk 16203, CoLk 16204, CoPb 16212, CoPant 16223, CoS 16232, CoS 16233  
 AVT (Midlate) II Plant : CoLk 15206, CoPb 15213, CoS 15232, CoS 15233

**PANT NAGAR**

IVT (Early) : CoLk 17201, CoLk 17202, CoPb 17212, CoPant 17221

IVT (Midlate) : CoH 17261, CoH 17262, CoPb 17213, CoPant 17223, CoPant 17224, CoS 17233

AVT (Early) I Plant : Co 15025, CoLk 14201, CoLk 16202  
 AVT (Early) II Plant : Co 15023, Co 15024, CoPb 15212  
 AVT (Midlate) I Plant : Co 16030  
 AVT (Midlate) II Plant : CoLk 15206, CoS 15233

**NORTH CENTRAL ZONE (Table 18 to 20)**

**PUSA**

IVT (Early) : CoBln 17501, CoLk 94184, CoP 17436, CoP 17437, CoP 17438, CoP 17440, CoP 17441, CoSe 01421, CoSe 16454, CoSe 17451

IVT (Midlate) : CoBln 17502, CoP 2061, CoP 9301, CoP 16455, CoP 16456, CoP 17444, CoP 17446, CoSe 17452

**MOTIPUR**

IVT (Early)	:	CoBln 17501, CoP 17436, CoP 17437, CoP 17438, CoP 17440, CoSe 16454, CoSe 17451
IVT (Midlate)	:	CoBln 17502, CoP 17444, CoP 17446, CoSe 16455, CoSe 17452
AVT (Early) I Plant	:	CoLk 16466, CoLk 16468, CoP 16437, CoP 16438, CoSe 16451
AVT (Early) II Plant	:	CoLk 15466, CoLk 15467, CoSe 15452, CoSe 15455
AVT (Midlate) I Plant	:	CoBln 16502, CoLk 16470, CoSe 16452
AVT (Midlate) II Plant	:	CoLk 15468, CoLk 15469, CoP 15438, CoP 15439, CoSe 15453, CoSe 15454

**SEORAH**

IVT (Early)	:	CoBln 17501, CoP 174376, CoP 17437, CoP 17440, CoP 17441, CoSe 16454, CoSe 17451
IVT (Mid late)	:	CoBln 17502, CoP 17444, CoP 17446, CoSe 16455, CoSe 16456, CoSe 17452
AVT (Early) I Plant	:	CoLk 16467, CoP 16437, CoSe 16451
AVT (Midlate) I Plant	:	CoSe 16452

**EAST COAST ZONE (Table 22 and 23)****ANAKAPALLE**

IVT (Early)	:	CoOr 18346, CoV 18356, CoV 18357
AVT (Early) I Plant	:	Nil
AVT (Early) II Plant	:	CoC 16336
AVT (Midlate) II Plant	:	CoC 16339, CoOr 15346

**CUDDALORE**

IVT (Early)	:	CoOr 18346, CoV 18356, CoV 18357
AVT (Early) I Plant	:	Nil
AVT (Early) II Plant	:	CoA 16321
AVT (Midlate) II Plant	:	CoC 16339, CoOr 15346

**PENINSULAR ZONE (Table 24, 26 and 27)****NAVSARI**

IVT(Early)	:	Co 17002, Co 17004, Co 17005, Co 17010, Co 17013, CoN 17071, CoN 17072, MS 17072, CoVSI 17021, CoT 17366
AVT(Early) I Plant	:	Co 11015, Co 15006, Co 15009, Co 15010, Co 15017, Co 15021, PI 15131
AVT(Early) II Plant	:	Co 14002, Co 14030, Co 14032, CoN 14073, CoT 14367, CoVc 14062, MS 14081, MS 14082

**COIMBATORE**

IVT(Early)	:	Co 17002, Co 17004, Co 17012, MS 17081, MS 17082
AVT(Early) I Plant	:	Co 15006, Co 15009, Co 15010, Co 15017, CoSnk 15071

**PUNE**

IVT (Early)	:	Co 17002, Co 17004, Co 17005, Co 17010, CoN 17071, CoN 17072, MS 17081, MS 17082, CoT 17366
AVT (Early) I Plant	:	Co 11015, Co 14005, Co 15006, Co 15009, Co 15017, PI 15131

## PP 17C: EVALUATION OF ZONAL VARIETIES FOR WILT

**Location** : Lucknow, Kapurthala, Pusa, Shajahanpur, Motipur, Anakapalle, Navsari

**Year of Start** : 2000-2001

**Varieties** : Entries of AVT of the respective zones for the year

**Plot size and Planting:** Two rows of 5m 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 tissues extends 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 =  $\frac{\text{Sum of wilt indices of individual stalks}}{\text{Number of stalks sampled}}$

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

## **RESULTS OF THE PREVIOUS YEAR**

### **LUCKNOW**

Out of 38 genotypes tested under natural conditions, five genotypes viz., CoLk 16470, CoP 15440, CoP 16438, CoSe 15452 and CoSe 16452 were rated as susceptible (S) to wilt. Remaining 33 genotypes were found R against wilt of sugarcane.

### **KAPURTHALA**

Among 40 evaluated genotypes, 18 namely Co 15027, CoH 14261, CoLk 14201, CoLk 14204, CoLk 15201, CoLk 15205, CoLk 15206, CoLk 15207, CoLk 15209, CoLk 16201, CoLk 16203, CoPant 16221, CoPb 15212, CoPb 15213, CoPb 16181, CoS 15233, CoS 16231 and CoS 16233 behaved as R and 15 genotypes viz., Co 14035, Co 15024, Co 15026, Co 16029, CoLk 14203, CoLk 16202, CoLk 16204, CoPant 16223, CoPb 14181, CoPb 14184, CoPb 14185, CoPb 16211, CoPb 16212, CoS 14233 and CoS 16232 as MR.

### **PUSA**

Among 23 evaluated entries single entry (CoSe 16451) was free from wilt whereas, 17 entries (BO 91, CoBln 16501, CoBln 16502, CoLk 16466, CoLk 16468, CoLk 16469, CoLk 16471, CoLk 16477, CoLk 94184, CoP 16436, CoP 16437, CoP 16439, CoP 16440, CoP 2061, CoP 9301, CoSe 01421 and CoSe 16452) were graded as MR., the remaining five entries (BO 156, CoLk 16467, CoP 16438, CoSe 16453 and CoSe 95422) showed MS reaction against wilt.

### **MOTIPUR**

Out of 38 genotypes tested under natural condition, five genotypes viz., CoLk 16470, CoP 15440, CoP 16438, CoSe 15452 and CoSe 16452 were rated as S to wilt and remaining 33 genotypes were found R against wilt.

### **ANAKAPALLE**

Out of 32 genotypes tested, seven entries (Co 86249, Co 01061, Co 06030, CoOr 03151, CoV 15356, PI 17376 and PI 17377) showed R, while four entries CoC 15339, CoC 16337, CoC 16338, CoOr 15346 reacted as MR and the remaining showed S to HS reaction.

### **NAVSARI**

Among the 32 genotypes tested under wilt sick plot, only Co 14004 genotype was found R to wilt while 25 genotypes viz., Co 13002, Co 13003, Co 13004, Co 13006, Co 13008, Co 13009, Co 13013, Co 13020, Co 14002, Co 14012, Co 14016, Co 14030, Co 14032, CoN 13072, CoN 13073, CoN 14073, CoSnk 13101, CoSnk 13103, CoSnk 14102, CoT 14367, CoTI 14111, CoVc 14062, MS 13081, MS 14081 and PI 13132 were found MR to wilt, whereas six genotypes viz., Co 13014, Co 13018, Co 14027, CoSnk 13106, CoSnk 14103 and MS 14082 showed MS to wilt.

## **RESULTS OF THE CURRENT YEAR**

### **LUCKNOW**

Out of forty six entries grown in wilt sick soil and tested, 13 viz., Co 15024, Co 15025, Co 15026, Co 15027, Co 17018, Co 17214, CoLk 17202, CoPant 17223, CoPb 15213, CoPb 17211, CoS 17233, CoS 17234 and CoS 17237 were rated as S to wilt of sugarcane, remaining 33 entries were found R against wilt (Table 13)

### **SHAHJAHANPUR**

Out of 46 entries, 23 were assessed R/MR. Among all entries, 13 entries were found S/HS. Of all entries, 10 entries were found MS (Table 14).

### **KAPURTHALA**

Among 46 evaluated entries, 19 behaved as R and 17 entries showed MR, rest of the entries behaved as MS (Table 15).

## **PUSA**

Out of 20 evaluated entries against wilt 12 entries observed MR reaction, while four entries (CoLk 94184, CoP 16455, CoP 17438 and CoP 17501) showed MS while, four entries showed S against wilt (Table 19).

## **MOTIPUR**

Out of 35 entries tested under natural condition, six *viz.*, CoBln 17501, CoBln 17502, CoP 16438, CoP 17441, CoSe 15454 and CoSe 17451 were rated as S to sugarcane wilt, remaining 29 entries were found R against wilt of sugarcane (Table 20).

## **ANAKAPALLE**

Out of 25 entries tested, four entries (Co 06030, Co 86249, CoOr 18346 and CoV 18356) showed R reaction while six entries (CoC 15339, CoC 16337, CoC 16338, CoOr 15346, CoOr 03151 and CoV 18357) reacted as MR. The remaining showed S to HS reaction (Table 23).

## **NAVSARI**

Among the 27 entries tested Co 14004 and Co 15005 were found R to wilt while 17 were found MR, whereas eight entries *viz.*, Co 14027, Co 15009, Co 15010, CoSnk 14013, CoSnk 14102, CoSnk 15102, MS 14082 and PI 15131 showed MS to wilt (Table 25).

## **SUMMARY**

The entries showing R or MR to wilt are listed below

### **LUCKNOW**

IVT (Early) : CoLk 17201, CoLk 17203, CoPb 17212, CoPant17221, CoS 17231  
AVT (I Plant, Early) : Co 16029, CoLk 14201, CoLk 16201, CoLk 16202, CoPb 16181  
AVT (II Plant, Early) : Co 15023, CoLk 15201, CoLk 15205, CoPb 15212  
IVT (Midlate) : CoH 17261, CoH 17262, CoLk 17204, CoLk 17205, CoPb 17213, CoPb 17215, CoPant 17224, CoS 17235, CoS 17236  
AVT (I Plant Midlate) : Co 16030, CoLk 16203, CoLk 16204, CoS 16232, CoS 16233  
AVT (II Plant midlate) : CoLk 15206, CoLk 15207, CoLk 15209, CoS 15232, CoS 15233

### **SHAHJAHANPUR**

IVT (Early) : CoLk 17201, CoLk 17202, CoLk 17203, CoS 17231  
IVT Mid late : CoH 17261, CoH 17262, CoLk 17204, CoLk 17205, CoS 17233, CoS 17234, CoS 17235  
AVT (I Plant, Early) : CoLk 14201, CoLk 16202  
AVT (II Plant, Early) : CoLk 15201, CoLk 15205, CoPb 15212  
AVT (I Plant Midlate) : CoLk 16203, CoLk 16204, CoS 16233  
AVT (II Plant midlate) : CoLk 15206, CoLk 15207, CoLk 15209

### **KAPURTHALA**

IVT (Early) : CoLk 17201, CoLk 17202, CoPant 17221, CoPb 17211, CoPb 17212, CoS 17231  
AVT (I Plant, Early) : Co 16029, CoLk 14201, CoLk 16201, CoPb 16181  
AVT (II Plant, Early) : Co 15024, Co 15027, CoLk 15201, CoLk 15205, CoPb 15212  
IVT (Mid Late) : Co 17018, CoH 17262, CoLk 17204, CoLk 17205, CoPant 17223, CoPant 17224, CoPb 17213, CoPb 17215, CoS 17233, CoS 17234, CoS 17235, CoS 17237,  
AVT (I Plant midlate) : CoLk 16203, CoLk 16204

## **PUSA**

IVT (Early) : CoP 17441, CoP 17436, CoP 17437, CoP 17440, CoSe 01421, CoSe 17451, CoSe 16454

IVT (Midlate) : BO 91, CoP 2061, CoP 9301, CoP 16456, CoP 17446

**MOTIPUR**

IVT (Early) : CoP 17436, CoP 17437, CoP 17438, CoP 17440, CoSe 16454

AVT (I Plant, Early) : CoLk 16466, CoLk 16468, CoP 16437, CoSe 16451

AVT (II Plant, Early) : CoLk 15466, CoLk 15467, CoP 15436, CoSe 15452, CoSe 15455

IVT (Midlate) : CoBln 17502, CoP 17444, CoP 17446, CoSe 16455, CoSe 16456, CoSe 17452,

AVT (I Plant midlate) : CoP 16439, CoLk 16470, CoSe 16452

AVT (II Plant midlate) : CoLk 15468, CoLk 15469, CoP 15438, CoP 15439, CoP 15440, CoSe 15453

**ANAKAPALLE**

IVT (Early) : CoOr 18346, CoV 18356, CoV 18357

AVT (II Plant, Early) : CoC 16337

AVT (II Plant midlate) : Co 86249, Co 06030, CoC 15339, CoOr 15346, CoC 16338

**NAVSARI**

AVT (I Plant, Early) : Co 11015, Co 14005, Co 15005, Co 15006, Co 15007, Co 15017, Co 15021, CoN 15071

AVT (II Plant, Early) : Co 14002, Co 14004, Co 14012, Co 14016, Co 14030, Co 14032, CoN 14073, CoT 14367, CoTI 14111, CoVc 14062, MS 14081

## PP 17D: EVALUATION OF ZONAL VARIETIES FOR YELLOW LEAF

**Location:** Lucknow, Kapurthala, Uchani, Shahjahanpur, Pantnagar, Karnal (SBI), Pusa, Seorahi, Motipur, Buralikson, Anakapalle, Cuddalore, Nayagarh, Coimbatore, Mandya, Sankeshwar, Powarkheda, Thiruvalla, Padegaon, Kolhapur, Navsari and Pune.

**Year of Start:** 2014-15

**Varieties:** Entries of AVT of the respective zones.

YL disease 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 YL severity, the following disease severity grades are to be given during maturity stages of the crop (3 observations by 8<sup>th</sup>, 10<sup>th</sup> and 12<sup>th</sup> months). Each time, minimum of 25 canes (free from other biotic stresses) are to be scored.

### YL severity grades:

(The colour photographs of YL 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 YL
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 YL severity scale is to be used to assign disease reaction of the variety.

### YL 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 OF THE PREVIOUS YEAR

### LUCKNOW

Out of 40 genotypes tested under natural conditions, 10 genotypes *viz.*, Co 15027, Co 16029, CoLk 14201, CoLk 14203, CoLk 16201, CoPant 16223, CoPb 15212, CoPb 15213, CoPb 16211 and CoS 16231 were rated as S against YL and remaining 30 genotypes were found R.



## **SHAHJAHANPUR**

Among all 40 entries, nine apparently showed no YL and rated as R. Among IVT (E), four entries *viz.* Co 15025, CoPb 16181, CoPb 16211 and CoPant 16222 were found as R and three entries such as Co 16029, CoLk 16202 and CoS 16231 were MR. In IVT (Midlate), of seven entries, CoLk 16204, CoPant 16223 and CoPb 16212 exhibited as MR and CoLk 16203 as R to MR. In AVT Early (I Plant), three entries *viz.* Co 15027, CoLk 15201 and CoLk 15205 were found as R and Co 15023 was observed as MR. In AVT Early (II Plant), all four entries *viz.*, Co 14034, CoLk 14201, CoPb 14181 and CoPb 14211 showed MR reaction. In AVT Midlate (I Plant), one entry CoLk 15206 was R and three entries such as Co 15026, CoLk 15209, CoS 15232 were MR. In AVT Mid late (II plant), the four entries namely Co 14035, CoH 14261, CoLk 14203 and CoPb 14184 were MR against YL.

## **KAPURTHALA**

Out of 40 entries, 17 were free from YL and 16 were categorized as MR whereas six were MS. Check entries Co 0238 and CoS 767 showed S and MS to YL.

## **UCHANI**

Of the six genotypes from AVT (early) Plant-1, only CoPb 15212 was found MR against YL. In AVT (early) Plant II, two genotypes CoLk 14201 and CoPb 14181 were R and one entry Co 14034 was found MR. In AVT (Midlate) Plant-I, two entries *viz.*, CoPb 15213 and CoS 15233 were R, 4 genotypes *viz.*, CoLk 15206, CoLk 15207, CoLk 15209 and CoS 15232 showed MR reaction against YL. In AVT (Midlate)-II, three genotypes CoH 14261, CoLk 14203 and CoPb 14184 were MR and in IVT (early), CoS 16231 showed R reaction and Co 16025 was MR. Out of 7 entries from IVT (midlate), CoS 16233 showed R and four entries Co 16030, CoLk 16203, CoLk 16204 and CoPant 16223 exhibited MR reaction.

## **KARNAL**

Among 48 clones screened, 33 were apparently free from the YL symptoms. The disease severity on rest of the clones was observed as MR (Co 0238, Co 05011, CoLk 15201, and CoS 14233), and MS (CoH 14261, CoLk 14203, CoPb 14181, CoPb 14184, CoPb 14185, CoPb 14211, CoPb 15213, CoS 767, CoS 15232 and CoS 15233).

## **PANTNAGAR**

Out of 46 entries, 12 genotypes were found R, 19 MR and 13 MS and two genotypes were found to be S.

## **PUSA**

Out of 23 entries screened against YL disease, two entries (CoLk 16466 and CoLk 16469) showed MS, six entries (BO 156, CoBln 16501, CoLk 16471, CoLk 94184, CoSe 95422 and CoSe 16453) showed MR and rest 15 entries showed R.

## **MOTIPUR**

Out of 38 genotypes tested under natural conditions, six genotypes *viz.*, CoBln 16501, CoLk 14209, CoLk 16470, CoP 15438, CoP 16440 and CoSe 15453 were rated as S against YL, whereas remaining 32 genotypes were R.

## **SEORAH**

Among the eight genotypes of IVT (Early), 4 genotypes were rated as R, 3 genotypes as MR and 1 genotype *viz.*, CoBln 16501 was rated as MS to YL. In IVT (Midlate), nine genotypes were evaluated and of these, 6 genotypes exhibited R, 2 genotypes were found MS and a genotype *viz.* CoBln 16502 was rated as S to YL. In AVT (Early), five genotypes were evaluated and of these three genotypes exhibited R, whereas two genotypes exhibited MR against to YL. In AVT (Midlate), seven genotypes were evaluated and of these, six genotypes exhibited R and one genotype exhibited MR against to YL.

## **ANAKAPALLE**

Out of 30 genotypes screened, MR reaction was observed in the genotypes, Co 86249, CoA 17321, CoA 17323, CoA 17324, CoA 92081, CoC 15339, CoC 16336, CoC 16337, CoC 16338, CoC 16339, CoOr 15346, CoOr 17346 and PI 17337.

#### **CUDDALORE**

Natural incidence of YL was recorded and eleven clones *viz.*, CoA 17322, CoA 17323, CoA 17324, CoC 17336, CoC 16337, CoC 16339, CoC 15339, CoOr 15346, CoOr 17346, CoV 16356 and PI 17377 registered MR.

#### **NAVSARI**

Among the 15 genotypes in IVT, 12 genotypes were apparently free from YL *viz.*, Co 11015, Co 16006, Co 16009, Co 16010, Co 16017, Co 16018, CoM 16081, CoM 16082, CoN 16071, CoR 16141, CoVSI 16121 and CoVc 16061; one genotype CoVc 16062 was exhibited MR to YL while two genotypes namely CoR 16142 and PI 16131 had exhibited MS to YL. Out of 15 genotypes in AVT-I, 9 genotypes *viz.*, Co 14002, Co 14004, Co 14012, Co 14032, CoN 14073, CoSnk 14102, CoT 14367, CoTI 14111 and CoVc 14062 were apparently free from YL. Four genotypes *viz.*, Co 14016, Co 14027, MS 14081 and MS 14082 had come under MR to YL while genotype Co14030 and CoSnk 14103 was exhibited MS and S against YL, respectively. Out of 17 genotypes in AVT-II, 16 genotypes *viz.*, Co 13002, Co 13003, Co 13004, Co 13006, Co 13008, Co 13009, Co 13013, Co 13014, Co 13018, CoN 13072, CoN 13073, CoSnk 13101, CoSnk 13103, CoSnk 13106, MS 13081 and PI 13132 were found free from YL while only Co 13020 was showed MR to YL.

#### **PUNE**

Eight varieties *viz.*, 14-22, Co 94012, CoC 671, CoM 9057, CoM 0265, CoVSI 9805, CoVSI 03102 and VSI 434 were observed free from the disease, while six clones *viz.*, 59-20, 191-3, Co 419, Co 86032, MS 10001 and VSI 08005 reacted as MR.

#### **COIMBATORE**

Of the 15 entries in IVT, 9 entries *viz.* Co 11015, Co 16006, Co 16018, CoM 16081, CoM 16082, CoN 16071, CoR 16141, CoR 16142 and PI 16131 were apparently free from YL. Three entries *viz.*, Co 16010, CoVc 16061 and CoVc 16062 were HS to YL with severity grade of 4. In AVT I plant, out of 15 entries, 8 entries were apparently free from YL and two entries were identified as HS and S to YL and the remaining entries were MS. In AVT II plant and ratoon, out of 17 entries, 9 entries were free from the disease.

### **RESULTS OF THE CURRENT YEAR**

#### **LUCKNOW**

Out of 46 entries tested under natural infection condition, four *viz.*, CoLk 17202, CoPant 17223, CoPant 17224 and CoS 17233 were rated as S against YL, remaining 42 entries were found R to YL (Table 13).

#### **SHAHJAHANPUR**

Among 46 entries, 18 show no disease symptoms and rated as R reaction. The rest of the entries were categorized as MR to MS reaction based on disease severity (Table 14).

#### **KAPURTHALA**

Out of 46 entries, 16 were found apparently free from any disease symptoms. Twenty-one entries were categorized as MR whereas nine as MS. Check entries Co 0238 and Co 05009 showed MS while CoS 767 as MR to YL (Table 15).

#### **UCHANI**

Twenty four AVT and 16 IVT entries were evaluated for resistance to YL. In AVT (E) Plant I four were found MR and two showed MS against YL. In AVT (E) Plant II, four entries Co 15023, Co 15027, CoLk 15205 and CoPb 15212 were MR to YL. In AVT (ML)

Plant-1, 4 entries were found to be R 4 and in AVT (ML)-II, four genotypes Co 15026, CoLk 15207, CoLk 15209 and CoS 15233 were found MR and two varieties CoLk 15206 and CoS 15232 showed MS reaction to YL. In IVT (E), the entry CoLk 17201 showed MR and in IVT (ML), five entries exhibited MR reaction against YL (Table 16).

#### **KARNAL**

Natural incidence of YL was recorded in 53 entries planted in the zonal varietal trial. Among the different IVT and AVT clones screened, 26 were apparently free from the YL symptoms, 14 clones exhibited MR reaction, whereas eleven clones showed MS (Table 17).

#### **PANTNAGAR**

Out of 50 entries assessed for YL 43 were found R, 3 MR, 4 MS and none of the genotypes were found S or HS (Table 18).

#### **PUSA**

Out of 20 entries evaluated against YL three entries (CoBln 17501, CoBln 17502 and CoLK 94184) showed MS whereas, two entries CoSe 01421 and CoSe 16455 showed MR and remaining entries showed R to YL (Table 19).

#### **MOTIPUR**

Out of 35 entries tested, 12 entries were rated as susceptible S against YL of sugarcane. Whereas remaining 23 genotypes were found R against YL (Table 20).

#### **SEORAH**

In IVT (E), eight entries were evaluated and of these, 2 genotypes were rated as R, 4 genotypes as MR. In IVT (ML), of the six genotypes evaluated, 5 genotypes exhibited R. In AVT (E) trials 5 genotypes were evaluated and of these 4 genotypes exhibited R and in AVT (ML) 3 of the four genotypes evaluated exhibited R (Table 21).

#### **ANAKAPALLE**

Out of 24 genotypes, 16 entries viz., CoA 16321, CoA 17321, CoA 17323, CoA 92081 and Co 06030, CoC 15339, CoC 16336, CoC 16337, CoC 16338, CoC 16339, CoOr 15346, CoOr 18346, CoV 16356, CoV 16357, CoV 18356 and CoV 18357 have recorded mean YL severity index of 0.0 to 1.0. The YL severity index of 1.0 to 2.0 was observed in the genotypes Co 86249, CoC 16339, CoC 17336 and CoOr 03151 (Table 23).

#### **CUDDALORE**

Seven clones viz., CoA 17321, CoA 17323, CoOr 15346, CoOr 18346, CoV 16356, CoV 18356 and CoV 18357 were R, 8 clones viz., CoA 16321, CoC 15339, CoC 16336, CoC 16337, CoC 16338, CoC 16339, CoC 17336 and CoV 16357 were MR to YL (Table 24).

#### **NAVSARI**

Among the 12 genotypes in AVT-I, 5 genotypes were apparently free from YL. One genotype Co 15010 showed MR to YL. Out of 15 genotypes in AVT-II, 5 genotypes viz., Co 14002, Co 14012, CoN 14073, CoT 14367 and MS 14082 were free from YL where as 3 genotypes showed MR (Table 25).

#### **THIRUVALLA**

All the entries of AVT of peninsular zone were evaluated for YL incidence. However no YL symptoms were observed in any of the varieties evaluated.

#### **PUNE**

Out of 12 varieties Co15006 and PI 15131 were found MR to YL disease, while other 10 entries were found R to YL under natural condition.

#### **COIMBATORE**

IVT and AVT entries were monitored throughout the crop season with regard to YL severity based on the 0-5 scale. In IVT, of the 18 entries 7 (38.8%) were identified as R, 44.44% as MS, and only one entry was HS and S viz. Co 17013 and Co 17006, respectively.

In AVT I plant, out of 12 entries, 7 entries were identified as R (58.33%), 3 MR (25%), and one exhibited MS (Co 15010) and one was HS (Co 15006). In AVT II plant, 93.33% entries were identified as R and only one, Co 14027 was identified as MS to YL whereas, the same 15 entries in ratoon (AVT I plant) exhibited different reactions viz., R was observed only at 20% in the entries viz., CoT 14367, Co 14030, and CoSnk 14102, 26.66% were MR, 33% were MS and 13.33% were S (Table 27).

### **SUMMARY**

The entries showing R or MR to YL are listed below

#### **LUCKNOW**

- IVT (Early) : All except CoLk 17202
- AVT (Early) Plant - I : All except Co 15025
- AVT (Early) Plant - II : All except Co 15024, Co 15027
- IVT (Midlate) : CoPant 17223, CoPant 17224, CoS 17233
- AVT (Midlate) Plant - I : All clones
- AVT (Midlate) Plant - II : All clones

#### **SHAHJAHANPUR**

- IVT Early : CoLk 17201, CoLk 17202, CoLk 17203, CoPant 17221, CoPb 17211, CoPb 17212, CoS 17231
- IVT Mid late : Co 17018, CoH 17261, CoH 17262, CoLk 17204, CoLk 17205, CoPant 17224, CoPb 17214, CoPb 17215, CoS 17233, CoS 17234, CoS 17235
- AVT Early (I Plant) : Co 15025, Co 16029, CoLk 14201, CoLk 16201, CoLk 16202, CoPb 16181
- AVT Early (II Plant) : Co 15023, Co 15024, Co 15027, CoLk 15205, CoPb 15212
- AVT Mid late (I Plant) : Co 16030, CoLk 16203, CoLk 16204, CoS 16232, CoS 16233
- AVT Mid late (II Plant) : Co 15026, CoLk 15206, CoLk 15209, CoPb 15213, CoS 15232, CoS 15233

#### **KAPURTHALA**

- IVT (Early) : CoLk 17201, CoLk 17202, CoPb 17211, CoPb 17212, CoS 17231
- AVT (Early) Plant - I : Co 15025, CoLk 14201, CoLk 16202, CoPb 16181
- AVT (Early) Plant - II : Co 15023, Co 15027, CoLk 15201, CoLk 15205, CoPb 15212
- IVT (Midlate) : Co 17018, CoH 17261, CoH 17262, CoLk 17204, CoLk 17205, CoPant 17223, CoPant 17224, CoPb 17213, CoPb 17215, CoS 17233, CoS 17234, CoS 17235, CoS 17237
- AVT (Midlate) Plant - I : Co 16030, CoLk 16204, CoS 16232, CoS 16233
- AVT (Midlate) Plant - II : Co 15026, CoLk 15206, CoLk 15207, CoLk 15209, CoS 15232, CoS 15233

#### **UCHANI**

- IVT (Early) : CoLk 17201
- IVT (Midlate) : CoH 17261, CoH 17262, CoPant 17224, CoS 17235, CoS 17237
- AVT (Midlate) Plant I : CoLk 16203, CoLk 16204, CoS 16232, CoS 16233
- AVT (Midlate) Plant II : Co 15026, CoLk 15207, CoLk 15209, CoS 15233

#### **KARNAL**

- AVT (Early) Plant I : Co 15025, Co 16029, CoLk 16201, CoLk 16202, CoPb 16181
- AVT (Early) Plant II : Co 15023, Co 15024, Co 15027, CoLk 15205
- IVT (Early) : CoLk 17201, CoLk 17202, CoLk 17203, CoPb 17211, CoS 17231
- IVT (Midlate) : Co 17018, CoH 17261, CoH 17262, CoLk 17205, CoPant 17223,

	: CoPb 17215, CoS 17235, CoS 17236
AVT (Midlate) Plant I	: Co 16030, CoLk 16203, CoLk 16204, CoS 16232, CoS 16233
AVT (Midlate) Plant II	: Co 15026, CoLk 15206, CoLk 15207, CoLk 15209, CoS 15232
<b>PANTNAGAR</b>	
IVT (Early)	: CoLk 17201, CoLk 17202, CoLk 17203, CoPb 17212, CoPant 17221
AVT (Early) Plant I	: Co16029, Co 15025, CoLk 14201, CoLk 16201, CoLk 16202, CoPb 16181
AVT (Early) Plant II	: Co 15023, Co 15024, Co 15027, CoLk 15205, CoPb 15212
IVT (Midlate)	: All clones except CoPb 17214
AVT (Midlate) Plant I	: All clones
AVT (Midlate) Plant II	: All clones
<b>PUSA</b>	
IVT (Early)	: All clones except CoLk 94184 and CoSe 16454
IVT (Midlate)	: All clones except CoBln 17502
<b>SEORAH</b>	
IVT (Early)	: All clones except CoP 17436 and CoP 17441
IVT (Midlate)	: All clones except CoSe 17452
AVT (Early) Plant I	: All clones
AVT (Midlate) Plant I	: All clones except CoP 16439
<b>MOTIPUR</b>	
IVT (Early)	: CoBln 17501, CoP 17437, CoP 17438, CoP 17441, CoSe 16454
AVT (Early) Plant I	: All clones
AVT (Early) Plant II	: All clones
IVT (Midlate)	: CoP 17446, CoSe 16456, CoSe 17452
AVT (Midlate) Plant I	: CoBln 16502, CoSe 16452
AVT (Mid Late) Plant II	: CoLk 15468, CoLk 15469, CoSe 15453
<b>ANAKAPALLE</b>	
IVT (Early)	: CoOr 18346, CoV 18356, CoV 18357
AVT (Early) I Plant	: CoA 17321, CoA 17323, CoC 17336
AVT (Early) II Plant	: CoA 16321, CoC 16336, CoC 16337, CoV 16356
AVT (Midlate) II Plant	: CoC 15339, CoC 16338, CoC 16339, CoOr 15346, CoV 16357
<b>CUDDALORE</b>	
IVT (Early)	: All clones
AVT (E) I Plant	: All clones
AVT - II plant (Early)	: All clones
AVT (ML) II Plant	: All clones
<b>NAVSARI</b>	
AVT (Early) Plant I	: Co 11015, Co 14005, Co 15007
AVT (Early) Plant II	: Co 14012, Co 14030, Co 14032, CoN 14073
<b>PUNE</b>	
	: Co 11015, Co 14005, Co 15005, Co 15006, Co 15007, Co 15009, Co 15010, Co 15017, Co 15021, CoSMK 15102, CoN 15071, PI 15131
<b>COIMBATORE</b>	
IVT (Early)	: Co 17005, Co 17008, Co 17010, Co 17012, Co 17014, CoN 17072, CoVc 17061, CoVSI 17121 and MS 17082
AVT (Early) Plant I	: Co 14005, Co 15007, Co 15009, Co 15017, Co 15021, CoSnk 15102, CoSnk 15071 and PI 15131

## **PP 17E: SCREENING OF SUGARCANE VARIETIES AGAINST BROWN RUST**

**Objective** : Screening of sugarcane varieties against brown rust  
**Year of Start** : 2020-21  
**Location** : Pune, Pravaranagar, Coimbatore, Anakapalle, Navsari  
**Varieties** : Entries of AVT of the respective zones.

### **RESULTS OF THE CURRENT YEAR**

#### **ANAKAPALLE**

Twelve AVT entries were inoculated twice with uredospore suspension by leaf whorl inoculation on 23.10.2020 and 11.11.2020 by collecting the disease infected foliage from Jami mandal of Vizianagaram district. However, rust incidence was not observed in any of the genotypes inoculated including susceptible variety CoA 92081.

#### **PUNE**

Observations regarding natural incidence of the disease were recorded throughout the crop period. All the 12 varieties were found resistant to brown rust. However, the presence of disease was noted on Co 15006, Co 15007, Co15009 and PI 15131.

#### **NAVSARI**

There was no brown rust incidence observed in field trial under natural condition as well as during survey of sugarcane diseases, not a single field found infected with brown rust.

#### **COIMBATORE**

About 30 IVT and AVT entries were evaluated for rust resistance under natural conditions field conditions. Among the 18 IVT entries, 10 entries *viz.*, Co 17001, Co 17002, Co 17005, Co 17006, Co 17008, Co 17010, Co 17012, Co 17013, Co 17014 and CoVSI 17121 showed rust pustules and remaining eight entries were free from any rust incidence. Of the 12 AVT entries, there were only two entries Co 15007 and Co 15021 showed rust pustules in traces and remaining entries were free from rust.



## **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, Seorahi, Motipur, Buralikson, Anakapalle, Cuddalore, Nayagarh, Coimbatore, Mandya, Sankeshwar, Powarkheda, Thiruvalla, 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).

### **FINDINGS OF THE PREVIOUS YEAR**

#### **NORTH WEST ZONE**

##### **LUCKNOW**

In Uttar Pradesh, red rot was found in CoJ 85, Co 0238, CoSe 95422, CoS 8436, Co 87263, CoLk 8102, CoS 95255, CoSe 01424 and CoS 91269. Red rot was noticed to the tune of 7 to 60% in Co 0238 and up to 30% in fields of CoSe 95422 and CoS 8436. Smut incidence of was observed in Co 0238 to the tune of 5 to 15%. It was also recorded in other varieties like CoSe 92423, CoS 88230 and CoS 91269. Yellow Leaf Disease was observed with the variety Co 0238 ranging 10 to 40% and 15-35% in CoS 91269, CoLk 94184 and CoJ 85. The incidence of PB was noticed in Co 0238 up to 30%, eye spot, brown spot and ring spot were also recorded to the tune of 3 to 10%.

##### **KAPURTHALA**

Red rot was observed from traces to 12% on Co 89003 and CoJ 85. Wilt incidence of traces to 8.0% was observed on Co 89003 and CoS 8436. However, severe incidence (>80 %) of red rot and wilt was also observed from two fields of Co 89003 and one field of Co 89003. Some of the plants were also found to form red rot-wilt complex. Smut was observed on varieties Co 0238, Co 89003 and CoJ 88 from traces to 25%. Pokkah boeng was observed on variety Co 0238, CoPb 91 and CoPb 92 (traces to 30%). However, incidence was low on varieties CoPb 91 and CoPb 92. Red stripe/top rot disease was also observed in traces on CoJ 85 and CoPb 93 and GSD was observed with an incidence of traces to 3% on Co 0238.

##### **SHAHJAHANPUR**

Severe incidence of red rot on Co 0238 was observed (70-100%) condition at Ajbapur, Rupapur, Kumbhi, Nigohi, Bisalpur and Hargaon sugar mill areas. The variety CoPk 05191 was with red rot up to 50% at Palia and up to 10 % on CoS 08279. Combined infection of red rot and wilt was also noticed from 15% (CoPk 05191) to 75% (Co 0238). Smut was recorded in the varieties Co 0238, Co 0118, CoH 160, Co 98014, UP 05125 and CoS 13231 with stray to 10% severity. The incidence of wilt varied from 2 to 15% on Co 0238, Co 0118, Co 98014, CoS 08279, CoS 13231, CoSe 11453, CoS 09232 and CoLk 94184. Severity of YL was noticed up to 30% on Co 0238, CoS 09232, CoS 08272, CoS 08279, CoS 12232, CoS 13231, UP 05125, Co 0118, Co 98014 and CoS 08276. The incidence of PB upto 60% was observed on Co 0238, CoS 08272, CoS 08279, CoS 08452, CoS 09232, Co 0118, Co 98014, and CoLk 94184. Leaf fleck was observed on Co 0238



and Co 98014 in Shahjahanpur district. Other diseases such as red strip/top rot (bacterial), mosaic (SCMV), leaf scald, ring spot, banded sclerotial and leaf binding were also noticed.

#### **UCHANI**

Red rot was observed on plant and ratoon crop of varieties like Co 89003, CoS 8436 and, CoJ 85 ranging from 2 to 15%. Top rot was also observed on CoJ 85, Co 0238, CoS 8436 and CoH 119 in traces to 28%. Wilt was noticed in Co 05011, Co 89003, CoS 8436, CoH 119 and Co 0238 ranging from 5 to 30%. Wilt in association with root borer and red rot was also noticed in Co 89003. The incidence of smut in the range of 2-42% was observed on plant and ratoon crop in CoH 119, Co 0118, Co 0238, Co 89003, Co 05011 and CoH 160. Grassy shoot disease was observed in traces to 12% on varieties which includes Co 0238, CoH 160, Co 0118, CoH 119, CoS 767, Co 89003, CoS 8436 and Co 05011. The pokkah boeng appeared on varieties CoS 8436, Co 0238, CoH 119, Co 0118, CoH 160, CoJ 85, CoH 167, Co89003 and Co 05011 ranging from traces to 45%. The yellow leaf disease was noticed in Traces to 12% on varieties viz., Co 0238, CoS 8436, CoH 119, CoH 160, Co 05011 and Co 89003. The incidence of mosaic in traces was observed in CoH 119, Co 0118 and Co 89003 varieties and the incidence of eye spot ranging from traces to 22% was noticed in plant and ratoon crop of Co 238, Co118 CoH 167 and CoH 160.

#### **PANTNAGAR**

Pokkah boeng was observed in the varieties Co 89003, Co 0118, Co 0238, CoJ 85, CoPant 3220, CoPant 99214, CoPb 91, CoS 8436 and smut incidence upto 30% was observed in CoS 07240 and Co 92423 and grassy shoot was observed on Co 0238, Co 0118 and CoPant 03220.

#### **KARNAL**

In Haryana, PB was prevalent in most of the cultivated varieties with mild to 5.0% incidence. Maximum (20%) incidence of smut was noticed on varieties CoH 160, Co 0238 and Co 89003. Traces to severe (20.0%) incidence of wilt were recorded in Co 89003 and CoH 160. Similarly, GSD was reported in Co 89003 (5%) and trace to 2% in varieties viz., CoJ 64, CoJ 85, CoS 8436 and Co 0238. Maximum incidence of leaf fleck disease caused by SCBV was in variety CoH 160 (up to 10%) followed by Co 89003 (5%) and CoS 8436, CoJ 85, CoJ 88, Co 0238 (trace to 3%). Mild to 5% of brown rust incidence was also noticed on CoJ 85) and CoH 160. In Uttar Pradesh, traces to severe incidences of red rot were noticed in Co 0238. Under DSM Sugar, Meeraganj incidence of red rot was recorded in varieties CoJ 88 (20-30%) and CoH 167 (20%). By and large, incidence of pokkah boeng was recorded in most of the cultivated varieties. Trace incidence of smut and GSD was also noticed in the variety Co 0238 under Unn Sugar mill. In Uttrakhand, trace incidences of smut, GSD, pokkah boeng and top rot were noticed on the variety Co 0238.

#### **NORTH CENTRAL ZONE**

##### **PUSA**

Red rot was noticed in Co 0233, Co 0238, CoH 167 in the range from 5 to 10%. Smut was observed in BO 141, Co 0238, CoH 167 and CoP 2061 and the incidence was upto 10% at Riga and Manjhaulia. Wilt was observed in BO 141, Co 0233, CoPant 97222, Co 0238, Co 92006, Co 0118, CoH 167, Co 0118, CoP 9301 and CoV 92102 and was observed upto 20%. Pokkah boeng incidence was observed in BO 141, BO 154, Co 0238, Co 0118, CoV 92102, and CoP 2061 upto 10% and drastically reduced after the monsoon showers. Yellow leaf disease was also noticed in traces to 5% on varieties, Co 0118, Co 0233, Co 0238, Co Pant 97222, and CoV 92102. Incidence of mosaic and leaf spot diseases were also noticed in traces to 5% in varieties Co 92006, Co 0118, Co 0233, Co Pant 97222 and CoV 92102.

## **MOTIPUR**

In Bihar, varieties *viz.*, CoLk 94184, Co 0118, Co 0238, CoSe 01421, Co 0232, CoSe 96234, CoSe 95422, CoSe 92423, Co 89029, BO 128 and Co 87263 were observed in sugarcane cultivation. The incidence of red rot was recorded in the varieties namely CoSe 92423, CoSe 95422, Co 0238, BO 128 and CoSe 96234 to the tune of 5-35%. The variety Co 0238 was recorded with the red rot infection to the tune of 3% to 35%. Yellow Leaf Disease was noticed in the varieties *viz.*, Co 0238, Bo 128, CoP 06436, CoLk 94184 and Co 0118. Higher incidence of YL (15 to 35%) was recorded in some locations of East and West Champaran cultivated with Co 0238 and BO 128. Eye spot, brown spot and ring spot were also recorded. Pokkah Boeng was observed in the varieties *viz.*, BO 154, Co 0118, Co 0238, Co 0239, CoP 06436, CoP 9301, CoSe 95422, CoLk 94184, BO 130 and CoP 112.

## **SEORAH**

Incidence of red rot varied from 4 to 60% on the variety Co 0238 in various sugar factory zones. The incidence of wilt varied from 1 to 15% on Co 0238 and on BO 110 (10%) from Pratappur and Chhatiyaon sugar factory zones. The incidence of smut varied from 1 to 5% in Co 0238, Co 0233, CoJ 88, CoS 8436, and CoSe 01434. GSD was noticed with 1 to 4% incidence in BO 110, Co 0238, CoLk 94184, CoSe 08452, and CoSe 11453. The incidence of PB varied from 1 to 4% in cultivars CoSe 01434, Co 0118, CoSe 08452, CoSe 92423, Co 98014 and Co 0238. Stinking rot was recorded @ 2 to 4% in Co 0238 and CoS 08279 at Seorahi sugar factory. Ratoon stunting disease (4 to 5%) was found in CoS 08279 and Co 0238 at Seorahi and Ramkola sugar factory. YL incidence (2-4%) was observed on CoLk 16470, CoS 11271, CoSe 15452, CoV 92102, CoSe 15454 and mosaic was also noticed in CoSe 16453, CoS 17236 and CoPant 97222 at Seorahi Farm.

## **NORTH EASTERN ZONE**

### **BURALIKSON**

Survey was conducted in various sugarcane growing areas in Golaghat and Morigaon district of Assam. In all the areas, leaf spots were invariably present in all the varieties. Red rot was observed upto 4.2% in Co 997 farmers' field of Bortika. Wilt was observed in plant as well as ratoon crop in Co 997 and mostly associated with borer infestation. Incidence of pokkah boeng was trace and YLD was not observed in any of the fields.

### **EAST COAST ZONE**

#### **ANAKAPALLE**

Red rot incidence was observed in Co 62175 and CoV 89101. Smut incidence (5-20%) was observed in CoA 92081, GSD (2-20%) was observed in Co 7805, CoA 14321, ROC 16, CoA 92081, Co 11015, 93V 297 and Co 18009. High incidence of GSD was recorded in CoA 14321 and Co 18009. High incidence of sugarcane mosaic was noticed in CoV 09356, CoVSI 08121, Co 11015, CoA 92081 and Co 7805. PB (5-30%) was observed in 2009A 107, 87A 380, CoLk 94023, VCF 0517, 2012V 123, 93V 297, Co 14002 and 2005V 96 in the areas surveyed. The genotypes, 2009A 107 and 2012V 123 recorded with high Pokkah boeng disease incidence. YL of 5 to 20% was observed in CoV 09356, 93V 297 and 2005A 128. Mosaic was also observed to the tune of 5-20% in CoV 09356, CoA 92081, Co 7805, CoVSI 08121 and Co 11015. High incidence (20%) of mosaic was observed in the ratoon crop of the varieties, CoV 09356 and 87A 298. Wilt incidence (10-20%) was observed in 2009A 107, 81V 48 and 2010V 32. Leaf fleck incidence (15 to 20%) was recorded in CoA 16321, CoA 14321, CoA 92081, 2006A 64, 2006A 223 and 2000A 56. Rust incidence was also noticed during maturity stage of the crop in CoA 92081, 2009A 107 and CoV 09356.

#### **CUDDALORE**

The survey conducted in Cuddalore, Kanchipuram, Thiruvallur and Villupuram districts of Tamil Nadu indicated that the presence of red rot disease in varieties *viz.*, CoC

24, CoV 09356, Co 86032, CoM 0265 and Co 06022 and the disease severity ranged from 2 to 14%. Smut disease was recorded in variety TNAU Si 8, CoC 22, Co 86032 and CoC 25 and the disease severity was upto 12%. YL was also noticed in Co 86032, PI 1401, PI 1110, CoC 24 and CoV 09356 with an incidence ranged from 5 to 25%.

### **PENINSULAR ZONE**

#### **NAVSARI**

Surveys indicated that wilt, red rot and whip smut were the major diseases while YL and rust in trace amount in South Gujarat region. Area affected under wilt, red rot and whip smut was 2.04, 1.82 and 4.51% respectively. The incidence of smut was recorded in CoSi 95071, Co 86002, Co 97009, Co 99004, Co 0238, Co 86032, CoVSI 08005 and MS 1001. Maximum incidence of smut was recorded in Co 86002 and it was 11.65% in Copper Sugar factory area. The wilt was noticed in CoC 671, Co 86032, Co 86002, CoM 0265, CoSi 95071, MS 10001, Co 0238, Co 99006, CoVSI 08005 and Co 97009. The red rot was recorded in the varieties of CoC 671, Co 86002, Co 86032, CoM 0265, CoSi 95071, MS 10001, Co 0238, CoVSI 08005 and Co 97009 and it was 0.35% to 3.91% in all Sugar factories area except Bardoli sugar factory area. In addition to these diseases, the incidence of yellow leaf diseases was observed in Co 86002, Co 86032 and Co 97009 in Mahuva Sugar factory areas. Rust was found in variety MS 10001 in traces at Chalthan sugar factory areas.

#### **PUNE**

The smut was noticed in ratoon crops of Co 86032 and GSD in CoM 0265 and Co 86032. The natural incidence of foliar diseases *viz.*, rust, pokkah boeng, yellow leaf, brown spot and eye spot has been recorded on sugarcane. Symptoms like chlorosis, top rot and knife cut were noticed in sugarcane crop affected by pokkah boeng. Brown rust of sugarcane was severe in western Maharashtra. The incidence of brown spot was severe in western and central Maharashtra on CoM 0265. Yellow leaf disease of sugarcane is increasing in Kolhapur, Sangli, Satara, Pune, Ahmednagar and Solapur districts and it was noted on Co 86032, VSI 08005 and CoM 0265 upto 20%. Last year due to heavy rains, floods, continuous cloudiness and heavy leaching of nutrients, leaf rotting and top rotting of cane was observed.

#### **THIRUVALLA**

The leaf spot diseases like eye spot, brown spot, banded sclerotial disease and rust were found in mild form. Proper field sanitation and detrashing for 2-3 times controlled the foliar diseases. The other diseases observed were Pokkah Boeng, leaf scald, mosaic and YL. But none of the diseases were in a severe stage to cause any drastic yield decline.

#### **COIMBATORE**

In different districts, incidences of YL and grassy shoot were more common across the varieties. Wilt was observed in different varieties including in the new variety Co 0212. Red rot was observed in the cv Co 86027. Severe incidences of Pokkah boeng was found in the cvs Co 06022 and PI 1110. In Karnataka, severe occurrence of brown spot was recorded in the cv CoM 0265 in Uttara Kannada and Hubli Districts and affecting the crop growth significantly. Epidemic scale disease outbreak restricted the varietal spread in the region and other popular varieties *viz.*, Co 86032 and Co 92005 were free from the disease.

### **FINDINGS OF THE CURRENT YEAR**

#### **NORTH WEST ZONE**

##### **LUCKNOW**

Not given in report.

##### **SHAHJAHANPUR**

Sixteen sugar factories areas were surveyed for disease assessment during pre-monsoon and post-monsoon season. Severe incidence of red rot was recorded on Co 0238

with 70-100% incidences. The varieties CoPk 05191, CoS 08279 and CoS 8436 were also affected with red rot up to two percent. Several districts of central Uttar Pradesh were found severely affected by red rot on Co 0238. Mix infection of red rot and wilt was also recorded up to 30% on Co 0238. Smut was assessed in several varieties namely Co 0238, Co 0118, CoH 160, Co 98014, UP 05125 and CoS 13231 up to 10% incidence level. Grassy shoot disease was observed on Co 0238 ranging from 0.5 to 3%. Severity of yellow leaf disease (ScYLV) was noticed up to 30% on Co 0238, CoS 09232, CoS 08272, CoS 08279, CoS 12232, CoS 13231, UP 05125, Co 0118, Co 98014 and CoS 08276 at Shahjahanpur farm and in different districts. The incidence of pokkah boeng varied from one to 40% on Co 0238 at various sugar factory areas. Knife cut stage of pokkah boeng was recorded on Co 0238 at Shahjahanpur, Lakhimpur Kheri and Pilibhit districts. Leaf fleck (Sugarcane bacilliform virus) was observed on the various entries of AICRP trials. Several other diseases such as red stripe/top rot (bacterial), mosaic (SCMV), leaf scald, banded sclerotial and leaf binding were also noticed up to various extent in some varieties in central UP.

### **KAPURTHALA**

Red rot was observed with an incidence from traces to 15.0 per cent on varieties CoJ 64, CoJ 85, Co 89003 and CoPb 91. Maximum incidence was observed on variety Co 89003. Wilt incidence of traces to 10.0 per cent was also observed on Co 89003. The incidence of wilt was also observed in association with red rot disease. Smut incidence was observed on varieties Co 0238, Co 89003 and CoPb 93 from traces to 20 per cent. High incidence of smut was noticed on both plant and ratoon crop of variety Co 0238. Pokkah boeng disease was observed on variety Co 0238, CoJ 85, Co 118, CoPb 91, CoPb 92 and CoPb 93 (traces to 25%). Severe incidence of pokkah boeng disease was also observed on variety Co 0238. Red stripe/top rot disease was also observed in traces to 3.0 per cent on Co 0238, CoJ 85 and CoPb 93. High incidence was observed on variety CoJ 85. Grassy shoot disease (GS) was observed with an incidence of traces to 4.0 per cent. YL was observed in traces to 2.0 per cent on varieties Co 0238 and Co 118. Mosaic disease was also observed in traces on variety CoJ 88 in Amloh, Phagwara, Nawanshahr and Morinda sugar mills area.

### **UCHANI**

Red rot was observed (5- 23 %) on varieties like Co 89009, CoJ 85, Co 0238, CoS 8436 in sugar mill zone areas of Shahabad, Yamunanager, Karnal, Asandh, Panipat. Top rot was also observed from 2- 25 percent on varieties Co 0238, CoH 119, CoH 152, CoJ 85 and CoS 8436 in Shahabad, Yamunanager, Kaithal, Badshu and Karnal sugar mill zone areas. Incidence of smut up to 55 percent was observed in Co 0118, Co 0238, Co 05011, Co 89003, CoH 119 and CoH 167. Wilt was noticed in Co 89003, Co 05011 and Co 15023 in Panipat, Karnal, Sonipat and Yamunanager mill zone areas 5 to 21 per cent. Wilt in association with root borer was also noticed in Co 89003 in Panipat, Karnal and Sonipat mill zones. Pokkha boeng appeared (2-48 percent) on most of the varieties which includes Co 0118, Co 0238, Co 05011, Co 89003, CoH 119, CoH 160, CoH 167, CoJ 64, CoJ 85 and CoS 8436. Incidence of eye spot was noticed in plant and ratoon crop of Co 0118, Co 0238, CoH 160 and CoH 167 varieties in Karnal, Shahabad and Yamunanager sugar mill zone areas ranging from traces-17 percent. Grassy shoot disease was observed in almost all the sugar mill zone areas of Haryana from traces to 10 per cent on varieties which includes Co 0118, Co 0238, Co 05011, Co 89003, CoH 119, CoS 767 and CoS 8436. Yellow leaf was noticed in 2-26 per cent on varieties viz., Co 0238, Co 05011, Co 89003, CoH 119, CoH 160, CoPant 97222, CoS 767 and CoS 8436 in Yamunanagar, Karnal, Kaithal, Rohtak, Shahabad, Asand and Panipat sugar mill zone areas. Mosaic disease was also noticed in several varieties including Co 0118, Co 89003, CoH 119 and CoLk 15205.

## **KARNAL**

Red rot incidence was observed up to 30% in samples of variety Co 89003 of five sugar mills viz. Assandh, Sonipat, Gohana (Haryana), Khatauli and Bajaj Hindustan Sugar Ltd. Bhaisana (UP) and trace incidence on variety CoJ 85 in Shahabad area. Mild to severe incidence of pokkah boeng was reported by many sugar mills on cultivated varieties in the zone. Trace incidence of smut was found in variety CoH 160 and Co 0238 in Karnal area, whereas, wilt by traces to 10% in diseased samples of variety CoH 160 from village Dhakwala Rodan (Karnal), Sonipat and Gohana (Haryana) and Bhaisana (UP). SCBV incidence (1 to 5%) was noticed in CoLk 15201, CoLk 16202, CoPant 17221, CoPb 17212, CoPb 17213 and CoS 16233 entries in ZVT trial.

## **PANTNAGAR**

In Kichha areas, Co 0238 was affected with PB and smut diseases. Co 0118 was observed with PB, GSD, smut and CoPant 3220 showed GS, PB symptoms. In Sitarganj & Khatima areas, Co 0238, Co 0239, CoPant 99214 and CoH 0160 were affected with Pokkah boeng (up to 50%). In Kashipur areas, CoPant 99214 was affected with PB, smut. The varieties, Co 0238, Co 0239, CoH 118 were affected by PB, GSD. In Haldwani areas Co 0238 was affected by red stripe, sett rot, leaf spots.

## **NORTH CENTRAL ZONE**

### **PUSA**

The incidence of smut ranged between 5 and 10 percent and PB varied up to 10-15 per cent. In Gopalganj areas Co 0118 was affected with wilt (5-20%) and red rot up to 5 %, CoP 2061 affected with wilt and PBD up to 5% Wilt up to 10% and PB 5-10% was noticed in variety Co 0118 and variety Co 0238 was found affected with YL varied from (traces-2%), red rot (5-10%) and wilt (5-25%) in Sugauli sugar mill areas. Incidence of red rot up to 30%, wilt varied from 30-50% and YL 2-5% was recorded in variety Co 0238 at Manjhaulia sugar factory areas. Severe incidence of red rot and wilt diseases was observed in varieties Co 0238, CoH 160 and CoH 167 in Riga Sugar factory areas. In variety Co 0238 red rot was noticed up to 30% and wilt ranged between 30-40% and YL 2%. In variety CoH 167 red rot was observed 10-40% and wilt varied from 20-50%. Variety CoH 160 was affected with red rot, wilt and smut diseases in the range of 10-30%, 50-70% and 10-15% respectively. Co 0233 was observed with wilt 30-40% red rot 30%, PB 5% and 2% mosaic incidence whereas, in variety BO 154 was observed with smut up to 2% and PB 5-10%. In Sidhwalia sugar factory areas variety Co 0118 was affected with wilt up to 10% and red rot ranged between traces and 2%, Co 0238 with red rot 15-20%, wilt up to 40%, CoP 2061 with wilt disease and varied from 2-5%. In Pusa variety BO 154, PB was noticed up to 5%, CoV 92102 with YL up to 2%, PB 10% and mosaic up to 5%. CoP 9301 was found affected with PB varied from 2-5% at Kalyanpur while, red rot in combination with wilt was noticed in between 10-20% incidence at Narkatiaganj sugar factory area.

### **MOTIPUR**

Incidence of red rot was found associated in the varieties viz., Co 0238, CoS 8436, CoS 767, CoS 92423, CoLk 8102, CoS 91269 and CoSe 95422. The variety Co 0238 was noticed with the infections of red rot at several location of Uttar Pradesh to a tune of 15 % to 80 %. In some fields of CoSe 95422, CoS 8436, and CoSe 92423 the red rot incidence was up to 20 per cent. Incidence of smut was observed in Co 0238, CoSe 92423, CoS 88230 and CoS 91269. Incidence of GSD was noticed in most of the field surveyed (1-5 %). In some locations, higher incidence of GSD was noticed in CoS 91269 (10-20 %) and Co 0238 (5-10 %). The incidence of the minor disease PB was observed as major disease in most of the location surveyed with the variety Co 0238. In some fields PB incidence was noticed more

than 30 per cent. The leaf scald was noticed 2 to 10 %. The Yellow Leaf was also observed in most of the location in Co 0238.

### **SEORAH**

The red rot severity varied from trace to 89% on the cv Co 0238 and 4- 5% on CoS 08272 and CoS 08279 was observed. Wilt incidence also noticed from 4 to 87% on the variety Co 0238. Root rot incidence varied from trace to 85% on the cv Co 0238 was observed depend upon locality. Smut incidence trace to 5% was observed in the varieties *viz.* Co 0238, CoS 08279, CoSe 01434 and CoSe 11453. Grassy shoot disease was observed in the varieties *viz.* Co 0238, BO 110, CoSe 08452, CoLk 94184 and CoSe 11453 ranging from trace to 4%. Incidence of pokkah boeng varied from trace to 6 % in the varieties *viz.* Co 0238, CoS 08279, CoSe 01434 and CoSe 92423. Stinking rot was noticed on Co 0238 and CoS 08279 ranging from 2 to 4%. Ratoon stunting disease (4 to 5%) was found in CoS 08279 and Co 0238. YL was observed on CoP17437, CoSe 17451, CoLk 16466, CoLk 16468 and sugarcane mosaic was also noticed in CoSe 16451, CoBlN 17501 and CoP 06436.

### **NORTH EASTERN ZONE**

#### **BURALIKSON**

Most of the farmers still continue to grow Co 997. Other varieties grown are CoBlN 9605, CoBlN 9104, CoBlN 9103 etc. Diseases observed were red rot (trace) and wilt (Co 997). Other diseases were completely absent in farmers' field. However, Pokkah boeng was observed in CoBlN 9104 in the SRS experimental field. Leaf spot was present in all the varieties. Top borer, Plassey borer as well as wooly aphid was observed in farmers' fields.

### **EAST COAST ZONE**

#### **ANAKAPALLE**

Red rot, smut, mosaic, YL, GS, PB, rust, ring spot and yellow leaf spot are the diseases noticed in various places surveyed. Red rot incidence was observed susceptible varieties like Co 62175, CoV 89101 and 87V 94. Smut incidence (5-20%) was observed in almost all the areas surveyed in Andhra Pradesh in the variety CoA 92081. Grassy shoot incidence is increasing in sugarcane cultivars like CoA 14321, CoA 7602, 2000A 56, 2007A 81, Co 7805 and CoA 92081. Leaf fleck incidence was recorded in sugarcane genotypes, CoA 14321, CoA 14323, 2006A 64 and CoA 92081. Wilt disease (10-30%) was observed in various regions surveyed in the varieties, CoA 92081 and 87V 94. High incidence of sugarcane mosaic was observed in sugarcane growing regions of Visakhapatnam district on CoA 14321, CoA 92081 and Co 7805. The incidence of YL was found to be higher in areas where the ratoon crops of the varieties CoV 09356 and CoV 89101 are being cultivated. Yellow spot incidence was observed in CoV 09356 and 209A 252 at grand growth stage.

### **CUDDALORE**

Surveys conducted in Cuddalore, Kanchipuram, Thiruvannamalai, Thanjavur and Villupuram districts of Tamil Nadu indicated that the incidences of red rot in varieties *viz.*, Co(SC)Si 6, CoC 23, CoC 24, CoV 09356 and PI 001401 and the disease severity ranged from 1 to 35 %. Smut was recorded in variety CoC 25 and PI 001401 and the disease severity was up to 5%. Yellow leaf disease was also noticed in Co 0212, Co 86032, CoV 09356, PI 001110 and PI 001401 with an incidence ranged from 2 to 15 %. Brown rust was noticed in variety Co 11015 (5 %). Sett rot disease was noticed in variety Co 86032 and the incidence ranged from 5 to 6 %. Grassy shoot and pokkah boeng was noticed in traces in varieties *viz.*, Co 86032, Co 11015 and CoC 13339.

### **PENINSULAR ZONE**

#### **NAVSARI**

Surveys were undertaken in nine sugarcane growing sugar factories area of South Gujarat region. The survey indicated that wilt, red rot and whip smut were the major

diseases while YL and rust in trace amount in South Gujarat regions. Area affected under wilt, red rot and whip smut was 2.08, 5.00 and 4.91 per cent, respectively. The incidence of whip smut was recorded in varieties like Co 0238, Co 15007, Co 86002, Co 86032, Co 97009, Co 99004, Co 985117, CoM 0265, CoSi 95071, CoVSI 08005 and MS 1001. Maximum incidence of whip smut was recorded in Co 86002, CoSi 95071 and Co 97009 varieties and it was 11.65 % in Kamrej Sugar factory area. The wilt incidence noticed in Co 0238, Co 06030, Co 16002, Co 97009, Co 985117, Co VSI 08005, CoC 671, CoM 0265, CoSi 95071 and MS 1001 varieties and it was 2.08 % in Kamrej and Mahuva Sugar factory area. The red rot was recorded in the varieties of Co 0238, Co 06030, Co 16002, Co 86032, Co 97009, Co 985117, CoC 671, CoM 0265, CoSi 95071, CoVSI 08005 and MS 10001 and it was 0.01 % to 5.00 % in all Sugar factories area. In addition to these diseases, the incidence of yellow leaf diseases was observed in Co 86002, Co 86032 and Co 97009 in Mahuva Sugar factory areas. Pokkah boeng disease was found in varieties Co 97009, Co 99004 and CoM 0265 in trace amount at Kamrej sugar factory areas.

#### **PUNE**

The smut incidence was more in ratoon crops of Co86032 and VSI 08005. Grassy shoot was noticed in M 0265 and Co 86032. The brown rust was severe in Western and Central Maharashtra in CoM 0265 and Co 86032. PB symptoms like leaf chlorosis, shortening of internodes, top rot and knife cut were exhibited by the canes affected by pokkah boeng. YL is increasing in Co 86032, VSI 08005 and CoM 0265 and brown spot disease was observed mostly in CoM 0265 and the diseases like eye spot, ring spot and wilt are observed in minor form.

#### **THIRUVALLA**

Red rot disease was observed in some isolated pockets of Marayoor areas. However no yield decline due to red rot was recorded. Leaf fleck, mosaic and leaf spot diseases like eye spot, brown spot, banded sclerotial disease and rust were also observed in almost all the areas. But they were not found in such a severe form to cause any drastic yield loss. Pokkah Boeng in mild to moderate form was recorded in some varieties but YL was not observed in any of the varieties observed. But none of the diseases were in a severe stage to cause any drastic yield decline.

#### **COIMBATORE**

Surveys were conducted in sugar mill areas in Tamil Nadu during the season and also monitored through virtual media. YL and grassy shoot were more common across the varieties in different districts in the state. Severe incidences of red rot in the cv Co 86027 and trace to 5% red rot in the cv CoM 0265 were recorded in Namakkal Dt. Moderate incidences of red rot were found in Co 06022 and CoC 24 in Villupuram Dt. Unexpectedly, under upland conditions of Sathyamangalam in Erode Dt, traces of red rot were recorded in the cv CoC 671 and for the first time red rot was recorded in the region, indicating subtle carry over of the inoculum under field conditions. This season had very severe outbreaks of PB in different varieties and mealy bug infestation in the spindle was found to aggravate the disease severity. The varieties Co 0212, Co 06022, Co 11015, PI 1110 and CoV 09356 exhibited severe crop losses due to severe PB in different districts. Many fields in Namakkal, Karur, Villupuram and Cuddalore districts recorded close to 100% disease incidences. The affected crops had extensive bud sprouting and drying of foliage. A particular field recorded ~50% PB incidences and 30% wilt, indicating cause of the two diseases by the same pathogen. The disease has also severely affected ratoon crops of Co 86032. In addition, the cvs Co 0212 and Co 06030 recorded wilt incidences to moderate levels. The cv Co 11015 also recorded smut and wilt in few pockets. Incidences of red rot in Co 06022 were recorded in Chittoor district in Andhra Pradesh.

## 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.

### RESULTS OF PREVIOUS YEAR

#### NORTH WEST ZONE

##### LUCKNOW

Out of 26 ISH genotypes tested, 5 namely SA04-454, BA 1003143, BM1010168, SA98-13 and AS04-635 were rated as R against both the pathotypes CF08 and CF09 by plug and nodal method of inoculation. Three genotypes BM 1009-163, MA5/51 and PG 9869137 were rated S to both the pathotypes and genotypes AS04-245 and GU073-774 were rated HS against both the pathotypes (CF08 and CF09). Three genotypes *viz.*, BM1022-173, AS04-1687 and CYM-07986 were rated as MS) against both the pathotypes (CF08 and CF09) by plug method of inoculation whereas R by nodal method of inoculation. Other 13 genotypes *viz.*, SA04-454, SA04-472, GU07-3849, MA/5/22, MA/5/37, SA04-390, SA04-496, AS04-2097, BM-1009149, MA5/5, SA04-409, MA5/99 and AS04-1689 were MR to both the pathotypes by plug method of inoculation and R by nodal method of inoculation.

##### KAPURTHALA

Twenty seven ISH genotypes were screened and of that none behaved as R, 11 were found MR against CF08 and eight against CF09. Seven genotypes *viz.*, AS 04-635, MA 5/5, MA 5/22, SA 98-13, SA 04-409, SA 04-472 and BM 10-22173 were found MS to both the pathotypes. Genotypes AS 04-1687, BM 1003143 and MA 5/37 behaved as MR to CF08 and MS to CF09, whereas PG 9869137 and BM 1009163 behaved as MS to CF08 and S against CF09. Four genotypes (AS 04-245, CYM 07-986, GU 07-3774 and SA 04-458) were HS to both the pathotypes by plug method of inoculation. Eight genotypes namely, BM 1005149, GU 07-2276, MA 5/51, MA 5/99, SA 04-390, SA 04-454, SA 04-496 and AS 04-1689 were found MR against both the pathotypes.

##### UCHANI

Twenty five ISH clones/genotypes were evaluated for resistance to red rot by plug method using pathotype CF08 and CF09. Six clones *viz.*, SA04-472, SA-98-13, MA-5-99, GU-07-3849, GU-07-2276, SA-04-390 were found R/MR against CF08 and CF09 by plug method. Seven clones namely, MA-5-37, SA04-496, MA-5-22, BM-1022-173, AS -04-1687, BM-100-3143 and BM-1010-168 exhibited MR/MS reaction against CF08 and CF09. Twelve clones *viz.*, AS-04-635, AS-04-245, Bm-1009-163, MA-5-5, AS -04-1689, BM-1005-149, AS -04-2097, GU-07-2276, GU-07-3774, MA-5-51, CUM-07-986, PG-9869137 and BM-1010-168 showed MS/S reaction against CF08 and CF09.



## **KARNAL**

Twenty seven ISH clones were inoculated with CF08 and CF09 pathotypes and in that 12 clones were rated as MR, six were MS and nine were S/HS to CF08, while ten clones showed MR, eight were MS and nine were S/HS to CF09 pathotypes.

## **SHAHJAHANPUR**

Twenty three ISH genotypes were tested for red rot resistance against CF08 and CF09. Of 23 genotypes, nine genotypes namely AS 04-1689, BM 1010168, GU 07-2276, GU 07-3849, MA 5/99, SA 04-390, SA 04-454, SA 04-496 and SA 98-13 showed MR reaction to both the pathotypes. Two genotypes AS 04-245 and GU 07-3774 behaved as HS against CF08 and CF09. The genotype MA 5/5 was rated as S to CF 08 and MA 5/22, PG 9869137 as S to CF09. Two genotypes BM 1003143 and BM 1005149 behaved as MS to CF08 and MR to CF09. Four genotypes such as AS 04/1687, CYM 07-986, MA 5/51 and SA 04-472 exhibited MS reaction to both the pathotypes.

## **NORTH CENTRAL ZONE**

### **PUSA**

Twenty seven elite and ISH sugarcane clones were artificially evaluated for resistance to red rot with CF07 and CF08 isolates by plug method of inoculation. Out of which, six clones (IGH 829, ISH 513, IGH 554, IGH 833, ISH 502 and ISH 545) were found R, four clones (IGH 834, ISH 594, ISH 585 and ISH 590) were found MR, two clones (IGH 816 & ISH 519) were MS and remaining fifteen clones were S to CF07 isolate. Whereas, seven clones (IGH 829, ISH 513, IGH 834, ISH 554, ISH 594, IGH 833 and ISH 502) were found as R, three clones (ISH 585, ISH 590 and ISH 545) were found MR, two clones (ISH 512 and ISH 519) were found MS and rest 15 clones were S to isolate CF08.

### **SEORAH**

Twenty seven ISH genotypes were evaluated against red rot. Of these, one genotype BM 1010168 was rated as R, 4 genotypes were rated as MR, 10 genotypes as MS, 10 genotypes were rated as S to CF07, while one genotype MA 5/99 was rated as R, 5 genotypes were rated as MR, 9 genotypes as MS, 10 genotypes were rated as S to CF08.

## **EAST COAST ZONE**

### **CUDDALORE**

Twenty-seven elite and ISH clones screened for resistance and among these the clone GU 07-2276 was recorded as R. Twelve genotypes *viz.*, AS 04-2097, BM 1005149, BM 1010168, GU 07-3849, MA 5/37, MA 5/99, MA 5/22, PG 9869137, SA 98-13, SA 04-454, SA 04-390, and SA 04-409 were MR to red rot. The genotypes *viz.*, AS 04-1689, AS 04-635, AS 04-1687, CYM 07-986 SA 04-472 and SA 04-496 were MS. The genotypes BM 1022173, GU 07-3774, MA 5/51 and SA 04-458, and were HS to red rot.

### **ANAKAPALLE**

Out of 27 ISH genotypes tested by plug method of inoculation, one entry (PG9869137) showed R, while 6 entries, SA 04-454, SA 04-496, AS 04-2097, MA 5/51, MA 5/37, MA 5/99 and GU 07-2276 showed MR reaction to the pathotype CF06 and remaining were MS to HS to red rot disease.

## **PENINSULAR ZONE**

### **NAVSARI**

Thirty elite and ISH Clones were evaluated for resistance to red rot by plug method using CF06 and CF12 pathotypes. Among them only one clone SES 594 was found R against both the pathotypes and 12 clones were rated as MR against both the pathotypes. Five clones *viz.*, ISH 50, ISH 175, ISH 229, ISH 287 and AS 04 1687 showed MS against both the pathotypes, 2 clones *viz.*, ISH 69 and MA 5/5 exhibited S against both the pathotypes, 3 clones *viz.*, ISH 9, ISH 43 and ISH 176 were rated as HS to both pathotypes.

Clone GU 07 2276 was rated as R to CF06 while MR to CF12, clones ISH 12, MA 5/22 and SA 04 454 were found MS to CF06, while MR to CF12. The clone CyM 07 986 showed S to CF06 and MS to CF06. Clone ISH 41 found HS to CF06 and S to CF06 whereas MA 5/51 showed S to CF06 and HS to CF06.

### **COIMBATORE**

The first batch of ISH clones was evaluated and the trial concluded. A new set of materials will be tested in the 2020-21.

### **RESULTS OF CURRENT YEAR**

#### **LUCKNOW**

Out of 24 ISH genotypes tested, one genotype namely ISH 516 was rated as R against both the pathotypes (CF08 and CF09) by plug and nodal both the method of testing. Sixteen genotypes were rated as MR to both the pathotypes (CF08 and CF09) in plug method of inoculation and R in nodal method of inoculation. Two genotypes ISH 585 and ISH 562 were rated as MS against the pathotype CF08 and MR against the pathotype CF09 in plug method of inoculation, whereas rated as R in nodal method. Two genotypes IGH 823 and IGH 834 were rated as MS against both the pathotypes (CF08 and CF09) in plug method of inoculation whereas rated as S by nodal method of inoculation (Table 28).

#### **SHAHJAHANPUR**

Of 25 genotypes, six near commercial hybrids namely Co 09022, Co 12029, Co 14034, Co 15023, Co 15026, Co 15027 also tested against red rot and was found MR to CF08 and CF09, while Co 15024 was MS to CF08 and MR to CF09. The genotypes namely IGH 823, ISH 501, ISH 516, ISH 528, ISH 548, ISH 554, ISH 558, ISH 567, ISH 584, ISH 590 and ISH 594 were screened as R/MR to CF08 and CF09 pathotypes. One genotype ISH 587 was found HS to CF08 and CF09. Three genotypes such as IGH 834, ISH 585 and ISH 536 were evaluated as MS to both the pathotypes. The genotypes IGH 829, ISH 534, ISH 542, ISH 545 were recorded as MS to CF08 and MR to CF09. Six genotypes such as IGH 833, ISH 502, ISH 519, ISH 524, ISH 526 and ISH 562 were evaluated as MR to CF08 and MS to CF09. Two genotypes ISH 534 and ISH 542 showed MS reaction to CF08 and S reaction to CF09. One genotype ISH 545 recorded MS to CF08 and HS to CF09. Susceptible check CoJ 64 expressed HS to both the pathotypes (Table 29).

#### **KAPURTHALA**

Out of the 27 genotypes, 12 ISH clones were found MR against both CF08 and CF09. Two clones namely ISH 542 and ISH 545 found MS against CF08 while MR against CF09. Among IGH clones, one namely IGH 816 showed S reaction against both the pathotypes while other three clones showed MR reaction. Four near commercial hybrids viz., Co 12029, Co 15023, Co 15026 and Co 15027 showed MR against two pathotypes whereas genotype Co 15024 showed MS against CF08 and MR against CF09. All the four water logging tolerant clones (WL-10-105, WL-10-18, WL-11-2534 and WL-10-85) showed MR reaction to both the tested pathotypes (Table 30).

#### **UCHANI**

Twenty five ISH clones/genotypes were evaluated for resistance to red rot by plug method using pathotypes CF08 and CF09. Eight clones namely, AS-04-635, MA-5-5, SA-98-13, A04-496, MA-5-22, BM-1022-173, AS -04-168, AS -04-1689, BM-100-3143 and GU-07-3849 were found R/MR against CF08 and CF09 in plug method. Two clones namely, GU-07-2276, A-04-409 exhibited MS/MS reaction by CF08 and CF09 pathotypes, whereas, clones viz., MA-5-37, SA04-472, MA-5-99, BM-1010-168 SA-04-390 and PG-9869137 showed MS/S reaction against pathotypes CF08 and CF09. Seven clones AS-04-245, BM-

1009-163, BM-1005-149, AS -04-2097, GU-07-3774-212, MA-5-51 and CYM-07-986 behaved as S/HS against CF08 and CF09 (Table 31).

#### **KARNAL**

Nineteen ISH clones, four IGH clones, four commercial hybrids and one water logging tolerant clone were evaluated for red rot resistance. All the test clones were inoculated with CF08 and CF09 pathotypes of red rot by plug method of inoculation. Among the ISH clones three were rated R, six MR, five MS, three S and two HS to CF08, while two clones showed R, six MR, five MS, four S and two HS reaction to CF09 pathotype. Of the three IGH clones, IGH-829 exhibited S reaction to both the pathotypes whereas, IGH 823 and IGH 829 found to be MS with CF08 pathotype and S to CF09 pathotype. The water logging clone WL-10-85 expressed MS reaction to both the isolates. Further, all the four commercial hybrid clones were rated R / MR to red rot both the pathotypes (Table 32).

#### **PUSA**

Thirty elite and ISH sugarcane clones were planted during 2020-21, but due to heavy rainfall and water stagnation for longer period in the field 13 clones were rotted. However remaining 17 clones were evaluated for resistance to red rot with CF07 and CF08 pathotypes by plug method of inoculation. Out of 17 evaluated clones five (IGH 829, ISH 554, ISH 585, ISH 590 and ISH 502) showed MR reaction against both the pathotypes, while rest of the clones were found MS to S reaction to both the pathotypes (Table 33).

#### **SEORAH**

Twenty seven ISH genotypes were evaluated against red rot. Of these, 7 genotypes were rated as R, 5 genotypes were rated as MR, 7 genotypes as MS, 8 genotypes were rated as S to CF07, while 4 genotypes were rated as R, 9 rated as MR, 8 as MS, 3 as S and 1 genotype as HS to CF08 (Table 34).

#### **ANAKAPALLE**

Out of 8 ISH genotypes tested by plug method of inoculation, five entries (Co 09022, Co 15023, Co 15024, Co 15026 and Co 15027) showed R while 2 entries, Co 13034 and Co 14034 showed MR reaction to CF06 and Co 12029 was MS in reaction (Table 35).

#### **CUDDALORE**

Thirty ISH clones were screened for resistance to red rot disease by plug method of inoculation against CF06 pathotype, among them 6 clones viz., ISH 516, ISH 536, ISH 548, ISH 567, ISH 806 and ISH 833 recorded R reactions. Eleven ISH genotypes viz., ISH 501, ISH 502, ISH 526, ISH 528, ISH 535, ISH 542, ISH 558, ISH 564, ISH 584, ISH 594 and ISH 823 were MR to red rot disease. Six ISH genotypes viz., ISH 519, ISH 524, ISH 534, ISH, 590 ISH 816 and ISH 834 were MS to red rot (Table 36).

#### **NAVSARI**

Twenty eight ISH and eight commercial hybrid clones were evaluated for resistance to red rot by plug method using CF06 and CF12 pathotypes. Only two clones ISH 564 and ISH 585 were found R against both the pathotypes. Fifteen clones were rated as MR against both the pathotypes whereas 12 clones exhibited MS against both the pathotypes. Four clones viz., ISH 524, Co 12029, Co 15023 and Co 15024 were found MR against CF06 and MS against CF12 while three clones viz., ISH 516, ISH 542 and ISH 594 exhibited MS against CF06 and MR against CF12 (Table 37).

#### **COIMBATORE**

About 30 ISH and IGH clones were evaluated for red rot resistance by plug and nodal methods under field conditions against the pathotypes CF06 and CF12. About 20 of them were identified as R to the pathotypes by plug method and 25 as R under nodal method (Table 38).

**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:** Kapurthala, Uchani, Shahjahanpur, Seorahi, Pusa, Kolhapur, Pune, Akola, Sankeshwar, Anakapalle and Nayagarh

**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 3<sup>rd</sup>/4<sup>th</sup> 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	
V1					
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 15<sup>th</sup>)

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.

## **RESULTS OF PREVIOUS YEAR**

### **I. SCREENING FOR POKKAH BOENG RESISTANCE**

#### **KAPURTHALA**

Forty entries were screened for PB incidence under natural condition. Among 40 entries, 15 namely Co 15024, Co 15025, Co 15027, Co 16030, CoLk 14203, CoLk 15209, CoLk 16202, CoPb 14211, CoPb 16181, CoLk 15205, CoLk 16204, CoPb 16212, CoS 16231, CoS 16233 and CoS 15233 were MS, four entries (CoPant 16222, CoLk 15201, CoPb 15212 and CoLk 15206) were S and remaining were R to pokkah boeng.

#### **UCHANI**

Seventy genotypes were screened against PB under natural conditions in that 37 entries were found R (0-4.93%). Eighteen genotypes showed MS reaction (5.34-9.95%) to PB. Ten entries *viz.*, Co 15026, Co 16030, CoJ 64, CoLk 15024, CoPant 16222, CoPant 16223, CoPb 14184, CoS 15233, MA5-5 and MA5-37 exhibited S reaction (10.53-19.25%) however, 4 clones *viz.*, BM-1022-173, Co 0238, SA04-472 and SA04-496 showed HS reaction (28.15-48.15%) against pokkah boeng.

#### **SHAHJAHANPUR**

Twenty two genotypes were evaluated naturally against PB. Six out of 21 genotypes *viz.*, CoJ 64, CoS 16233, CoS 17233, CoSe 16451, CoSe 16453 and 5347/12 behaved as R, whereas six screened as MS. Nine genotypes were observed as S/HS and susceptible check Co 0238 exhibited HS to PB.

#### **PUSA**

Twenty sugarcane varieties were screened under natural condition out of which, twelve entries (BO 91, BO 139, BO 153, BO 155, CoP 151, CoP 2061, CoP 14436, CoP 14437, CoP 14438, CoP 15436 CoP 16437 and CoP 15438) were observed as R, six entries (CoP 16440, CoLk 14208, BO 130, CoP 155, BO 156 and CoP 154) showed MS and two entries CoSe 95422 and CoSe 14453 showed S reaction to Pokkah boeng.

#### **SEORAH**

Total of 33 genotypes were screened for PB and out of these, 21 exhibited R, 7 exhibited MS and rest of them exhibited S behavior to pokkah boeng disease (Table 43).

#### **ANAKAPALLE**

Out of 35 genotypes, less than 5% disease incidence was observed in eight genotypes, *viz.*, Co 6907, CoA 17321, CoA 17323, CoA 17324, CoA 92081, CoC 16338, CoOr 17346 and CoV 16357 and rated as R and the remaining entries were found to be either MS or S to HS with a disease score of >5%.

#### **PUNE**

Out of fourteen entries 14-22, 191-3, Co 419, CoVSI 03102, CoM 0265 and CoM 9057 were free from the disease, while the remaining 8 *viz.*, Co 86032, Co 94012, CoC 671, CoVSI 9805, MS 10001, VSI 434, and VSI 08005 were found to be S. Maximum disease incidence was noted in CoVSI 9805 (26.75%) and VSI 08005 (19.33%).

## **II. EPIDEMIOLOGY**

### **KAPURTHALA**

During the present study, the overall disease severity was moderate to high and disease progressed readily when environmental conditions were favourable. The progress of disease started picking up from the last week of May and gradually increased till September. The severe incidence of the disease was observed in the months of July and August. Weather parameters *viz.*, maximum temperature, relative humidity (morning and evening) and rainfall were found to be positively correlated; therefore it is evident that disease severity progressed significantly with rise in temperature, relative humidity and high rainfall. Higher relative humidity coupled with cloudy weather and drizzling favoured the growth and development

of pathogen. Coefficient of determination between disease severity and weather parameters revealed that all the weather parameters together governed 74% towards disease severity.

#### **UCHANI**

The progress of disease started picking up from the second week of June and gradually increased till August. The severe incidence of the disease was observed in the months of June and July. There was a significant positive correlation between disease severity and rainfall ( $r=0.55$ ), minimum temperature ( $r=0.57$ ) relative humidity morning ( $r=0.49$ ) and evening ( $r=0.90$ ). The correlation coefficients of disease severity with evaporation ( $r=-0.45$ ) and sunshine ( $r=-0.48$ ) was negatively significant. There was negative correlation between disease severity and maximum temperature ( $r=-0.33$ ) but not significant.

#### **SHAHJAHANPUR**

Pokkah boeng incidence appeared during 1<sup>st</sup> fortnight of June and gradually increased till July to September due to high rainfall and humidity. Rainfall in July, August and September were recorded 484.6 mm, 140.6 mm and 167.2 mm, respectively. Likewise, utmost relative humidity was recorded up to 82%, 81% and 84% in same months, respectively. Higher relative humidity % coupled with cloudy weather and showery favoured the growth of pathogen. Maximum temperature also recorded as 33.5<sup>o</sup>C, 33.5<sup>o</sup>C and 32.3<sup>o</sup>C in aforesaid months, respectively. Temperature, rainfall and relative humidity collectively played a key role in the severe incidence and spreading of PB.

#### **PUSA**

The maximum disease incidence of PB was observed during 2<sup>nd</sup> and 1<sup>st</sup> fortnight of August (18.5% and 16.6%) respectively. The minimum and maximum temperature ranged between 26.7<sup>o</sup>C to 34.6<sup>o</sup>C, relative humidity 73.0 to 91.0% and rainfall 8.2 mm to 161.3 mm respectively, during the maximum development of the disease. The correlation analysis between weather factors and disease incidence indicate that minimum temperature showed highly significant positive correlation with disease incidence ( $R=0.66^{**}$ ), whereas, RH of 07 hrs and 14 hrs ( $r=0.19, 0.44$ ) showed +ve correlation but not significant and rainfall (0.51<sup>\*</sup>) showed significant positive correlation. The multiple linear regression were also worked out by taking disease incidence as dependent variable and weather factors as independent variables. The data showed that all the weather factors together governed 76% towards disease incidence ( $R_2 = 0.76$ ) and the minimum temperature and rainfall were the favourable weather factors for PB in Bihar.

#### **SEORAH**

It was noticed that temperature (22.07 to 32.6<sup>o</sup> C), relative humidity (68.51 – 89.97%) and rainfall (231 - 342 mm) during the year favored disease development. The disease incidence was found maximum in first week of July which gradually increased till last week of August. Maximum rainfall and high humidity favored the development of PB. The reduction in disease incidence was observed from the second week of July after the period of rain fall.

#### **ANAKAPALLE**

The disease incidence was initiated during the first fortnight of June and high incidence was recorded in the month of August. The disease incidence gradually reduced by second fortnight of September, 2019. The disease incidence was found to be highly influenced by minimum temperature followed by number of rainy days. As the minimum temperature reduced from the second fortnight of October, the disease also reduced. Pokkah boeng incidence started from first fortnight of June and considerable disease incidence was noticed till second fortnight of September (175 days after planting). However, high incidence of the disease was observed from second week of August to first week of September which was found to be influenced by minimum temperature (25.3 to 26.1<sup>o</sup>C) and number of rainy days.

### **III. POKKAH BOENG MANAGEMENT SHAHJAHANPUR**

The efficacy of carbendazim fungicide for the management of PB was assessed with two susceptible varieties Co 0238 and CoS 08279. Study revealed that carbendazim managed the disease severity as compared to control. The treatment T<sub>3</sub> (Sett treatment with carbendazim + foliar spray with carbendazim) was found better in germination and most effective to manage PB during the monsoon season followed by T<sub>2</sub> in both the varieties. Highest germination of 40% with low incidence of PB (11.63%) was recorded in Co 0238 and 48.75% germination and 11.92% PB incidence recorded in CoS 08279.

#### **KAPURTHALA**

The efficacy of carbendazim fungicide for management of pokkah boeng was tested on two susceptible varieties viz., Co 0238 and CoJ 85 under four treatment combinations viz., T<sub>1</sub>: sett treatment-overnight soaking with Carbendazim (0.1% a.i.), T<sub>2</sub>: Foliar spray of Carbendazim (0.05% a.i.-3 sprays at 15 days interval from May 15<sup>th</sup>), T<sub>3</sub>: Sett treatment (T<sub>1</sub>) + Foliar spray with carbendazim (T<sub>2</sub>) and Control (T<sub>4</sub>). The results revealed that fungicide carbendazim was significantly better in increasing germination and to manage the disease in comparison to control. Overnight soaking along with foliar spray at 15 days interval starting from May 15<sup>th</sup> (T<sub>3</sub>) was most effective in checking the disease which gave higher germination and low disease incidence of 9.25% and 9.75 %, respectively in Co 0238 and CoJ 85.

#### **UCHANI**

Experiment was conducted with three treatments viz., T<sub>1</sub> Sett treatment (overnight soaking with carbendazim 0.1%), T<sub>2</sub> Foliar spray with carbendazim 0.05% - 3 sprays at 15 days interval and T<sub>3</sub> (T<sub>1</sub> + T<sub>2</sub>) and control with four replications on varieties Co 0238 and CoS 8436. Overnight soaking with carbendazim 0.1% and foliar sprays with carbendazim was found most effective in checking the the PB which gave lowest disease incidence of 6.7% and 5.8% in Co 0238 and CoS 8436, respectively and also increase % germination.

#### **PUSA**

To manage the PB, sett treatment with carbendazim @ 0.1% and three foliar sprays with carbendazim at 15 days intervals showed highest germination and maximum disease control in all the treated varieties. Highest germination 36.4% with low disease incidence (7.2%) was observed in BO 154 and lowest germination 22.3% and 13.2% disease incidence was recorded in variety CoBln 15501.

#### **ANAKAPALLE**

Sett treatment + foliar spray of carbendazim -0.05% recorded low (5.33%) top rot incidence compared to control which was on par with foliar spray with carbendazim @ 0.05% a.i (5.55%).

### **RESULTS OF CURRENT YEAR**

#### **I. SCREENING FOR POKKAH BOENG RESISTANCE**

##### **SHAHJAHANPUR**

Twenty four entries were evaluated naturally against PB and correlate with climatic conditions. Eleven genotypes such as SL 146/10, M. 1936/08, S. 2991/12, CoS 17233, CoS 17235, CoS 17237, CoS 18231, CoSe 18451, CoSe 18452, CoS 767, CoJ 64 out of 21 genotypes/varieties behaved as R whereas two behaved as MS. Ten genotypes/varieties behaved as S to HS. Susceptible check Co 0238 exhibited HS to PB (Table 39).

##### **KAPURTHALA**

Out of 46 entries screened for pokkah boeng incidence under natural conditions, 17 were found MS, ten were S and remaining were R to pokkah boeng. However, check varieties Co 0238 and CoJ 85 behaved as HS to the disease (Table 40).

## **UCHANI**

Seventy one varieties /genotypes (IVT and AVT early, mid late, plant I, plant II and ISH clones) of sugarcane were screened against pokkah boeng disease under natural conditions. Thirty four varieties were found R to pokkah boeng (0-4.7%). Twenty three varieties showed MS reaction (5.1 -9.8 %) to pokkah boeng. Eight varieties showed HS reaction (22.2-47.3%) against pokkah boeng (Table 41).

## **SEORAH**

Eight genotypes in (IVT -E) were evaluated against PB and of these, 4 genotypes were rated as R, 02 genotypes as MR and 2 genotypes (CoBln 17501 and CoP 17438) were rated as MS to pokkah boeng. Of the 6 genotypes (IVT-ML), 04 genotypes exhibited R, 1 genotype was found MR, while 1 genotype was found MS to pokkah boeng. In AVT-E, 5 genotypes were evaluated against pokkah boeng and of these 3 genotypes exhibited R 2 genotypes exhibited MR to pokkah boeng. Under AVT-ML, 3 genotypes exhibited R and one genotype exhibited MR against to PB (Table 43).

## **ANAKAPALLE**

Out of 25 entries screened against pokkah boeng disease under natural conditions, less than 5% disease incidence was observed in eight genotypes, which were rated as resistant as per the disease rating scale. The remaining entries were found to be either MS or S to HS with a disease score of >5 per cent. The entries, CoV 18356, CoC 17336, CoV 16356, CoC 16339 and 2003V 46 were rated as HS to pokkah boeng disease with disease incidence more than 20 per cent (Table 44).

## **CUDDALORE**

Natural incidence of PB in clones was recorded. Nine clones *viz.*, CoA 17321, CoA 17323, CoC 16336, CoC 16337, CoC 16338, CoC 16339, CoOr 15346, CoOr 18346 and CoV 18357 recorded resistant reaction. Six clones *viz.*, CoA 16321, CoC 15339, CoC 17336, CoV 16356, CoV 16357 and CoV 18356 were found MS to PB (Table 23).

## **THIRUVALLA**

All the AVT entries were observed for natural incidence of PB. Among 31 entries evaluated, only 15 expressed mild PB symptoms in mild to moderate form but the disease reaction indicated R reaction for all the entries (Table 25).

## **COIMBATORE**

About 30 IVT and AVT entries were monitored and PB incidences under natural conditions in the field. No PB incidences were noticed during this season on any of the entries except Co 17013 and check entries CoC 671 and Co 96007 (Table 26).

## **PUNE**

Observations regarding PB incidence were recorded throughout the crop period. Out of 12 varieties from AVT-I plant, variety PI 15131 reacted as MS, while other varieties were reacted as R (Table 27).

## **II. EPIDEMIOLOGY**

### **SHAHJAHANPUR**

Pokkah boeng has been correlated with climatic conditions. Pokkah boeng incidence appeared during 1<sup>st</sup> fortnight of June and gradually increased till July to September due to high rainfall and humidity. Rainfall in July and August were recorded 431.0 mm and 92.8 mm, respectively. Likewise, relative humidity was recorded up to 81%, 79% and 75% in July to September, respectively. Higher relative humidity coupled with cloudy weather and showery favoured to the growth of pathogen. Maximum temperature also recorded as 33.3°C, 33.2°C and 34.7°C in aforesaid months, respectively. Temperature, rainfall and relative humidity collectively played a key role in the severe incidence and spreading of PB.



## **KAPURTHALA**

The PB severity was correlated with weather parameters like maximum and minimum temperature (°C), relative humidity morning and evening (%) and rainfall (mm). The disease progressed readily when environmental conditions were favourable. The progress of disease started picking up from the last week of May and gradually increased. The severe incidence of the disease was observed in the months of July-August upto September. There was a significant positive correlation between disease severity and maximum temperature ( $r=0.24$ ), minimum temperature ( $r=0.56$ ), relative humidity morning ( $r=0.55$ ) and evening ( $r=0.52$ ). The correlation coefficients of disease severity with rainfall was also positive, but non-significant; therefore it is evident that disease severity progressed significantly with rise in temperature, relative humidity and rainfall. Coefficient of determination between disease severity and weather parameters revealed that all the weather factors governed 75 per cent towards disease severity.

## **UCHANI**

The progress of PB started picking up from the second week of June and gradually increased till September. The severe incidence of the disease was observed in the months of July and August. There was a significant positive correlation between disease severity and rainfall ( $r=0.45$ ), relative humidity morning ( $r=0.68$ ) and evening ( $r=0.79$ ). There was positive correlation between disease severity and minimum temp. ( $r=-0.14$ ), but not significant. Regression equation for PB was  $Y = -164.18 + 1.329 X_1 - 0.143 X_2 + 0.951 X_3 + 0.775 X_4 - 0.011 X_5 - 3.74 X_6 + 2.694 X_7$  with coefficient of determination ( $R^2$ ) 0.90. Coefficient of determination revealed that weather parameters contributed upto 90% towards disease severity. Correlation coefficient between disease severity and weather variables was significant.

## **PUSA**

On the basis of observation, disease incidence ranged from 0.60 to 12.8 percent during (April to November, 2020). The maximum disease incidence was observed during 2<sup>nd</sup> fortnight and 1<sup>st</sup> fortnight of July (12.8% and 9.2%) respectively. The maximum and minimum temperature noticed in this period (32.2 °C and 21.6 °C), relative humidity (91.4% and 85.3%), rainfall occurred 27.4mm and sunshine 4.1 hrs. is recorded respectively, during the maximum disease development. The multiple linear regression worked out by taking disease incidence as dependent variable and weather factors as independent variables. The data showed that all the weather factors together governed 86 percent towards disease incidence ( $R^2=0.86$ ). Thus, it may be concluded that rainfall and relative humidity were the congenial weather factors for PB disease development.

## **SEORAH**

The maximum disease incidence of PB was observed during 1<sup>st</sup> fortnight of June and gradually increased till July to September due to high rainfall and humidity. Rainfall in June, July, August and September were recorded 204 mm, 372 mm, 324 mm and 217 mm respectively during the maximum development of the disease. Similarly, maximum relative humidity was recorded up to 72%, 84%, 87%, and 85% and maximum temperature 30.6°C, 28.5°C, 28.2°C, 27.6°C in aforesaid months, respectively. Temperature, rainfall and relative humidity play an important role in pokkah boeng incidence.

## **ANAKAPALLE**

Pokkah boeng incidence was monitored at weekly intervals from May to November, 2020. The disease incidence was initiated during second fortnight of May and increased till second fortnight of August, 2020. High incidence (18.52%) was recorded in the month of August and the disease incidence gradually reduced by second fortnight of September, 2020. It was observed that PB incidence started from second fortnight of May and

considerable disease incidence was noticed till second fortnight of September. However, high incidence of the disease was observed from second fortnight of June to first fortnight of September which was found to be influenced by number of rainy days and afternoon relative humidity. Considerable disease incidence could be seen at maximum and minimum temperatures of 32.3-33.8 and 24.3- 25.6, respectively. Morning and afternoon relative humidity ranged from 90-93% and 70-75% respectively during this period.

### **III. POKKAH BOENG MANAGEMENT SHAHJAHANPUR**

The efficacy of carbendazim fungicide for the management of PB was assessed with two susceptible varieties Co 0238 and CoS 08279. Study revealed that carbendazim managed the disease severity as compared to control. The treatment T<sub>3</sub> (Sett treatment with carbendazim + foliar spray with carbendazim) was found better in germination and most effective to manage PB during the monsoon season followed by T<sub>2</sub> in both the varieties. Highest germination 69% with low incidence of PB (16.14%) recorded in Co 0238 and 60% germination and 16.61 per cent PB incidence recorded in CoS 08279 (Table 40).

#### **KAPURTHALA**

For the management of PB disease an experiment was conducted on two susceptible varieties viz., Co 0238 and CoJ 85. Overnight soaking with carbendazim fungicide along with foliar spray at 15 days interval starting from May 15<sup>th</sup> (T<sub>3</sub>) was the most effective in checking the disease, which gave higher germination and low disease incidence of 6.25% and 5% per cent, respectively in Co 0238 and CoJ 85 in comparison to other treatments (Table 41).

#### **UCHANI**

For management of PB, experiment was conducted on varieties Co 238 and CoS 8436. Overnight cane soaking with carbendazim 0.1% and foliar sprays with carbendazim was found most effective in checking the pokkah boeng which gave lowest disease incidence of 5.6 per cent and 3.9 per cent in Co 0238 and Co H 119 respectively and also increase per cent germination (Table 42).

#### **PUSA**

Sett treatment with Carbendazim @ 0.1 %, and three foliar sprays with Carbendazim at 15 days gaps recorded highest germination (34.4% and 31.6%) and minimum disease incidence (7.6% and 8.6% in BO154 and CoSe 95422 varieties, respectively (Table 43).

#### **SEORAH**

The efficacy of Carbendazim fungicide for management of PB was tested on two susceptible varieties viz. Co 0238 and CoS 08279. The result revealed that fungicide Carbendazim was significantly better in increasing germination and to manage the disease in comparison to control. Overnight soaking along with foliar spray at 15<sup>th</sup> day's intervals starting from May 15<sup>th</sup> (T-3) was the most effective in checking the disease which give higher germination and low disease incidence of 10.4 and 11.2%, respectively in Co 0238 and CoS 08279 in comparison to follow by other treatments (Table 44).

#### **ANAKAPALLE**

Foliar spray of carbendazim -0.05% recorded low (7.94%) top rot incidence compared to control which was on par with sett treatment with carbendazim followed by foliar spray with carbendazim -0.05% a.i (8.79%). Sett treatment with carbendazim@0.1% recorded 15.16 per cent disease incidence. Highest incidence of pokkah boeng was recorded in control (24.97 per cent). However, there was no significant difference in all the treatments with respect to yield (Table 45).



## 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

### RESULTS OF THE CURRENT YEAR

#### PUNE

There is no significant improvement in germination, total height, cane yield and CCS. The maximum germination (55.17%) was recorded in T4 (Mancozeb @ 0.3%). The total height of cane was maximum (i.e. 294.11 cm in T3 (Tebuconazole @ 0.1 %). The mill able cane height was maximum in T3 (Tebuconazole @ 0.1 %). The cane yield was maximum in T3 (Tebuconazole @ 0.1 %) i.e. 141.11 t/ha, followed by T1 and T5 i.e. 137.30 and 132.61 t/ha, respectively. The CCS (t/ha.) was found maximum T3 (Tebuconazole @ 0.1 %) i.e. 14.58 t/ha. It is followed by T4. However, there is significant difference in treated and untreated plots. The maximum disease control (69.72 %) was obtained by T3 (Tebuconazole @ 0.1 %. 3 sprays at 15 days interval after initiation of disease). However, T-1 Propiconazole @ 0.1% for 3 sprays is also found beneficial to control the disease, effectively. Highest cost benefit ratio was obtained by T3 (Tebuconazole @ 0.1 %. 3 sprays at 15 days interval after initiation of disease). i.e. 1: 2.27. Amongst all the fungicides tested, fungicides *viz.*, Tebuconazole and Propiconazole are found effective to control brown spot disease up to 69.72 % and 61.66 % (Table 45).



## **PP 33:MANAGEMENT OF YELLOW LEAF THROUGH MERISTEM CULTURE**

Objective: To produce sugarcane seed cane free from yellow leaf disease through meristem culture.

Locations: Lucknow, Shahjahanpur, Uchani, Pantnagar, Coimbatore, Pune, Navsari, Anakapalle & Cuddalore

Year of Start : 2016-17

### **RESULTS OF THE PREVIOUS YEAR**

#### **ANAKAPALLE**

Seedlings of CoA 92081 raised through meristem tip culture were transplanted in the field and YL incidence was recorded in CoA 92081 and CoV 09356. Yellow leaf incidence was not observed in breeder seed crop of CoA 92081. However, 1-2% incidence of YL was recorded in the ratoon crop of variety, CoA 92081 and 5% disease incidence in CoV 09356. This may be attributed to the horizontal spread of ScYLV from infected plants to the fields transplanted with tissue culture seedlings through viruliferous aphids.

#### **CUDDALORE**

The mother culture of variety Co 86032 was collected from Sugarcane Breeding Institute, Coimbatore. The culture were used for shoot multiplication, rooting and 3500 hardened seedlings were transplanted in field and observed for disease incidence. There was no YL in breeder as well as foundation seed crop. The growth character of the tissue culture plants (Co 86032) was compared with the plants raised from two bud setts. The observation on the plant character revealed that the sugarcane raised from the tissue culture seedlings was superior to conventional two bud sett planting in all the plant growth characters. The tissue culture sugarcane was free from yellow leaf disease incidence, whereas the plants from the two budsetts has higher incidence of yellow leaf disease.

#### **PUNE**

The tissue culture plantlets of 2 varieties viz., Co86032 and VSI08005 were produced as per the standard procedure being followed at VSI, Pune. Properly hardened TC plantlets were transplanted in the field for the production of breeder seed and observed throughout the year for the natural incidence of YL. During the production of breeder seed, the crop remained free from YL. The sugarcane setts obtained from breeder seed plot were planted for production of foundation seed. The foundation seed crop was also found free from YL. However, the ratoon crop of breeder seed exhibited the symptoms of YL.

#### **COIMBATORE**

A field trial was conducted with healthy and disease-affected planting materials of three popular cvs Co 86032, Co 0238 and Co 11015 and assessed impact of YL on cane growth and yield under field conditions. Overall, in all the three varieties virus-infected materials exhibited a poor crop stand and lacked uniform crop stand as that of virus-free plants. The diseased plots recorded significantly reduced flowering especially in the cv Co 86032. Further, it was also observed that in the diseased plants, either flowering was delayed or the arrows along with short blade dried without complete emergence. Among the three varieties, the virus-free plants of cv Co 11015 picked up the disease and recorded severe YL as in the case of virus-infected plots. Virus-free plots recorded PDI of 48% as compared to 63% in virus-infected plots. However, in other two varieties healthy plots exhibited less than 3.0% disease as compared to 15.6% (Co 0238) and 52.1% (Co 86032) in the diseased plots.

In the plots YL severity grades were recorded and till December, upto severity grade 4 was recorded. In case of Co 86032, only 0.11% canes in the healthy plots were observed with grade 1 symptom and no further severe grades were observed. Whereas in the diseased plots 3.5, 4.2, 7.01 and 3.7% plants exhibited YL grades -1, -2, -3 and -4, respectively. In the cv Co 0238 the severity grades 1-2 were observed in limited number of plants. However, in case of Co 11015, 12.5% plants of healthy and 16.8% plants of the diseased plots expressed YL grade 3 and the respective figures for the grade 4 were 32.5 and 35.06. In the cv Co 86032, YL affected plots recorded 17.1% and 29.6% reductions in cane and juice yield, respectively at the time of harvest. Similarly, the cvs Co 0238 and Co 11015 recorded a loss of 29.5% and 14.2% in cane yield, respectively at the time of harvest. The cv Co 11015 recorded a loss of 26.4% in juice yield due to YL at the time of harvest, however, the cv Co 0238 did not such severe loss in juice yield.

## **RESULTS OF THE CURRENT YEAR SHAJAHANPUR**

The mother culture of variety CoS 08272 was used for shoot multiplication and after that only well-grown shoots with three to four leaves were transferred to rooting medium. Roots were developed within 15-25 days and 3600 plantlets with good root were transferred to polybags/planting trays for hardening. A total of 2280 hardened seedlings of CoS 08272 raised through meristem culture were transplanted in the field for the production of breeder seed and observed for YL disease incidence. The 95 percent of these seedlings survived after transplanting in field. The result revealed that the breeder seed raised by tissue culture was free from yellow leaf, while the conventional planting with two budded setts was found affected with yellow leaf.

## **UCHANI**

This experiment is being conducted in collaboration with CPB, Hisar. Seedlings of Co 0238 and CoH 160 varieties develop through tissue culture were raised and planted in six canal area and also distributed to farmers at RRS karnal.

## **ANAKAPALLE**

Yellow leaf incidence of 1-2% was noticed in breeder seed crop of CoA 14321. To test the impact of healthy seed setts obtained from tissue culture seedlings, seed setts of cultivar CoA 92081 obtained from tissue culture seedlings (TC) were planted in February, 2020. Shoot population at tillering, grand growth stage and harvest were recorded along with yield and disease incidence. The results revealed that the shoot population at formative, grand growth and harvest stage were high in plants rose from seed setts obtained from short crop of tissue culture seedlings. Similarly, yield is high in TC plants (68.33 t/ha) compared to CP (56.88 t/ha) plants. Mosaic incidence was found to be high in CP (7.2%) plants compared to TC plants (4.7%).

## **CUDDALORE**

The tissue culture seedlings of Co 86032 and CoC 25 were transplanted in the fields and observed for the yellow leaf incidence. The observation on the plant character revealed that the sugarcane raised from the tissue culture seedlings was superior to conventional two budded sett planting in all the plant growth characters observed in both the varieties Co 86032 and CoC 25. The tissue culture based sugarcane was free from YLD incidence whereas the plants from the two budded setts had higher incidences of YLD.

## **PUNE**

The tissue culture plantlets of 2 varieties *viz.*, Co 86032 and VSI 08005 were produced as per the standard procedure being followed at VSI, Pune. Properly hardened TC plantlets are transplanted in the field for the production of breeder seed and observed

throughout the year for the natural incidence of YL. During the production of breeder seed, the crop remains free from YL. The sugarcane setts obtained from breeder seed plot were planted for production of foundation seed. The foundation seed crop was found moderate disease reaction for YL. However, the ratoon crop of breeder seed was exhibited the symptoms of YL.

### **NAVSARI**

Out of 1500 tissue culture plantlets of Co 86032 produced, 500 plantlets were transplanted to farm field, 555 plantlets transplanted to farmers fields and mortality was found in 445 plantlets. The virus indexing of YL will start from 2021-22.

### **COIMBATORE**

Detailed studies were conducted on the impact of YL on cane growth and yield in three popular sugarcane varieties Co 86032, Co 0238 and Co 11015. Disease affected setts were planted along with disease-free setts (tissue culture derived) and different growth parameters were recorded during different growth stages. These varieties recorded a loss of 36.31, 19.35 and 30.21% in germination and 29.17, 17.14 and 13.08% in NMC and 81.06, 37.89 and 21.55% in flowering, respectively. The healthy plots recorded YL incidences of 11.1, 1.4 and 30.7% as against 62.7, 16.1 and 28.0% in the diseased plots, respectively in the three varieties. In the cv Co 0238, both the healthy and diseased plots exhibited YL severity in the grade of '1', respectively, the respective YL severity grades in the cv Co 86032 were '1' and '3' and 2 and 4 in Co 11015. The study revealed a rapid build-up YL in the cv Co 11015 followed by Co 86032. Further analyses on cane yield and juice parameters in the plots will be recorded at the time of harvest. Impact of YL on various morpho-physiological and yield parameters were recorded in virus-free, apparently healthy and symptomatic plants of the cv Co 86032 in a separate study. Significant declines in cane height, cane girth, single cane weight, leaf length, leaf width, number of green leaves, leaf weight, sheath weight, root length/cane, root girth, number of roots/ cane, root weight/cane, juice weight/cane, juice volume/cane, brix % and Pol % were observed in YL affected canes compared to the apparently healthy and healthy canes.





## PP 34: EFFICIENT DELIVERY OF FUNGICIDES AND OTHER AGRO INPUTS TO MANAGE MAJOR FUNGAL DISEASES IN SUGARCANE

**Objective** : To demonstrate efficient delivery of plant protection chemicals or agro inputs/ microbes through mechanized delivery for effective disease management and increased settling vigour.

**Year of Start** : 2020-21

**Locations** : Shajahanpur, Seorahi, Anakkapalle, Cuddalore, Navsari, Coimbatore

**Technical programme:**

### **I. Disease management trials**

#### **A. Management of Red rot**

T1- Sett treatment in STD with Fungicide

T2- Sett treatment in STD with Fungicide + Soil drenching by 45th& 90th day

T3- Soil drenching by 45th& 90th day

T4- Infected setts

T5- Healthy setts

Fungicide: Thiophanate methyl (0.1%)

Vacuum level: 200 mmHg

Duration: Vacuum buildup – 5min; Retention – 15min; Air release: 5-10min

#### **B. Management of Smut**

T1 - Sett treatment in STD with fungicide

T2 - Sett treatment in STD with fungicide + Spray by 45th& 90th days

T3 - Spray at 45th& 90th day after planting

T4 - Setts from infected clump

T5 - Healthy setts

Fungicide: Propiconazole (Tilt- 25Ec) – 0.4ml/L (100 ppm)

Vacuum level: 200 mmHg

Duration: Vacuum buildup – 5min; Retention – 15min; Air release: 5-10min

#### **C. Management of Wilt**

T1 - Sett treatment in STD with fungicide

T2 - Sett treatment in STD with fungicide + Soil drenching at 45th and 90th days

T3 - Soil drenching at 45th and 90th days after planting

T4 - Setts from infected clump

T5 - Healthy setts

Fungicide: For sett treatment - Propiconazole – 0.4 ml/L (100 ppm); For Soil drenching – Carbendazim– 1.0g/L

Vacuum level: 200 mmHg

Duration: Vacuum buildup – 5min; Retention – 15min; Air release: 5-10min

### **II. Delivery of agro inputs to improve settling vigour in nurseries**

Single bud setts will be treated with micro nutrients, urea, fungicide and insecticide to produce healthy settlings with improved vigour.

Nutrient mixture: Urea– 0.5g/L + ZnSO<sub>4</sub> – 0.5g/L + FeSO<sub>4</sub> – 0.5g/L + Fungicide:

Carbendazim –0.5 g/L + Insecticide: Fipronil – 0.5 ml/L

Vacuum level: 150 mmHg

Duration: Vacuum buildup – 5min; retention – 15min; Air release: 5-10min

## **RESULTS OF THE CURRENT YEAR**

### **A. Management of Red rot SHAJAHANPUR**

Mechanized sett treatment with fungicides for red rot management was evaluated in the field trial of SRI, Shahjahanpur. The trial for the management of primary infection of red rot was conducted by using sett treatment with fungicides and sett treatment device following the recommended treatments. The primary incidence of red rot was observed only in T<sub>3</sub> (Infected plot) in the month May and June. The secondary incidence of red rot was assessed in almost all the treatments, while maximum incidence was recorded in T<sub>3</sub> (Infected plot) followed by T<sub>1</sub>, T<sub>2</sub> and T<sub>4</sub> treatment. Hence, the treatment T<sub>2</sub> - Sett treatment in STD with fungicide + Soil drenching by 45<sup>th</sup> & 90<sup>th</sup> day was most effective against red rot than T<sub>1</sub> and T<sub>3</sub>. The treatment T<sub>2</sub> was expressed almost similar crop vigour and crop stand to T<sub>4</sub> treatment (Healthy setts). The result revealed that sett treatment with device along with drenching at 45<sup>th</sup> and 90<sup>th</sup> days inhibits buildup of red rot in field conditions (Table 46).

### **SEORAH**

The efficacy of Thiophanate methyl (Hexa top) fungicide for management of red rot was tested on two susceptible varieties *viz.* CoJ 64 and Co 0238. The result revealed that fungicide Thiophanate methyl was significantly better in increasing germination and to manage the disease in comparison to healthy setts. Sett treatment device (STD) with fungicide (T<sub>2</sub>) was found to be the most effective in checking the disease which gives higher germination and very low disease incidence compared to other treatments (Table 47).

### **ANAKKAPALLE**

In red rot management trial, sett treatment in STD with Thiophanate methyl (0.1%) + Soil drenching with Thiophanate methyl (0.1%) by 45<sup>th</sup> & 90<sup>th</sup> day was effective in reducing red rot incidence (4.75%) in susceptible cultivar, 81V48, compared to control (17%) which was on par with the treatment, soil drenching with Thiophanate methyl by 45<sup>th</sup> & 90<sup>th</sup> day (6%) after planting. Red rot incidence was 8.5% in T<sub>1</sub>, i.e., sett treatment in STD with Thiophanate methyl (0.1%). In healthy check, disease incidence was 4.5 per cent indicating natural incidence of the disease (Table 48).

### **CUDDALORE**

Higher germination (88.6%) was recorded in sett treatment with fungicides using sugarcane sett treatment device. Among the treatments, T<sub>2</sub>-Sett treatment in STD with thiophanate methyl 70WP 0.1% + soil drenching by 45<sup>th</sup> & 90<sup>th</sup> day recorded the red rot incidence of 4.8 % whereas in control Treatment (T<sub>3</sub>) maximum red rot incidence of 14.8 % was recorded. Maximum yield of 106.5 t ha<sup>-1</sup> was recorded in the healthy setts without addition of red rot inoculum (Table 49).

### **NAVSARI**

During the year 2020-21 our Research Station has purchased the sett treatment device in the month of June-2020 and the installation was done on 12/10/2020. As per new technical programme of sugarcane pathology 2021-22, the trial was planted by giving setts treatment in sett treatment device.

### **COIMBATORE**

Field trials were laid out at Coimbatore to evaluate mechanized means of sett treatment with fungicides and bioagents for the management of red rot and smut with disease susceptible varieties CoC 671 and Co 97009, respectively. Separate treatments of *Trichoderma harzianum* and *Paenibacillus alvei*, their combination, fungicide alone and its combination with *P. alvei* were maintained in the trials with suitable healthy and infected/inoculated controls. For fungicidal treatment, thiophanate methyl – 1000ppm was used against red rot and propiconazole – 100 ppm against smut. In both the experiments sett

treatment with both the biocontrol agents and fungicide individually or in combination were found to be not deleterious and were effective in reducing the disease incidence, improving plant growth and yield attributes. However there was no significant difference among treatments due to lower disease incidence in both the experiments. Another field experiment on red rot management with above treatments indicated that treating setts in the Sett Treatment Device (STD) with the combination of thiophanate methyl and *P. alvei* was found to be significantly superior followed by combination of *P. alvei* and *T. harzianum* in protecting the setts from soil borne inoculum and improving plant survival.

## **B. Management of Smut**

### **SEORAH**

The fungicide Propiconazole (Tilt-25Ec) was tested for its efficacy against smut on two susceptible varieties viz. Co 1158 and Co 0238. The result revealed that fungicide Propiconazole was significantly better increasing germination and to manage the disease in comparison to healthy setts. Sett treatment device (STD) with fungicide (100ppm) + Spray by 45<sup>th</sup> & 90<sup>th</sup> day (T<sub>2</sub>) was found to be the most effecting in checking the disease which gives higher germination and low disease incidence compared to other treatments (Table 50).

### **CUDDALORE**

Sett treatment in STD with propiconazole (Tilt-25Ec) @ 0.4ml/ lit (100 ppm) + Spray by 45<sup>th</sup> and 90<sup>th</sup> day (T<sub>2</sub>) recorded the smut incidence of 6.6 % whereas untreated setts from infected clump (T<sub>3</sub>) recorded maximum smut incidence of 28.4 %. Maximum yield of 110.3 t ha<sup>-1</sup> was recorded in the healthy setts (T<sub>4</sub>) which is on par with treatment in STD with propiconazole (25 EC) 0.4ml/ lit + spray by 45<sup>th</sup> and 90<sup>th</sup> day (Table 51).

## **C. Management of Wilt**

### **SEORAH**

The efficacy of Propiconazole with sett treatment device and soil drenching Carbendazim fungicide for management of wilt was tested on susceptible variety viz. Co 0238 and the result revealed that fungicide Propiconazole with Carbendazim were significantly better increasing germination and to manage the disease in comparison to control. T<sub>2</sub>: Sett treatment in STD with fungicide + Soil drenching at 45<sup>th</sup> and 90<sup>th</sup> days was the most effecting in checking the disease which give higher germination and very low disease incidence compared to other treatments (Table 52).

### **ANAKKAPALLE**

In wilt management trial, Sett treatment in STD with Propiconazole (0.4ml/L) + Soil drenching with carbendazim @ 0.1% by 45<sup>th</sup> & 90<sup>th</sup> day recorded less wilt incidence (3.57%) compared to control (15.72%) and is on par with the treatments, T<sub>3</sub>-soil drenching with carbendazim @ 0.1% by 45<sup>th</sup> & 90<sup>th</sup> day (4.12%) and T<sub>1</sub>-Sett treatment in STD with Propiconazole (0.4ml/L). Treatment of single noded setts with STD using mixture of Urea – 0.5g /L + ZnSO<sub>4</sub> – 0.5g/L + FeSO<sub>4</sub> – 0.5g/L + carbendazim-0.5g/L + Fipronil -0.5ml/L has enhanced sett germination (13%) and seedling vigour in sugarcane variety, 2009A107, compared to untreated setts (Table 53).

## **II. Delivery of agro inputs to improve settling vigour in nurseries**

### **ANAKKAPALLE**

Treatment of single noded setts with STD using mixture of Urea – 0.5g /L + ZnSO<sub>4</sub> – 0.5g/L + FeSO<sub>4</sub> – 0.5g/L + carbendazim-0.5g/L + Fipronil -0.5ml/L has enhanced sett germination (approx.13%) and seedling vigour in sugarcane variety 2009A107 compared to untreated setts (Table 54).



**Table 1. Pathogenic behavior of *C. falcatum* pathotypes on host differentials - Lucknow**

Sl. No.	Pathotype /Isolates	Source	Reaction on host differentials																		
			Co 419	Co 975	Co 997	Co 1148	Co 62399	Co 7717	CoC 671	CoJ 64	CoS 767	CoS 8436	BO 91	Co 86002	Co 86032	Co 7805	CoV 92102	CoSe 95422	Baragua	Khakai	SES 594
1	CF07	CoJ 64	I	R	S	S	R	R	I	S	R	R	R	I	R	R	S	I	R	S	R
2	CF08	CoJ 64	I	S	S	S	S	S	S	S	I	R	R	I	R	R	S	I	R	S	R
3	CF09	CoS 767	I	R	I	S	R	R	I	S	S	R	R	I	R	R	S	R	R	S	R
4	IR-184	Co 0238	I	S	R	R	S	I	S	I	R	R	I	S	I	I	S	I	I	I	R
5	IR-185	Co 0238	I	S	R	R	S	I	S	I	R	R	I	S	R	I	S	I	R	I	R
6	IR-186	Co 0238	I	S	R	R	S	I	S	I	R	R	R	S	I	I	S	I	I	I	R
7	IR-187	Co 0238	I	S	R	R	S	I	S	I	R	R	I	S	I	S	S	I	I	I	R
8	IR-188	Co 0238	I	S	R	R	S	I	S	I	R	R	I	S	R	I	S	I	R	I	R
9	IR-189	Co 0238	I	S	R	R	S	I	S	I	R	R	I	S	I	I	S	I	I	I	R
10	IR-190	Co 0238	I	S	R	R	S	I	S	I	R	R	I	S	R	I	S	I	I	I	R
11	IR-191	CoS 8436	S	R	R	R	I	I	S	S	R	S	R	I	R	R	S	I	R	S	R
12	IR-192	CoS 8436	S	R	R	R	I	I	S	S	R	S	R	I	R	R	S	I	R	S	R
13	IR-193	Co 0238	I	S	R	R	S	I	S	I	R	R	I	S	R	I	S	I	I	S	R
14	IR-194	CoLk 8102	R	S	R	R	I	S	S	S	I	R	R	I	I	I	I	S	R	S	R

Table 2. Pathogenic behavior of *C. falcatum* pathotypes on host differentials - Shahjahanpur

Sl. No.	Pathotype/ Isolates	Source	Reaction on host differentials																			
			Co 419	Co 975	Co 997	Co 1148	Co 7717	Co 62399	CoC 671	CoJ 64	CoS 767	CoS 8436	BO 91	Co 86002	Co 86032	Co 7805	CoV 92102	CoSe 95422	Baragua	Khakai	SES 594	Co 0238
1	CF01	Co 1148	S	R	X	S	R	X	X	S	R	R	R	X	R	X	R	R	S	R	R	
2	CF02	Co 7717	R	R	X	S	R	R	S	S	X	R	R	X	R	R	X	R	R	S	R	R
3	CF03	CoJ 64	X	R	X	R	R	R	S	S	R	R	R	R	X	R	R	R	S	R	R	
4	CF07	CoJ 64	R	R	S	X	R	R	X	S	S	R	R	S	R	X	X	R	R	S	R	R
5	CF08	CoJ 64	R	R	S	X	R	R	R	S	S	R	R	S	R	X	X	R	R	S	R	R
6	CF09	CoS 767	S	R	S	R	R	R	X	S	S	R	R	S	R	X	X	R	R	S	R	R
7	CF11	CoJ 64	S	S	X	S	S	S	S	S	S	R	R	X	S	X	X	R	R	S	R	R
8	Cf8436	CoS 8436	S	X	S	X	X	X	S	S	R	S	R	R	S	X	X	R	R	S	R	R
9	Cf07250	CoS 07250	S	R	S	S	X	R	S	S	X	R	S	X	X	S	X	X	R	S	R	R
10	Cf97264	CoS 97264	R	R	S	X	R	R	X	X	X	R	X	S	R	R	R	X	R	S	R	R
11	Cf05191	R 1941	R	X	S	R	R	S	S	R	R	R	R	X	S	S	S	R	R	X	R	S
12	Cf05191	R 2005	R	X	S	R	X	S	S	R	R	R	R	X	S	S	X	R	R	X	R	S
13	Cf08279	R 1945	R	X	X	R	X	S	S	R	R	R	R	R	S	R	S	R	R	S	R	S
14	Cf 0238	IISR	R	X	R	R	R	S	S	R	R	R	R	R	S	S	S	R	R	X	R	S
15	Cf0238	R 1705	R	R	S	R	R	S	S	R	R	R	R	R	S	X	S	R	R	X	R	S
16	Cf0238	R 1924	R	R	R	R	R	S	S	R	R	R	R	R	S	R	R	R	R	R	R	S
17	Cf0238	R 1711	R	R	X	R	R	S	S	R	R	R	R	R	S	R	R	R	R	X	R	S
18	Cf0238	R 2001	R	S	R	R	R	S	S	R	R	R	R	R	S	X	R	R	R	R	R	S
19	Cf0238	R 2003	R	S	X	R	R	S	S	R	R	R	R	R	S	R	S	R	R	X	R	S
20	Cf0238	R 1938	R	S	R	R	R	S	S	R	R	R	R	R	S	R	X	R	R	X	R	S
21	Cf0238	R 1707	R	S	R	R	R	S	S	R	R	R	R	R	S	R	R	R	R	X	R	S

**Table 3. Pathogenic behavior of *C. falcatum* pathotypes on host differentials- Kapurthala**

Sl. No	Pathotype/ Isolates	Source	Reaction on host differentials																			
			Co 419	Co 975	Co 997	Co 1148	Co 7717	Co 62399	CoC 671	CoJ 64	CoS 767	CoS 8436	BO 91	Baragua	Khakai	SES 594	Co 86002	Co 7805	Co 86032	CoV 92102	CoSe 95422	Co 0238
1	CF01	Co 1148	S	X	S	S	X	X	S	X	R	R	R	R	S	R	R	R	R	X	R	R
2	CF02	Co 7717	X	R	S	S	S	S	X	S	R	R	R	R	S	R	R	R	R	X	R	R
3	CF03	CoJ 64	X	R	S	X	X	R	S	S	R	R	R	R	S	R	R	X	X	R	R	R
4	CF07	CoJ 64	X	R	S	X	R	R	S	S	X	R	R	R	S	R	X	R	X	R	R	R
5	CF08	CoJ 84	S	S	S	S	X	S	S	S	X	R	R	R	S	R	X	S	R	R	R	R
6	CF09	CoS 767	X	X	X	S	R	R	S	S	S	R	R	R	S	R	X	X	R	R	R	R
7	Cf0238	Co 0238	X	X	R	X	X	S	S	X	R	R	R	R	S	R	X	S	S	X	R	S
8	Cf64	CoJ 64	S	S	S	S	X	S	S	S	S	R	R	R	S	R	X	X	R	R	R	R
9	Cf88	CoJ 88	S	X	S	X	X	S	S	S	X	R	R	R	S	R	R	X	R	R	R	R
10	Cf85-1	CoJ 85	S	X	S	S	R	S	S	S	S	R	R	R	S	R	R	S	R	R	R	R
11	Cf85-2	CoJ 85	S	S	S	S	X	S	S	S	S	R	R	R	S	R	X	X	R	R	R	R
12	Cf85-3	CoJ 85	S	S	X	S	X	S	S	S	X	R	R	R	S	R	X	X	R	R	R	R
13	Cf89003-1	Co 89003	X	X	X	S	X	S	X	S	X	R	R	R	S	R	R	X	R	R	R	R
14	Cf89003-2	Co 89003	X	X	S	S	X	S	X	S	R	R	R	R	S	R	R	X	R	R	R	R
15	Cf89003-3	Co 89003	S	S	S	S	X	S	S	S	X	R	R	X	S	R	X	S	R	R	R	R
16	Cf89003-4	Co 89003	S	S	S	X	X	S	S	S	X	R	R	R	S	R	R	X	X	R	R	R



**Table 4. Pathogenic behavior of *C. falcatum* pathotypes on host differentials– Uchani**

Sl. No	Pathotypes/ Isolates	Reaction on host differentials																				
		Source	Co 419	Co 975	Co 997	Co 1148	Co 7717	Co 62399	CoC 671	CoJ 64	CoS 767	CoS 8436	BO 91	Baragua	Khakai	SES 594	CoSe 95422	Co 7805	Co 86002	CoV 92102	Co 86032	Co 0238
1	CF01	Co 1148	S	R	S	S	S	S	S	S	R	R	R	R	S	R	R	I	R	I	R	R
2	CF02	CoJ 7717	I	R	S	R	S	S	S	R	R	R	R	R	S	R	R	R	R	R	R	R
3	CF03	CoJ 64	R	R	S	R	R	R	S	S	R	R	R	R	S	R	R	R	I	R	R	R
4	CF07	CoJ 64	R	R	S	R	S	R	R	S	S	R	I	R	S	R	R	R	S	R	R	R
5	CF08	CoJ 64	S	R	S	S	S	R	S	S	S	R	R	R	S	R	R	S	S	R	R	R
6	CF09	CoS 767	S	R	S	S	I	S	S	S	S	R	I	R	S	R	R	R	S	R	R	S
7	CF11	CoJ 64	S	S	S	S	S	S	S	S	I	R	R	R	S	R	R	I	S	I	I	R
8	XXXXIII	CoJ 85	S	S	S	S	I	S	S	S	R	R	R	R	S	R	R	S	I	R	R	R
9	RR XXXXIV	CoJ 85	S	S	S	S	I	S	S	S	R	R	R	R	S	R	R	S	R	R	R	R
10	RR XXXXV	Co 89003	I	S	S	R	S	S	S	S	I	R	R	R	R	R	I	S	R	R	R	R
11	RR XXXXVI	Co 89003	S	I	S	R	I	S	S	S	R	S	R	R	S	R	R	S	I	R	R	R
12	RR XXXXVII	Co 89003	S	R	S	S	R	S	S	S	S	R	R	S	S	R	R	R	R	S	R	S
13	RR XXXXVIII	CoS 8436	S	S	S	R	S	S	S	S	R	S	R	R	S	R	R	S	I	R	R	S
14	RR XXXXIX	CoS 8436	S	S	S	I	S	S	S	S	R	R	R	R	S	R	R	S	I	R	R	S
15	RR XXXXX	Co 0238 L	S	R	S	R	R	S	S	I	R	R	R	R	S	R	R	R	S	R	R	S
16	RR XXXXXI	Co 0238 H	S	R	S	S	S	S	S	I	R	R	R	I	S	R	R	R	S	S	S	S

Table 5. Pathogenic behavior of *C. falcatum* pathotypes on host differentials- Karnal

Sl. No.	Pathotype /isolate	Source	Reaction on host differentials																				
			Co 419	Co 975	Co 997	Co 1148	Co 7717	Co 7805	Co 62399	Co 89003	Co 86002	Co 86032	CoC 671	CoJ 64	CoS 767	CoS 8436	CoV 92102	CoSe 95422	BO 91	Baragua	Khakai	SES 594	Co 0238
1	CF01	Co 1148	S	R	S	S	S	I	S	R	S	R	S	S	I	R	S	I	I	R	R	R	S
2	CF02	Co 7717	S	R	S	S	S	R	S	I	S	I	S	S	R	R	R	R	I	R	I	R	I
3	CF03	CoJ 64	R	R	S	S	R	R	R	R	S	R	S	S	R	R	R	R	R	R	R	R	R
4	CF07	CoJ 64	R	R	S	R	R	S	I	R	S	R	S	S	R	R	S	R	R	R	R	R	R
5	CF08	CoJ 64	R	R	S	S	R	S	S	R	S	R	I	S	R	R	I	R	R	R	R	R	R
6	CF09	CoS 767	R	R	I	I	I	S	R	R	R	R	S	S	R	R	R	R	R	R	I	R	R
7	CF11	CoJ 64	S	S	S	R	S	I	S	S	S	S	S	S	R	R	I	I	I	R	I	R	R
8	Cf0238 (LucKnow)	Co 0238	R	S	S	R	R	S	S	R	I	S	S	R	R	R	R	R	R	R	R	R	S
9	Cf0238 (Afjalgarh)	Co 0238	R	I	S	R	I	R	S	I	R	S	S	R	R	R	R	R	I	R	R	R	S
10	Cf0238 (Ajrapur)	Co 0238	R	S	S	R	I	S	S	I	S	S	S	I	R	R	R	R	I	R	R	R	S
11	Cf0238 (Faridpur)	Co 0238	R	R	S	R	R	R	S	R	R	S	S	R	R	R	I	R	R	R	R	R	S
12	Cf89003 (Karnal)	Co 89003	S	S	S	R	R	S	S	R	R	S	S	S	R	S	R	R	R	R	S	R	S
13	Cf8436 (Karnal)	CoS 8436	S	I	R	R	R	S	I	R	S	R	S	S	R	S	R	R	R	R	I	R	S
14	CfLk94184 (UP)	CoLk 94184	I	R	R	I	R	S	S	R	S	R	S	R	R	R	R	R	R	R	R	R	I

Table 6. Pathogenic behavior of *C. falcatum* pathotypes on host differentials - Seorahi

Sl. No.	Pathotype /Isolates	Source	Reaction of host differentials																			
			Co 419	Co 975	Co 997	Co 1148	Co 7717	Co 62399	CoC 671	CoJ 64	CoS 767	CoS 8436	BO 91	Baragua	Khakai	SES 594	CoSe 95422	Co 86002	CoV 92102	Co 86032	Co 7805	Co 0238
1	CF01	Co 1148	S	R	I	S	R	I	I	S	R	R	R	R	S	R	R	R	I	R	R	R
2	CF02	Co 7717	R	R	S	S	R	R	S	S	I	R	R	R	I	R	R	R	R	R	R	R
3	CF03	CoJ 64	I	R	S	R	I	R	S	S	I	R	R	R	I	R	R	R	R	R	R	R
4	CF07	CoJ 64	R	R	S	S	R	R	I	S	S	R	R	R	S	R	R	I	I	S	R	R
5	CF08	CoJ 64	R	R	S	S	S	S	S	S	S	R	R	R	S	R	R	S	R	S	I	R
6	CF09	CoS 767	S	R	S	R	R	R	I	S	S	R	R	R	I	R	R	S	I	R	I	R
7	CF11	CoJ 64	S	S	S	I	S	I	S	S	S	R	R	R	S	R	R	S	S	S	I	R
8	R1702Seo	CoS 8436	R	I	I	S	I	I	R	I	I	S	R	R	I	R	R	S	S	S	I	R
9	R1801Seo	Co 0238	I	S	R	R	I	S	S	I	R	R	R	I	R	R	R	S	S	R	I	S
10	R1802Seo	Co 0238	I	S	R	R	I	S	S	I	R	R	R	R	I	R	R	S	S	R	I	S
11	R1803Seo	Co 0238	I	S	R	R	I	S	S	I	R	R	R	I	R	R	R	S	S	R	I	S
12	R1904Seo	Co 0238	I	S	R	R	I	S	S	I	R	R	R	R	R	R	R	S	S	R	I	S
13	R1905Seo	Co 0238	I	S	R	R	I	S	S	I	R	R	R	I	R	R	R	S	S	R	I	S

**Table 7. Pathogenic behavior of *C. falcatum* pathotypes on host differentials– Anakapalle**

Sl. No	Pathotype/ Isolates	Source	Reaction of host differentials																		
			Co 419	Co 975	Co 997	Co 1148	Co 7717	Co 62399	CoC 671	CoJ 64	CoS 767	CoS 8436	BO 91	Baragua	Kakhai	SES 594	Co 7805	Co 86002	Co 86032	CoV 92102	CoSe 95422
1.	CF06	CoC 671	S	R	R	R	R	R	S	R	R	R	R	R	S	R	S	R	R	R	R
2.	CfA261 - Perumallapalle	85A 261	S	R	R	R	R	R	S	R	R	R	R	R	X	R	R	R	R	R	R
3.	Cf62175 -Govada	Co 62175	S	R	R	R	R	R	S	R	R	R	R	R	X	R	S	R	R	R	R
4.	Cf62175 - Gouripatnam	Co 62175	S	R	R	R	R	R	S	R	R	R	R	R	S	R	S	R	R	R	R
5.	Cf62175 - Juttada	Co 62175	S	R	R	R	R	R	S	R	R	R	R	R	X	R	S	R	R	R	R
6.	CfV89101 - Munagapaka	CoV 89101	S	R	R	R	R	R	S	R	R	R	R	R	X	R	S	R	X	R	R
7.	CfV89101 - Dibbapalem	CoV 89101	S	R	R	R	R	R	S	R	R	R	R	R	X	R	S	R	X	R	R
8.	CfV297- Chinagottigallu	93V297	S	R	R	R	R	R	S	R	R	R	R	R	X	R	S	R	R	R	R
9.	CfA53 – Pichatoor	99A 53	X	R	R	R	R	R	X	R	R	R	R	R	X	R	S	R	X	R	R
10.	CfT275 - Perumallapalle	2017T 275	X	R	R	R	R	R	S	R	R	R	R	R	X	R	S	R	X	R	R

**Table 8. Pathogenic behavior of *C. falcatum* pathotypes on host differentials– Cuddalore**

Sl No	Pathotype/ Isolates	Source	Reaction of host differentials																		
			Co 419	Co 975	Co 997	Co 1148	Co 7717	Co 62399	CoC 671	CoJ 64	CoS 767	CoS 8436	BO 91	Baragua	Khakai	SES 594	CoSe 95422	Co 7805	Co 86002	CoV 92102	Co 86032
1	CF06	CoC 671	S	S	S	S	X	X	S	X	R	R	R	R	X	R	R	R	R	X	X
2	CF12	Co 94012	S	S	X	S	X	S	S	X	X	R	R	R	X	R	R	X	X	X	X
3	Cf23 Sogathur	CoC 23	S	X	S	X	X	R	S	X	R	R	R	R	R	R	R	X	R	R	X
4	Cf24 Natham	CoC 24	S	X	S	S	S	X	S	S	X	R	R	R	X	R	R	X	X	X	X
5	Cf24 Keelkuppam	CoC 24	S	X	S	X	S	X	S	X	R	R	X	R	X	R	R	X	R	X	S
6	Cf09356 T.Edayar	CoV 09356	S	X	S	S	S	R	S	X	R	R	R	R	X	R	R	R	X	X	X
7	Cf6 T.Edapalayam	CoSi (SC)6	X	X	X	X	X	R	S	X	X	R	R	R	X	R	R	X	X	R	X
8	Cf06022 Arumkurikhai	Co 06022	X	R	X	X	X	R	S	X	R	R	R	R	R	R	R	R	R	X	X
9	Cf24 Pillayarkuppam	CoC 24	S	X	S	S	X	X	S	X	R	R	X	R	X	R	R	S	R	X	S
10	Cf09356Kanthalavadi	CoV 09356	X	X	S	X	X	X	S	S	X	R	R	R	R	R	R	R	X	X	X
11	Cf6 Sithanur	CoSi (SC)6	S	S	X	X	X	R	S	X	R	R	R	R	X	R	R	X	R	X	X

Table 9. Pathogenic behavior of *C. falcatum* pathotypes on host differentials–Navsari

Sl. No.	Pathotype /Isolates	Source	Reaction on host differentials																		
			Co 419	Co 975	Co 997	Co 1148	Co 7717	Co 62399	CoC 671	CoJ 64	CoS 767	CoS 8436	BO 91	Baragua	Khakai	SES 594	CoV 92102	Co 7805	Co 86002	CoSe 95422	Co 86032
1.	CF06	CoC 671	S	R	I	I	S	I	S	R	I	R	I	R	I	R	I	I	S	I	S
2.	CF12	Co 94012	S	I	I	I	I	I	S	R	I	R	I	R	I	R	R	I	R	I	I
3.	Cf0265	CoM 0265	S	S	I	I	I	I	S	R	I	R	R	R	I	R	R	I	I	I	I
4.	Cf97009 (Mahuva)	Co 97009	I	I	I	I	I	I	S	R	I	R	R	R	I	R	R	I	S	I	S
5.	Cf 671 (Gandevi)	CoC 671	S	I	I	I	I	I	S	R	I	R	R	R	I	R	I	I	S	I	S
6.	Cf97009 (Gandevi)	Co 97009	I	I	I	I	I	I	S	R	I	R	R	R	I	R	R	I	S	I	S
7.	Cf86002 (Gandevi)	Co 86002	I	I	I	I	I	R	S	R	I	R	R	R	I	R	I	I	S	I	S
8.	Cf86032 (Chalthan)	Co 86032	I	I	I	I	I	R	S	R	I	R	R	R	I	R	I	I	S	I	S
9.	Cf0265 (Shayan)	CoM 0265	S	S	I	I	I	I	S	R	I	R	R	R	I	R	R	I	I	I	I

**Table 10. Pathogenic behavior of *C. falcatum* pathotypes on host differentials - Coimbatore**

Sl. No	Pathotype/ Isolates	Source	Reaction on host differentials																		
			Co 419	Co 975	Co 997	Co 1148	Co 7717	Co 62399	CoC 671	CoJ 64	CoS 767	CoS 8436	BO 91	Baragua	Khakai	SES594	CoSe 95422	Co 7805	Co 86002	CoV 92102	Co 86032
1	CF06	CoC 671	I	I	S	R	R	R	S	I	R	R	R	R	I	R	R	R	R	R	R
2	CF12	Co 94012	I	I	S	R	R	R	S	I	R	R	R	R	I	R	R	R	R	R	R
3	Cfc24 Thandavarayanpatti	CoC 24	R	R	R	R	R	R	S	R	R	R	R	I	R	R	R	R	R	R	R
4	Cf06022 Pennadam	Co 06022	I	I	R	R	R	R	S	R	R	R	R	R	R	R	R	I	R	R	R
5	CfM0265 RK pet	CoM 0265	R	R	R	R	R	I	I	R	R	R	R	R	R	R	R	R	R	R	R
6	Cf86027 Vellalapalayam	Co 86027	I	I	R	R	R	R	S	I	R	R	R	R	I	R	R	R	R	R	R
7	Cfc24 Mandagapattu	CoC 24	R	I	I	I	I	R	S	R	R	R	R	R	I	R	R	R	I	R	R
8	Cf86032 NKM	Co 86032	I	R	I	R	I	R	S	I	R	R	R	R	I	R	R	R	I	R	R
9	CfM0265 Palapatti	CoM 0265	I	I	R	R	R	R	S	I	R	R	R	R	I	R	R	I	R	R	R
10	Cf86027 Amaravathi	Co 86027	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	R	R

Table 11. Pathogenic behavior of *C. falcatum* pathotypes on host differentials -Thiruvalla

Sl. No	Pathotype/ Isolates	Source	Reaction of host differentials																			
			Co 419	Co 975	Co 997	Co 1148	Co 7717	Co 62399	CoC 671	CoJ 64	CoS 767	CoS 8436	BO 91	Baragua	Kakhai	SES 594	CoSc 95422	CoV 92102	Co 7805	Co 86002	Co 86032	Co 0238
1	CF06	CoC 671	R	R	S	R	R	I	S	I	R	R	I	R	I	R	I	I	I	I	I	R
2	CF12	Co 94012	I	R	I	R	R	R	S	I	R	R	I	R	I	R	I	I	I	I	I	R
3	Cfc24 Thandavarayanpatti	CoC 24	I	R	I	R	I	R	S	I	I	I	I	I	R	R	I	R	I	R	I	I
4	Cf06022 Pennadam	Co 06022	I	R	S	I	R	R	S	S	R	I	I	R	S	R	I	R	R	I	I	I
5	CfM0265 RK pet	CoM 0265	I	I	S	I	I	S	S	S	I	I	I	I	S	R	S	I	I	R	I	R
6	Cf86027 Vellalalayam	Co 86027	I	I	S	R	R	R	S	S	R	I	I	R	I	R	I	I	I	I	R	R
7	Cfc24 Mandagapattu	CoC 24	S	I	S	I	I	S	S	I	I	I	I	I	S	R	I	S	S	I	I	R
8	Cf86032 NKM	Co 86032	I	I	S	I	I	I	S	I	R	I	I	I	I	R	R	R	I	R	I	R
9	CfM0265 Palapatti	CoM 0265	I	I	R	I	R	R	S	I	R	I	I	R	I	R	R	R	I	I	R	I
10	Cf86027 Amaravathi	Co 86027	I	I	S	R	R	I	S	I	R	R	I	R	I	R	R	I	I	I	R	R



**Table 12. Evaluation of sugarcane genotypes for red rot, smut, wilt & YLD resistance- Lucknow**

Sl. No.	Genotype	Red Rot				Smut	Wilt	YLD
		Plug Method		Nodal Method				
		CF08	CF09	CF08	CF09			
<b>Initial Varietal Trial (Early)</b>								
1	CoLk 17201	MR	MR	R	R	R	-	-
2	CoLk 17202	MR	MR	R	R	MS	W	Y
3	CoLk 17203	MR	MR	R	R	S		-
4	CoPant17221	S	S	S	S	MS	-	-
5	CoPb 17211	MR	MR	R	R	R	W	-
6	CoPb 17212	MR	MR	R	R	R	-	-
7	CoS 17231	MR	MR	R	R	R	-	-
<b>Initial Varietal Trial (Mid Late)</b>								
1	Co 17018	MR	MR	R	R	S	W	-
2	CoH 17261	MR	MR	R	R	R	-	-
3	CoH 17262	S	S	S	S	R	-	-
4	CoLk 17204	MR	MR	R	R	R	-	-
5	CoLk 17205	MR	MR	R	R	R	-	-
6	CoPant 17223	MR	MR	R	R	MR	W	Y
7	CoPant 17224	HS	HS	S	S	MS	-	Y
8	CoPb 17213	S	S	S	S	MS	-	-
9	CoPb 17214	MS	MS	R	R	MR	W	-
10	CoPb 17215	MR	MR	R	R	R	-	-
11	CoS 17233	MR	MR	R	R	R	W	Y
12	CoS 17234	MR	MR	R	R	R	W	-
13	CoS 17235	MR	MR	R	R	MR	-	-
14	CoS 17236	MR	MR	R	R	R	-	-
15	CoS 17237	MR	MR	R	R	R	W	-
<b>Advance Varietal Trial (I-Plant, Early)</b>								
1	Co 15025	MR	MR	R	R	R	W	-
2	Co 16029	MR	MR	R	R	MS	-	-
3	CoLk 14201	MR	MR	R	R	R	-	-
4	CoLk 16201	R	R	R	R	MS	-	-
5	CoLk 16202	MR	MR	R	R	R	-	-
6	CoPb 16181	MR	MR	R	R	R	-	-
<b>Advance Varietal Trial (II-Plant, Early)</b>								
1	Co 15023	MR	MR	R	R	R	-	-
2	Co 15024	MS	MS	R	R	R	W	-
3	Co 15027	MR	MR	R	R	R	W	-
4	CoLk 15201	MR	MR	R	R	R	-	-
5	CoLk 15205	MR	MR	R	R	R	-	-
6	CoPb 15212	MS	MS	R	R	R	-	-
<b>Advance Varietal Trial (I- Plant, Mid Late)</b>								
1	Co 16030	MS	MS	R	R	R	-	-
2	CoLk 16203	MR	MR	R	R	R	-	-

3	CoLk 16204	R	R	R	R	R	-	-
4	CoS 16232	MR	MR	R	R	R	-	-
5	CoS 16233	MR	MR	R	R	R	-	-
<b>Advance Varietal Trial (II Plant, Mid Late)</b>								
1	Co 15026	MR	MR	R	R	R	W	-
2	CoLk 15206	MR	MR	R	R	MR	-	-
3	CoLk 15207	MR	MR	R	R	MR	-	-
4	CoLk 15209	MR	MR	R	R	MS	-	-
5	CoPb 15213	MR	MR	R	R	R	W	-
6	CoS 15232	MR	MR	R	R	R		-
7	CoS 15233	MR	MR	R	R	R	-	-
<b>Checks</b>								
1	CoJ 64*	HS	S	-	-	MR	-	-
2	CoS 767*	S	S	-	-	R	-	-
3	Co 1158**	-	-	-	-	S	-	-
4	CoLk 7701**	-	-	-	-	S	-	-

\* Check for red rot \*\* Check for smut

**Table 13. Evaluation of sugarcane genotypes for red rot, smut & YLD resistance-  
Shahjahanpur**

Sl. No.	Genotypes/ Varieties	Red rot				Smut	Wilt	YLD	PBD
		Plug method		Nodal method					
		CF08	CF09	CF08	CF09				
<b>IVT Early</b>									
1	CoLk 17201	MR	MR	R	R	MR	R	R	R
2	CoLk 17202	MR	MR	R	R	R	R	S	R
3	CoLk 17203	S	MS	S	R	R	R	MR	R
4	CoPant 17221	MS	MS	R	R	R	S	MR	S
5	CoPb 17211	MS	MR	R	R	R	HS	R	HS
6	CoPb 17212	S	MS	S	R	R	HS	MR	S
7	CoS 17231	MR	MR	R	R	R	R	R	R
<b>IVT Mid late</b>									
1	Co 17018	MR	MR	R	R	R	S	MR	MS
2	CoH 17261	MR	MS	R	R	R	MR	MR	HS
3	CoH 17262	MR	MR	R	R	MS	MR	MR	HS
4	CoLk 17204	MR	MR	R	R	MS	R	MR	S
5	CoLk 17205	MR	MR	R	R	S	R	R	S
6	CoPant 17223	MR	MR	R	R	R	MS	MS	R
7	CoPant 17224	S	S	S	S	R	MS	MR	R
8	CoPb 17213	MR	MS	R	R	MR	S	S	S
9	CoPb 17214	MR	MS	R	R	MR	S	MR	R

10	CoPb 17215	MR	MR	R	R	R	MS	MR	HS
11	CoS 17233	MR	MR	R	R	R	MR	MR	R
12	CoS 17234	MR	MR	R	R	R	MR	S	S
13	CoS 17235	MR	MR	R	R	R	MR	MR	HS
14	CoS 17236	MR	MR	R	R	MR	MS	MR	HS
15	CoS 17237	HS	HS	S	S	R	MS	MS	HS
<b>AVT Early (I Plant)</b>									
1	Co 15025	MR	MR	R	R	MR	S	MR	R
2	Co 16029	R	MR	R	R	MR	HS	MR	R
3	CoLk 14201	MR	MR	R	R	MS	R	MR	R
4	CoLk 16201	MR	MR	R	R	MS	MS	MR	R
5	CoLk 16202	MR	MR	R	R	R	MR	R	R
6	CoPb 16181	MS	MR	R	R	MS	MS	R	MS
<b>AVT Early (II Plant)</b>									
1	Co 15023	MR	R	R	R	R	HS	MR	R
2	Co 15024	MS	MR	R	R	R	HS	R	R
3	Co 15027	MR	MR	R	R	R	S	R	MS
4	CoLk 15201	MR	MS	R	R	MS	R	MS	R
5	CoLk 15205	MR	MR	R	R	MS	R	R	MS
6	CoPb 15212	MS	MS	R	R	MR	R	MR	R
<b>AVT Mid late (I Plant)</b>									
1	Co 16030	MR	MR	R	R	MR	MS	R	R
2	CoLk 16203	MR	MR	R	R	MS	R	R	R
3	CoLk 16204	MR	R	R	R	S	R	R	R
4	Cos 16232	MR	R	R	R	MS	MS	R	R
5	CoS 16233	MR	R	R	R	MR	MR	MR	R
<b>AVT Mid late (II Plant)</b>									
1	Co 15026	MR	R	R	R	MS	S	R	R
2	CoLk 15206	MR	MR	R	R	MR	MR	R	MS
3	CoLk 15207	MR	R	R	R	MS	MR	MS	R
4	CoLk 15209	MR	MR	R	R	S	MR	R	MS
5	CoPb 15213	MR	MR	R	R	MR	HS	MR	MS
6	CoS 15232	MR	MR	R	R	R	MS	R	MS
7	CoS 15233	MR	R	R	R	MR	MS	R	MS
<b>Checks</b>									
1	Co 0238	MR	MR	R	R	MS	R	MR	HS
2	Co 05009	MR	MR	R	R	R	MR	MR	MS
3	CoJ 64	HS	HS	S	S	MR	MR	R	R
4	CoPant 97222	MR	MR	R	R	MS	MS	R	R
5	Co 05011	MR	MR	R	R	S	MS	MR	MS
6	CoS 767	HS	HS	S	S	MS	MR	R	R
7	Co 1158	-	-	-	-	S	-	-	-

**Table 14. Evaluation of sugarcane genotypes for red rot, smut, wilt and YLD resistance-Kapurthala**

S. No.	Entries	Plug method		Nodal Cotton swab method		Smut	Wilt	YLD	PBD
		CF08	CF09	CF08	CF09				
<b>IVT (Early)</b>									
1	CoLk 17201	MR	MR	R	R	MR	R	MR	R
2	CoLk 17202	MR	MR	R	R	R	R	R	R
3	CoLk 17203	MS	MS	S	R	MR	MS	MS	R
4	CoPant 17221	S	S	S	S	MS	MR	MS	S
5	CoPb 17211	MR	MR	R	R	MR	R	R	S
6	CoPb 17212	MS	MS	R	R	MR	MR	MR	R
7	CoS 17231	MR	MR	R	R	MR	R	R	R
<b>IVT (Mid Late)</b>									
1	Co 17018	MR	MR	R	R	MR	R	R	MS
2	CoH 17261	MR	MR	R	R	MS	MS	MR	MS
3	CoH 17262	MR	MR	R	R	MR	R	MR	MS
4	CoLk 17204	MR	MR	R	R	R	R	R	R
5	CoLk 17205	MR	MR	R	R	MR	MR	MR	MS
6	CoPant 17223	MR	MR	R	R	MR	R	R	MS
7	CoPant 17224	HS	HS	S	S	MR	MR	MR	R
8	CoPb 17213	MR	MR	R	R	MR	R	MR	S
9	CoPb 17214	MR	MR	R	R	MR	MS	MS	MS
10	CoPb 17215	MR	MR	R	R	MR	R	R	R
11	CoS 17233	MR	MR	R	R	MS	R	MR	R
12	CoS 17234	MR	MR	R	R	MR	R	R	R
13	CoS 17235	MR	MR	R	R	MR	MR	R	MS
14	CoS 17236	MR	MR	R	R	MR	MS	MS	S
15	CoS 17237	HS	HS	S	S	MS	MR	R	MS
<b>AVT (Early -I Plant)</b>									
1	Co 15025	MR	MR	R	R	R	MS	MR	S
2	Co 16029	MR	MR	R	R	MS	MR	MS	R
3	CoLk 14201	MR	MR	R	R	MS	MR	R	R
4	CoLk 16201	MR	MR	R	R	MR	MR	MS	R
5	CoLk 16202	MR	MR	R	R	MR	MS	MR	MS
6	CoPb 16181	MR	MR	R	R	MR	R	R	MS
<b>AVT (Early -II Plant)</b>									
1	Co 15023	MR	MR	R	R	MR	MS	MR	MS
2	Co 15024	MS	MR	R	R	MS	MR	MS	S
3	Co 15027	MR	MR	R	R	MR	R	MR	MS
4	CoLk 15201	MR	MR	R	R	MS	MR	R	S
5	CoLk 15205	MR	MR	R	R	MS	R	MR	MS
6	CoPb 15212	MR	MS	R	R	MR	R	MR	S
<b>AVT (Mid Late -I Plant)</b>									
1	Co 16030	MR	MR	R	R	R	MS	MR	MS
2	CoLk 16203	MR	MR	R	R	MS	MR	MS	R

3	CoLk 16204	MR	MR	R	R	MS	MR	MR	S
4	CoS 16232	MR	MR	R	R	MR	MS	MR	MS
5	CoS 16233	MR	MR	R	R	MS	MR	R	MS
<b>AVT (Mid Late -II Plant)</b>									
1	Co 15026	MR	MR	R	R	MS	MR	MR	MS
2	CoLk 15206	MR	MR	R	R	MR	R	R	S
3	CoLk 15207	MR	MR	R	R	MS	MR	MR	R
4	CoLk 15209	MR	MR	R	R	MS	R	MR	S
5	CoPb 15213	MR	MR	R	R	MR	MR	MS	R
6	CoS 15232	MR	MS	R	R	MS	MS	MR	R
7	CoS 15233	MR	MR	R	R	MR	R	R	S
<b>Checks</b>									
1	Co 0238	MR	MR	R	R	S		MS	HS
2	Co 05009	MR	MR	R	R	MR		MS	
3	Co 05011	MR	MR	R	R	MR			
4	CoJ 64	HS	HS	S	S	MS			
5	CoPant 97222	S	S	S	S	S			
6	CoS 767	S	S	S	S	S		MR	
7	Co 740					HS			
8	Co 1158					HS			
9	Co 62175					HS			
10	NCo 310					HS			
11	Katha					HS			
12	Co 7717						HS		
13	Co 89003						HS		
14	CoJ 85								HS

**Table 15. Evaluation of sugarcane genotypes for red rot, smut & YLD resistance- Uchani**

Sl. No.	Genotype	Red rot				Smut	YLD	PBD
		Plug method		Nodal method				
		CF08	CF09	CF08	CF09			
<b>IVT (Early)</b>								
1	CoLk 17201	MR	MR	R	R	MR	MR	R
2	CoLk 17202	MR	MR	R	R	R	MS	MS
3	CoLk 17203	MR	MR	R	R	MR	MS	R
4	CoPant 17221	MS	MS	R	R	MS	MS	R
5	CoPb 17211	MR	MS	R	R	MR	MS	R
6	CoPb 17212	S	S	S	S	MR	S	R
7	CoS 17231	MR	MR	R	R	MR	MS	R
<b>IVT (Midlate)</b>								
1	Co 17018	MR	MR	R	R	MR	S	MS
2	CoH 17261	MR	MR	R	R	R	MR	R
3	CoH 17262	MR	MR	R	R	R	MR	R
4	CoLk 17204	MS	MR	R	R	R	S	R
5	CoLk 17205	MR	MR	R	R	MS	MS	R
6	CoPant 17223	MR	MS	R	R	MS	S	R
7	CoPant 17224	S	S	S	S	MR	MR	MS
8	CoPb 17213	MS	MR	R	R	MR	MS	R
9	CoPb 17214	MS	MS	R	R	MR	MS	MS
10	CoPb 17215	MR	MR	R	R	MR	MS	R
11	CoS 17233	MR	MR	R	R	MS	S	R
12	CoS 17234	MS	MS	R	R	MS	S	R
13	CoS 17235	MR	MR	R	R	MR	MR	MS
14	CoS 17236	MR	MR	R	R	MS	MS	MS
15	CoS 17237	HS	HS	S	S	MS	MR	R
<b>AVT (Early) I Plant</b>								
1	Co15025	MR	MR	R	R	MR	MR	S
2	Co16029	MR	MR	R	R	R	MS	MS
3	CoLk 14201	MR	MR	R	R	MS	MR	MS
4	CoLk 16201	MR	MR	R	R	MS	MS	MS
5	CoLk 16202	MS	MR	R	R	MR	MR	MS
6	CoPb16181	MR	MR	R	R	MR	MR	R
<b>AVT (Early) II Plant</b>								
1	Co 15023	MR	MR	R	R	MR	MR	S
2	Co 15024	MS	MR	R	R	R	MS	S
3	Co 15027	MR	MR	R	R	MS	MR	MS
4	CoLk 15201	MS	MS	R	R	MS	S	MS
5	CoLk 15205	MR	MR	R	R	MR	MR	R
6	CoPb 15212	MR	MR	R	R	MR	MR	R

<b>AVT (Midlate) Plant I</b>								
1	Co16030	MR	MS	R	R	MR	MS	S
2	CoLk16203	MS	MR	R	R	MR	MR	R
3	CoLk16204	MR	MR	R	R	MR	MR	R
4	CoPant 16223	-	-	-	-	MR	-	-
5	CoPb 16212	-	-	-	-	MR	-	-
6	CoS 16232	MR	MR	R	R	MR	MR	MS
7	CoS 16233	MR	MR	R	R	MR	MR	R
<b>AVT (Midlate) Plant II</b>								
1	Co 15026	MR	MR	R/S	R/MS	MS	MR	S
2	CoLk 15206	MR	MR	R	R	MR	MS	MS
3	CoLk 15207	MR	MR	R	R	MS	MR	R
4	CoLk 15209	MR	MR	R	R	MS	MR	R
5	CoPb 15213	MS	MR	R	R	MR	S	MS
6	CoS 15232	MS	MR	R	R	MR	MS	MS
7	CoS 15233	MR	MR	R	R	MR	MR	S
<b>Checks</b>								
1	Co 0238	MR	MR	R	R	S	S	HS
2	Co 05009	MS	MR	R	R	MR	S	S
3	Co 05011	MR	MR	R	R	MR	MS	MS
4	CoJ 64	HS	HS	S	S	MS	MS	S
5	CoPant 97222	S	S	S	S	S	S	MS
6	CoS 767	S	S	S	S	S	S	S

**Table 16. Evaluation of sugarcane genotypes for red rot and YLD- Karnal**

Sl. No.	Entry	Red rot rating				YLD	Other diseases
		Plug Method		Cotton swab Method			
		CF08	CF09	CF08	CF09		
<b>IVT (Early)</b>							
1	CoLk 17201	MR	MR	R	R	R	
2	CoLk 17202	MR	MR	R	R	R	
3	CoLk 17203	MR	MR	R	R	MR	
4	CoPant 17221	MS	MS	R	R	MS	
5	CoPb 17211	MR	MR	R	R	R	Wilt
6	CoPb 17212	HS	S	S	S	R	
7	CoS 17231	MR	MR	R	R	R	Wilt
<b>IVT (Mid Late)</b>							
1	Co 17018	MR	MR	R	R	MR	
2	CoH 17261	MR	MR	R	R	R	
3	CoH 17262	MR	MR	R	R	MR	
4	CoLk 17204	MS	MR	R	R	MS	
5	CoLk 17205	MR	MR	R	R	R	

6	CoPant 17223	MR	MR	R	R	MR	
7	CoPant 17224	S	HS	S	S	R	
8	CoPb 17213	MS	MR	R	R	MR	
9	CoPb 17214	MS	MS	R	R	S	Wilt
10	CoPb 17215	MR	MR	R	R	R	
11	CoS 17233	MR	MR	R	R	S	
12	CoS 17234	MS	MS	R	R	MS	
13	CoS 17235	MR	MR	R	R	R	
14	CoS 17236	MR	MR	R	R	R	
15	CoS 17237	HS	HS	S	S	MS	
<b>AVT (Early - I Plant)</b>							
1	Co 15025	MR	MR	R	R	MR	
2	Co 16029	R	MR	R	R	R	
3	CoLk 16201	R	MR	R	R	MS	
4	CoLk 16202	MR	MR	R	R	R	
5	Co Pb 16181	MR	MR	R	R	MS	
<b>AVT (Early - II Plant)</b>							
1	Co 15023	R	MR	R	R	MR	
2	Co 15024	MR	MR	R	R	R	
3	Co 15027	R	MR	R	R	R	
4	CoLk 15201	MS	MS	R	R	R	
5	CoLk 15205	MR	MR	R	R	MR	
6	CoPb 15212	MS	MS	R	R	R	
<b>AVT (Mid Late - I Plant)</b>							
1	Co 16030	R	MR	R	R	R	
2	CoLk 16203	MR	MR	R	R	R	
3	CoLk 16204	MR	MR	R	R	MR	
4	CoS 16232	MR	MR	R	R	R	
5	CoS 16233	MR	MR	R	R	R	
<b>AVT (Mid Late - II Plant)</b>							
1	Co 15026	R	MR	R	R	MR	
2	CoLk 15206	MR	MS	R	R	MR	
3	CoLk 15207	MR	MR	R	R	R	
4	CoLk 15209	R	MR	R	R	R	
5	CoPb 15213	MR	MR	R	R	MS	
6	CoS 15232	MR	MR	R	R	MR	
7	CoS 15233	R	MR	R	R	MS	
<b>Checks</b>							
1	Co 0238	MR	MR	R	R	MR	
2	Co 05009	MR	MR	R	R	R	
3	Co 05011	R	MR	R	R	R	
4	CoJ 64	S	MR	S	R	MS	
5	CoPant 97222	MS	MR	R	R	MS	
6	CoPant 84211	S	MR	R	R	MR	
7	CoS 767	R	MR	R	R	MS	
8	CoS 8436	MR	MR	R	R	R	



**Table 17. Evaluation of sugarcane genotypes for red rot, smut & YLD- Pantnagar**

S. No.	Genotypes	Red rot				Smut	YLD
		Plug method		Nodal method			
		CF08	CF09	CF08	CF09		
<b>IVT (Early)</b>							
1	CoLk 17201	MS	MS	R	R	R	MR
2	CoLk 17202	MR	MS	R	R	MR	R
3	CoLk 17203	MR	MR	R	R	HS	R
4	CoPant 17221	MR	MR	R	R	MR	R
5	CoPb 17212	MS	MS	R	R	R	R
6	CoPb 17211	These varieties were not planted due to non-availability of seed					
7	CoS 17231						
<b>IVT (Mid Late)</b>							
1	Co 17018	MS	MR	R	R	MS	R
2	CoH 17261	MR	MR	R	R	R	R
3	CoH 17262	MR	R	R	R	R	MR
4	CoLk 17204	MS	MR	R	R	S	R
5	CoLk 17205	MR	MR	R	R	MS	R
6	CoPant 17223	MR	MR	R	R	MR	R
7	CoPant 17224	MR	MR	R	R	MR	R
8	CoPb 17213	MS	MR	R	R	MR	R
9	CoPb 17214	MR	MS	R	R	MS	MS
10	CoPb 17215	MS	MS	R	R	HS	R
11	CoS 17233	MR	MR	R	R	R	R
12	CoS 17234	MS	MS	R	R	MS	R
13	CoS 17235	MS	MR	R	R	MS	R
14	CoS 17236	MR	MR	R	R	MS	R
15	CoS 17237	MS	MS	R	R	MS	R
<b>AVT(Early) I Plant</b>							
1	Co 15025	R	R	R	R	R	R
2	Co 16029	MR	R	R	R	HS	R
3	CoLk 14201	MR	MR	R	R	MR	R
4	CoLk 16201	MS	MR	R	R	S	R
5	CoLk 16202	MR	MR	R	R	MR	R
6	CoPb 16181	MS	MS	R	R	HS	R
<b>AVT (Early) II Plant</b>							
1	Co 15023	MR	MR	R	R	MR	R
2	Co 15024	MR	MR	R	R	R	R
3	Co 15027	MR	R	R	R	MS	R
4	CoLk 15201	MS	MS	R	R	MS	MS

5	CoLk 15205	MR	MR	R	R	MS	R
6	CoPb 15212	MR	MR	R	R	R	R
<b>AVT(Mid Late) I Plant</b>							
1	Co 16030	MR	MR	R	R	R	R
2	CoLk 16203	MR	MR	R	R	MS	R
3	CoLk 16204	MR	MR	R	R	S	R
4	CoS 16232	MR	MR	R	R	MS	R
5	CoS 16233	MR	MR	R	R	MS	R
<b>AVT (Mid Late) II Plant</b>							
1	Co 15026	MS	MR	R	R	MS	R
2	CoLk 15206	MR	MR	R	R	R	R
3	CoLk 15207	MR	MR	R	R	MS	R
4	CoLk 15209	MR	MR	R	R	HS	MR
5	CoPb 15213	MR	MR	R	R	HS	R
6	CoS 15232	MS	MS	R	R	MS	R
7	CoS 15233	MR	R	R	R	MR	R
<b>Checks</b>							
1	Co 0238	MS	MR	R	R	HS	R
2	Co 05009	MR	MR	R	R	MS	R
3	Co 05011	MS	MR	R	R	MR	MS
4	CoJ 64	S	S	R	R	MR	R
5	CoPant 97222	MS	MS	R	R	MS	R
6	CoS 767	S	S	R	R	MR	MS

**Table 18. Evaluation of sugarcane genotypes for red rot, smut, wilt & YLD resistance- Pusa**

S. No.	Genotypes	Red rot				Smut	Wilt	YLD	PB
		Plug method		Nodal method					
		CF07	CF08	CF07	CF08				
<b>IVT (Early)</b>									
1	CoBln 17501	MR	MR	S	R	MR	MS	MS	S
2	CoLk 94184	MS	MR	S	R	MR	MS	MS	MS
3	CoP 17436	MR	R	R	R	R	MR	R	R
4	CoP 17437	MR	R	R	R	R	MR	R	R
5	CoP 17438	MS	MR	S	S	MR	MS	R	R
6	CoP 17440	MR	MR	R	R	MR	MR	R	R
7	CoP 17441	MR	MR	R	R	MR	MR	R	R
8	CoSe 01421	MR	MR	R	R	MR	MR	MR	R
9	CoSe 16454	MS	MR	R	R	MR	MR	R	MS
10	CoSe 17451	MR	MR	R	R	MR	MR	R	S
<b>IVT (Mid Late)</b>									
1	CoBln 17502	MS	MS	S	R	MR	S	MS	S
2	CoP 2061	MR	MR	R	R	R	MR	R	
3	CoP 9301	MR	MR	R	R	MR	MR	R	R
4	CoP 06436								R
5	CoP 16455	MR	MR	R	R	R	MS	MR	MS
6	CoP 16456	MR	R	R	R	MR	MR	R	MS
7	CoP 17444	MS	MS	S	S	MR	S	R	R
8	CoP 17446	R	R	R	R	R	MR	R	MS
9	CoSe 17452	S	MS	S	R	MR	S	R	MS
<b>Checks</b>									
1	CoSe 95422	HS	S	S	S	MR	S	-	S
2	BO 91	MR	R	R	R	R	MR	R	R

**Table 19. Evaluation of sugarcane genotypes for red rot, smut, wilt & YLD- Motipur**

Sl. No.	Genotype	Red Rot				Smut	Wilt	YLD
		Plug Method		Nodal Method				
		CF07	CF08	CF07	CF08			
<b>Initial Varietal Trial (Early)</b>								
1	CoBln 17501	MR	MR	R	R	R	W	-
2	CoP 17436	MR	MR	R	R	R	-	Y
3	CoP 17437	MS	MS	S	S	R	-	-
4	CoP 17438	MR	MR	R	R	R	-	-
5	CoP 17440	MR	MR	R	R	R	-	Y
6	CoP 17441	MR	MR	R	R	MS	W	-
7	CoSe 16454	MR	MR	R	R	R	-	-

8	CoSe 17451	MR	MR	R	R	MR	W	Y
<b>Advance Varietal Trial (I-Plant, Early)</b>								
1	CoLk 16466	MR	MR	R	R	MR	-	-
2	CoLk 16468	MR	MR	R	R	MR	-	-
3	CoP 16437	MR	MR	R	R	R	-	-
4	CoP 16438	MR	MR	R	R	MR	W	-
5	CoSe 16451	MS	MS	S	S	R	-	-
<b>Advance Varietal Trial (II-Plant, Early)</b>								
1	CoLk 15466	MR	MR	R	R	R	-	-
2	CoLk 15467	MR	MR	R	R	MR	-	-
3	CoP 15436	MR	MR	R	R	MS	-	-
4	CoSe 15452	MR	MR	R	R	MR	-	-
5	CoSe 15455	MR	MR	R	R	MR	-	-
<b>Initial Varietal Trial (Mid Late)</b>								
1	CoBln 17502	S	S	S	S	MR	-	Y
2	CoP 17444	MS	MS	S	S	R	-	Y
3	CoP 17446	MR	MR	R	R	R	-	-
4	CoSe 16455	MS	MS	S	S	R	-	Y
5	CoSe 16456	MR	MR	R	R	MS	-	-
6	CoSe 17452	MS	MS	R	R	R	-	-
<b>Advance Varietal Trial (I-Plant Midlate)</b>								
1	CoBln 16502	MR	MR	R	R	R	W	-
2	CoLk 16470	MR	MR	R	R	R	-	Y
3	CoP 16439	MR	MR	R	R	MS	-	Y
4	CoSe 16452	MR	MR	R	R	MR	-	-
<b>Advance Varietal Trial (II-Plant Midlate)</b>								
1	CoLk 15468	MR	MR	R	R	R	-	-
2	CoLk 15469	MR	MR	R	R	R	-	-
3	CoP 15438	MR	MR	R	R	R	-	Y
4	CoP 15439	MR	MR	R	R	R	-	Y
5	CoP 15440	MR	MR	R	R	MS	-	Y
6	CoSe 15453	MR	MR	R	R	MR	-	-
7	CoSe 15454	MR	MR	R	R	R	W	Y
<b>Checks</b>								
1	CoJ 64*	HS	HS	-	-	R	-	-
2	CoSe 95422*	S	S	S	S	MR	-	-
3	Co 1158**	-	-	-	-	HS	-	-
4	CoLk 7701**	-	-	-	-	S	-	-

\* Check for red rot    \*\*Check for smut

**Table 20. Evaluation of sugarcane genotypes for red rot, smut & YLD resistance- Seorahi**

Sl. No.	Genotype	Red rot				Smut	YLD	PBD
		Plug Method		Nodal method				
		CF07	CF08	CF07	CF08			
<b>IVT (Early)</b>								
1	CoBln 17501	MR	MR	R	R	R	MR	MS
2	CoP 17437	MR	MR	R	R	R	R	R
3	CoP 17436	MR	MR	R	R	MR	MS	R
4	CoP 17441	MR	MR	R	R	R	MS	R
5	CoP 17440	MR	MR	R	R	MR	MR	MR
6	CoP 17438	MR	MR	R	R	R	MR	MS
7	CoSe 16454	MR	MR	R	R	R	R	MR
8	CoSe 17451	MR	MR	R	R	R	MR	R
<b>IVT (Midlate)</b>								
1	CoBln 17502	S	MS	S	S	MR	R	R
2	CoP 17446	MR	MR	R	R	MR	R	R
3	CoP 17444	MR	MR	R	R	MR	R	MR
4	CoSe 16455	MR	MR	R	R	MR	R	R
5	CoSe 16456	MR	MR	R	R	R	R	R
6	CoSe 17452	MR	MR	R	R	R	MS	MS
<b>AVT (Early) I Plant</b>								
1	CoLk 16466	MR	MR	R	R	S	MR	R
2	CoLk 16467	MR	MR	R	R	R	R	MR
3	CoP 16437	MR	MR	R	R	R	R	MR
4	CoP 16438	MS	MR	R	R	MS	R	R
5	CoSe 16451	MR	MR	R	R	R	R	R
<b>AVT (Mid late)</b>								
1	CoBln 16502	MS	MS	R	R	S	R	R
2	CoLk 16470	MS	MS	R	R	MS	R	R
3	CoP 16439	MR	MR	R	R	MS	MS	R
4	CoSe 16452	MR	MR	R	R	R	R	MR
<b>Checks</b>								
1	BO 91	MR	MR	R	R	R/MR	R	R
2	Co 1158	-	-	-	-	S	-	-
3	CoLk 94184	MR	MR	R	R	R	R	R
4	CoP 9301	MR	MR	R	R	R	R	R
5	CoP 06436	MS/MR	MR	R	R	R/MR	R	MR
6	CoSe 95422	MS	S	R	R	MR	R	R
7	CoSe 01421	MR	MR	R	R	MR	MR	R

**Table 21. Evaluation of sugarcane genotypes for red rot resistance- Buralikson**

Sl No	Entries/ Genotypes	Plug method		Nodal method	
		CFO7	CFO8	CFO7	CFO8
<b>IVT- Mid Late</b>					
1	CoBln 17501	MR	MR	R	R
2	CoBln 17502	MS	MS	S	S
<b>AVT (Early) I plant</b>					
1	CoLk 16466	MS	MR	S	R
2	CoLk 16468	MR	R	R	R
3	CoP 16437	MR	MR	R	R
<b>AVT (Early) II plant</b>					
1	CoSe 15452	MS	MS	S	S
2	CoSe 15455	MR	MS	R	S
<b>AVT (Midlate) I plant</b>					
1	CoBln 16502	MR	MR	R	R
2	CoLk 16470	MR	MR	S	R
3	CoP 16439	R	R	R	R
4	CoSe 16452	MR	MR	R	R
<b>AVT (Midlate) II plant</b>					
1	CoLk 15468	MR	MR	R	R
2	CoLk 15469	R	MR	R	R
3	CoP 15438	MR	MR	R	R
4	CoP 15439	MR	MR	R	R
5	CoP 15440	MR	MR	R	R
<b>Checks</b>					
1	BO 91	MR	MR	R	R
2	CoLk 94184	MR	MR	R	R
3	CoP 9301	MR	R	R	R
4	CoP 06436	MR	MR	R	R
5	CoSe 95422	S	S	S	S
6	CoSe 01421	MR	MR	R	R

**Table 22. Evaluation of genotypes for red rot, smut, wilt & YLD resistance - Anakapalle**

S. No	Clone	Red rot (CF06)		Smut	Wilt	YLD
		Plug method	Nodal method			
<b>IVT Early</b>						
1	CoV 18356	R	R	MR	R	R
2	CoV 18357	R	R	MR	MR	R
3	CoOR 18346	R	R	MR	R	R
<b>AVT I (Early)</b>						
1	CoA 17321	R	R	MS	MS	R
2	CoA 17323	R	R	HS	MS	R
3	CoC 17336	R	R	S	MS	MR
<b>AVT II (Early)</b>						
1	CoA 16321	R	R	MS	S	R
2	CoC 16336	MS	R	MR	MS	R
3	CoC 16337	MS	R	S	MR	R
4	CoV 16356	MR	R	S	S	R
<b>AVT II (Midlate)</b>						
1	CoC 15339	MR	R	HS	MR	R
2	CoOR 15346	R	R	MR	MR	R
3	CoC 16338	MS	R	HS	MR	R
4	CoC 16339	MR	R	MR	MS	MR
5	CoV 16357	R	R	MS	S	R
<b>Checks</b>						
1	Co 06030	MR	R	MR	R	R
2	Co 86249	R	R	MR	R	MR
3	CoA 11321	R	R	MR	S	S
4	CoA 92081	R	R	HS	MS	R
5	CoC 01061	MR	R	MR	MS	MS
6	CoOR 03151	MR	R	S	MR	MR
7	CoV 92102	MR	R	MR	S	MR
8	Co 419	HS	S	HS		
9	Co 997	HS	S	MS		
10	Co 6907	S	S	MS		
11	Co 7219	S	R	MS		
12	Co 7706	S	R	S		
13	CoA 89085	MS	R	MS		
14	CoC 671	HS	S	MS		
15	CoA 14321				S	
16	2012A 246				HS	
17	2012A 249				S	
18	CoV 09356					MS
19	2001A 63					MS

**Table 23. Evaluation of sugarcane genotypes for red rot, smut and YLD- Cuddalore**

S. No.	Clone	Plug method (CF06)	Nodal method (CF06)	Smut	YLD	PBD
<b>IVT - Early</b>						
1	CoOr 18346	MR	R	MR	R	R
2	CoV 18356	MR	R	MR	R	MS
3	CoV 18357	MR	R	MR	R	R
<b>AVT - Early I Plant</b>						
1	CoA 17321	MR	R	S	R	R
2	CoA 17323	MR	R	MS	R	R
3	CoC 17336	MR	R	MS	MR	MS
<b>AVT - Early II Plant</b>						
1	CoA 16321	MR	R	MR	MR	MS
2	CoC 16336	MS	R	MS	MR	R
3	CoC 16337	MR	R	MS	MR	R
4	CoV 16356	MR	R	MS	R	MS
<b>AVT- Midlate I Plant</b>						
1	CoC 15339	MR	R	MS	MR	MS
2	CoC 16338	MS	R	S	MR	R
3	CoC 16339	MR	R	MR	MR	R
4	CoOr 15346	MR	R	MR	R	R
5	CoV 16357	MR	R	S	MR	MS
<b>Checks</b>						
1	Co 86249	R	R	HS	S	-
2	CoC 671	HS	S	HS	HS	-

**Table 24. Evaluation of sugarcane genotypes for red rot, smut, wilt and YLD- Navsari**

S. No.	Clones	Plug method		Nodal method		Smut	Wilt	YLD
		CF06	CF12	CF06	CF12			
<b>IVT</b>								
1	Co 17001	R	R	R	R	MS	-	-
2	Co 17002	MR	MR	R	R	R	-	-
3	Co 17003	R	R	R	R	MS	-	-
4	Co 17004	MR	MR	R	R	R	-	-
5	Co 17005	MR	MR	R	R	R	-	-
6	Co 17006	MR	MR	R	R	S	-	-
7	Co 17008	R	R	R	R	MS	-	-
8	Co 17010	MR	MR	R	R	R	-	-
9	Co 17012	MR	MR	R	R	MS	-	-
10	Co 17013	MR	MR	R	R	MR	-	-
11	Co 17014	MR	MR	R	R	S	-	-
12	CoVc 17061	MS	MR	R	R	MS	-	-



13	CoN 17071	MS	MS	R	R	R	-	-
14	CoN 17072	MR	MR	R	R	R	-	-
15	CoVc 17061	MS	MR	R	R	MS	-	-
16	CoVSI 17021	HS	HS	S	S	MR	-	-
17	CoT 17366	MR	MR	R	R	MR	-	-
18	MS 17081	MS	MS	R	R	MS	-	-
19	MS 17082	HS	S	S	R	MR	-	-
<b>AVT- I Plant</b>								
1	Co 11015	MS	MS	R	R	MR	MR	R
2	Co 14005	MR	MR	R	R	MS	MR	MS
3	Co 15005	MR	MR	R	R	MS	R	R
4	Co 15006	MS	MS	R	R	R	MR	S
5	Co 15007	MS	MS	R	R	S	MR	MS
6	Co 15009	MS	MS	R	R	R	MS	R
7	Co 15010	MR	MR	R	R	MR	MS	MR
8	Co 15017	MR	MR	R	R	MR	MR	R
9	Co 15021	MR	MR	R	R	MR	MR	MS
10	CoN 15071	MR	MR	R	R	R	MR	R
11	CoSnk 15102	HS	S	S	R	S	MS	MS
12	PI 15131	S	HS	R	S	MR	MS	S
<b>AVT- II Plant</b>								
1	Co 14002	MS	MS	R	R	MR	MR	R
2	Co 14004	MR	MR	R	R	S	R	MR
3	Co 14012	MR	MR	R	R	HS	MR	R
4	Co 14016	MR	MS	R	R	HS	MR	MR
5	Co 14027	MS	MS	R	R	HS	MS	HS
6	Co 14030	MR	MR	R	R	MR	MR	MS
7	Co 14032	MR	MR	R	R	R	MR	MS
8	CoN 14073	MR	MR	R	R	R	MR	R
9	CoSnk 14102	MR	MR	R	R	MS	MS	MS
10	CoSnk 14103	MR	MR	R	R	MS	MS	MS
11	CoT 14367	MS	S	R	R	R	MR	R
12	CoTI 14111	R	MR	R	R	MS	MR	MS
13	CoVc 14062	MR	MR	R	R	MR	MR	S
14	MS 14081	MR	MR	R	R	MR	MR	MR
15	MS 14082	R	MR	R	R	MR	MS	R
<b>Checks</b>								
1	Co 86032	S	S	R	R	MR	MS	S
2	Co 09004	MR	MR	R	R	MS	MR	
3	CoC 671	HS	HS	S	S	MR	HS	R
4	CoSnk 05103	MR	MR	R	R	MR	MS	MR
5	Co 85004					S		
6	Co 86002					HS		
7	Co 97009					HS	MR	MS
8	CoM 0265							MS

**Table 25. Evaluation of sugarcane genotypes for red rot- Thiruvalla**

S. No	Genotypes	Plug		Nodal Cotton swab		YLD	PB
		CF06	CF12	CF06	CF12		
<b>AVT (II plant)</b>							
1	Co 14002	MR	MS	R	R	R	R
2	Co 14004	MR	MR	R	R	R	R
3	Co 14012	MR	MR	R	R	R	R
4	Co 14016	MR	MR	R	R	R	R
5	Co 14027	MS	MS	R	R	R	R
6	Co 14030	MS	MR	R	R	R	R
7	Co 14032	MR	MR	R	R	R	R
8	CoN 14073	MS	MS	R	R	R	R
9	CoSnk 14102	MS	MS	R	R	R	R
10	CoSnk 14103	MR	MR	R	R	R	R
11	CoT 14367	MR	MR	R	R	R	R
12	CoTI 14111	R	R	R	R	R	R
13	CoVC 14062	MR	MR	R	R	R	R
14	MS 14081	MR	MR	R	R	R	R
15	MS 14082	MR	MR	R	R	R	R
<b>AVT (I plant)</b>							
1	Co 11015	MS	MS	R	R	R	R
2	Co 14005	MS	MR	R	R	R	R
3	Co 15005	MR	MR	R	R	R	R
4	Co 15006	MR	MR	R	R	R	R
5	Co 15007	MR	MR	R	R	R	R
6	Co 15009	MR	MS	R	R	R	R
7	Co 15010	MS	MS	R	R	R	R
8	Co 15017	MR	MR	R	R	R	R
9	Co 15021	MR	MS	R	R	R	R
10	CoSnk 15102	S	S	S	R	R	R
11	CoN 15071	S	S	R	R	R	R
12	PI 15131	MS	MS	R	R	R	R
<b>IVT</b>							
1	Co 17001	R	R	R	R	-	-
2	Co 17002	MR	MR	R	R	-	-
3	Co 17003	MR	MR	R	R	-	-
4	Co 17004	S	MS	R	R	-	-
5	Co 17005	MR	MR	R	R	-	-
6	Co 17006	MR	MR	R	R	-	-
7	Co 17008*					-	-
8	Co 17010	MR	MR	R	R	-	-
9	Co 17012*					-	-
10	Co 17013	MR	MR	R	R	-	-
11	Co 17014	MR	MR	R	R	-	-

12	CoN 17071	S	S	S	S	-	-
13	CoN 17072	MS	MS	R	R	-	-
14	COT 17366		MR	R	R	-	-
15	CoVC 17061	R	R	R	R	-	-
16	CoVSI 17121		S	S	S	-	-
17	MS 17081	MR	MR	R	R	-	-
18	MS 17082*					-	-
<b>Checks</b>							
1	Co 86032	MS	MS	R	R	-	R
2	Co 09004	MR	R	R	R	-	R
3	CoC 671	S	S	S	S	-	R
4	CoSnk 05103	MR	MR	R	R	-	R

\*Inoculation not done

**Table 26. Evaluation of sugarcane genotypes for red rot & smut resistance – Coimbatore**

S. No.	Clones	Red rot reaction CF06		Smut	Rust	PB	YLD (grade)
		Plug	Nodal				
<b>IVT</b>							
1	Co 17001	MR	R	HS	Tr	-	MS
2	Co 17002	R	R	R	Tr	-	MS
3	Co 17003	MR	R	HS	-	-	MS
4	Co 17004	MR	R	R	-	-	MS
5	Co 17005	R	R	S	Tr	-	R
6	Co 17006	R	R	HS	Tr	-	S
7	Co 17008	R	R	HS	Tr	-	R
8	Co 17010	R	R	S	Tr	-	R
9	Co 17012	MR	R	MR	Tr	-	R
10	Co 17013	MR	R	HS	Tr	PB	HS
11	Co 17014	MR	R	HS	Tr	-	R
12	CoN 17071	HS	S	MS	-	-	MS
13	CoN 17072	MS	R	MS	-	-	R
14	CoT 17366	MR	R	HS	-	-	MS
15	CoVc 17061	R	R	HS	-	-	R
16	CoVSI 17121	HS	S	MS	Tr	-	R
17	MS 17081	MR	R	R	-	-	MS
18	MS 17082	MS	R	R	-	-	R
<b>AVT</b>							
1	Co 11015	MS	R	S	-	-	MS
2	Co 14005	MR	R	HS	-	-	R
3	Co 15005	R	R	S	-	-	MS

4	Co 15006	MS	R	MR	-	-	HS
5	Co 15007	MS	R	S	Tr	-	R
6	Co 15009	R	R	R	-	-	R
7	Co 15010	MS	R	MR	-	-	MS
8	Co 15017	MS	R	R	-	-	R
9	Co 15021	MR	R	HS	Tr	-	R
10	CoSnk 15102	HS	S	HS	-	-	MR
11	CoSnk 15071	MS	R	MR	-	-	R
12	PI 15131	MR	R	HS	-	-	R
<b>Checks</b>							
1	CoC 671	HS	S	-	-	PB1	MS
2	Co 94012	HS	S	-	-	PB2	-
3	Co 96007	-	-	HS	-	PB2	-
4	Co 97009	-	-	HS	-	-	-
5	Co 86032	-	-	-	-	-	MS
6	Co 09004	-	-	-	-	-	MR

**Table 27. Evaluation of sugarcane genotypes for smut & PB resistance- Pune**

Sl. No.	Genotypes	Disease incidence (%)	Disease Reaction	PB
<b>Initial Varietal Trial</b>				
1	Co 17001	33.33	HS	-
2	Co 17002	00.00	R	-
3	Co 17003	20.00	MS	-
4	Co 17004	00.00	R	-
5	Co 17005	00.00	R	-
6	Co 17006	28.57	S	-
7	Co 17008	20.00	MS	-
8	Co 17010	00.00	R	-
9	Co 17012	16.66	MS	-
10	Co 17013	12.50	MS	-
11	Co 17014	33.33	HS	-
12	CoN 17071	00.00	R	-
13	CoN 17072	00.00	R	-
14	CoT 17366	00.00	R	-
15	MS 17081	00.00	R	-
16	MS 17082	00.00	R	-
17	CoVc 17061	20.00	MS	-
18	CoVSI 17121	16.66	MS	-
<b>Advanced Varietal Trial -I</b>				
1	Co 11015	00.00	R	R
2	Co 14005	00.00	R	R
3	Co 15005	33.33	HS	R
4	Co 15006	00.00	R	R
5	Co 15007	22.22	S	R
6	Co 15009	00.00	R	R
7	Co 15010	14.28	MS	R
8	Co 15017	00.00	R	R
9	Co 15021	16.66	MS	R
10	CoN 15071	14.28	MS	R
11	CoSnk 15102	20.00	MS	R
12	PI 15131	00.00	R	MS
<b>Standard checks</b>				
1	Co 86032	14.28	MS	-
2	CoC 671	21.25	S	-
3	Co 09004	0	R	-
<b>Susceptible check</b>				
1	Co 740	26.02	S	-
2	Co 7219	18.33	MS	-

**Table 28. Assessment of elite and ISH genotypes for resistance to red rot - Lucknow**

Sl. No.	Genotype	Red Rot			
		Plug Method		Nodal Method	
		CF08	CF09	CF08	CF09
1	ISH 501	MR	MR	R	R
2	ISH 548	MR	MR	R	R
3	ISH 536	MR	MR	R	R
4	ISH 524	MR	MR	R	R
5	ISH 542	S	S	S	S
6	ISH 526	MR	MR	R	R
7	ISH 594	HS	HS	S	S
8	ISH 585	MS	MR	R	R
9	ISH 519	MR	MR	R	R
10	IGH 823	MS	MS	S	S
11	ISH 558	MR	MR	R	R
12	ISH 545	MR	MR	R	R
13	IGH 834	MS	MS	S	S
14	IGH 833	MR	MR	R	R
15	ISH 590	MR	MR	R	R
16	ISH 562	MS	MR	R	R
17	ISH 584	MR	MR	R	R
18	ISH 587	S	S	S	S
19	ISH 502	MR	MR	R	R
20	ISH 528	MR	MR	R	R
21	IGH 829	MR	MR	R	R
22	ISH 554	MR	MR	R	R
23	ISH 567	MR	MR	R	R
24	ISH 516	R	R		
Check	CoJ 64	HS	S	-	-
Check	CoS 767	S	S	-	-

**Table 29. Assessment of elite and ISH genotypes for resistance to red rot - Shahjahanpur**

Sl. No.	Genotypes	Red rot reaction		Sl. No.	Genotypes	Red rot reaction	
		CF08	CF09			CF08	CF09
1	Co 09022	MR	MR	17	ISH 526	MR	MS
2	Co 12029	MR	MR	18	ISH 528	MR	MR
3	Co 14034	MR	MR	19	ISH 534	MS	S
4	Co 15023	MR	MR	20	ISH 536	MS	MS
5	Co 15024	MS	MR	21	ISH 542	MS	S
6	Co 15026	MR	MR	22	ISH 545	MS	HS
7	Co 15027	MR	MR	23	ISH 548	MR	R
8	IGH 823	MR	MR	24	ISH 554	MR	MR
9	IGH 829	MS	MR	25	ISH 558	MR	MR
10	IGH 833	MR	MS	26	ISH 562	MR	MS
11	IGH 834	MS	MS	27	ISH 567	MR	MR
12	ISH 501	MR	MR	28	ISH 584	MR	MR
13	ISH 502	MR	MS	29	ISH 585	MS	MS
14	ISH 516	MR	MR	30	ISH 587	HS	HS
15	ISH 519	MR	MS	31	ISH 590	MR	MR
16	ISH 524	MR	MS	32	ISH 594	MR	MR

**Table 30. Assessment of elite and ISH genotypes for resistance to red rot– Kapurthala**

Sl. No.	Genotypes	Red rot reaction		Sl. No.	Genotypes	Red rot reaction	
		CF08	CF09			CF08	CF09
1	ISH 501	MR	MR	16	ISH 594	MR	MR
2	ISH 502	MR	MR	17	IGH 816	S	S
3	ISH 512	MR	MR	28	IGH 823	MR	MR
4	ISH 513	MR	MR	19	IGH 829	MR	MR
5	ISH 519	MR	MR	20	IGH 833	MR	MR
6	ISH 524	MR	MR	21	Co 12029	MR	MR
7	ISH 526	MR	MR	22	Co 15023	MR	MR
8	ISH 536	MR	MR	23	Co 15024	MS	MR
9	ISH 542	MS	MR	24	Co 15026	MR	MR
10	ISH 545	MS	MR	25	Co 15027	MR	MR
11	ISH 548	MS	MS	26	WL-10-105	MR	MR
12	ISH 564	MR	MR	27	WL-10-18	MR	MR
13	ISH 584	MR	MR	28	WL 11-2534	MR	MR
14	ISH 585	MR	MR	29	WL-10-85	MR	MR
15	ISH 587	S	S				

**Table 31. Assessment of elite and ISH genotypes for resistance to red rot– Uchani**

Sl. No.	Genotypes	Red rot reaction		Sl. No.	Genotypes	Red rot reaction	
		CF08	CF09			CF08	CF09
1	AS-04-635	MR	MR	14	BM-1005-149	S	S
2	AS-04-245	HS	S	15	AS -04-2097	S	S
3	Bm-1009-163	HS	S	16	BM-100-3143	MR	MR
4	MA-5-5	MR	MR	17	GV-07-3849	MR	MR
5	MA-5-37	S	MS	18	BM-1010-168	MS	MS
6	SA04-472	MS	MS	19	GV-07-2276	MS	MR
7	SA-98-13	MR	MR	20	SA-04-390	MS	MS
8	SA04-496	MR	MR	21	GV-07-3774-212	S	HS
9	MA-5-22	MR	MR	22	MA-5-51	HS	HS
10	BM-1022-173	MR	MR	23	CUM-07-986	S	S
11	AS -04-1687	MR	MR	24	SA-04-409	MR	MS
12	AS -04-1689	MR	MR	25	PG-9869137	MS	S
13	MA-5-99	MS	MS				

**Table 32. Assessment of elite and ISH genotypes for resistance to red rot- Karnal**

Sl. No.	Genotypes	Red rot reaction		Sl. No.	Genotypes	Red rot reaction	
		CF08	CF09			CF08	CF09
1	WL-10-85	MS	MS	15	ISH-567	R	R
2	ISH-501	MS	MS	16	ISH-584	MR	MR
3	ISH-502	MR	MR	17	ISH-585	R	R
4	ISH-512	MR	MS	18	ISH-587	S	HS
5	ISH-513	HS	HS	19	ISH-588	MS	MS
6	ISH-519	MR	MR	20	ISH-594	HS	S
7	ISH-524	MR	MS	21	IGH-829	HS	S
8	ISH-534	S	S	22	IGH-823	MS	S
9	ISH-536	MR	MS	23	IGH-833	MS	S
10	ISH-542	MS	MR	24	Co 09022	MR	MR
11	ISH-544	MS	MR	25	Co 12029	MR	MR
12	ISH-545	MS	S	26	Co 13034	MR	R
13	ISH-548	S	S	27	Co 14034	MR	R
14	ISH-564	R	MR				



**Table 33. Assessment of elite and ISH genotypes for resistance to red rot– Pusa**

Sl. No.	Genotypes	Red rot reaction		Sl. No.	Genotypes	Red rot reaction	
		CF07	CF08			CF07	CF08
1	IGH 823	S	S	16	ISH 512	Rotten	Rotten
2	ISH 526	S	S	17	ISH 535	Rotten	Rotten
3	ISH 528	S	S	18	ISH 548	Rotten	Rotten
4	ISH 567	S	S	19	ISH 519	S	S
5	IGH 829	MR	MR	20	ISH 58 7	Rotten	Rotten
6	ISH 513	Rotten	Rotten	21	ISH 534	S	S
7	ISH 584	S	S	22	ISH 590	MR	MR
8	ISH 501	S	S	23	IGH 835	MS	MS
9	ISH 516	S	S	24	ISH 502	MR	MR
10	ISH 834	MS	MS	25	ISH 558	S	S
11	IGH 816	Rotten	Rotten	26	ISH 524	Rotten	Rotten
12	ISH 554	MR	MR	27	ISH 545	Rotten	Rotten
13	ISH 536	Rotten	Rotten	28	ISH 542	Rotten	Rotten
14	ISH 594	Rotten	Rotten	29	ISH 564	Rotten	Rotten
15	ISH 585	MR	MR	30	IGH 806	Rotten	Rotten

**Table 34. Assessment of elite and ISH genotypes for resistance to red rot - Seorahi**

Sl. No.	Genotypes	Red rot reaction		Sl. No.	Genotypes	Red rot reaction	
		CF07	CF08			CF07	CF08
1	PG1869137	S	MS	15	SA04-635	MS	MS
2	SA98/13	MS	S	16	GU07-2276	R	R
3	BM1009163	S	MS	17	BM1005149	MR	MR
4	MA5/37	R	MR	18	MA5/51	MR	MR
5	BM1010168	MS	S	19	SA04-290	R	MS
6	SA04-409	R	MS	20	SA-2097	MS	MR
7	SA04-454	R	R	21	MA5/22	MR	MS
8	BM1003143	S	MS	22	SA04-2454	MS	MR
9	MA 5/5	S	HS	23	SA04-1687	MR	R
10	MA5/99	R	MR	24	GU07-3849	R	R
11	BA1022173	S	S	25	SA04-1689	MR	MR
12	SA04-472	S	MR	26	GU 07-3774	-	-
13	SA04-496	MS	MS	27	SA 04-458	-	-
14	CYM07/946	MS	MS				

**Table 35. Assessment of elite and ISH genotypes to red rot- Anakkapalle**

Sl. No.	Genotypes	Red rot reaction
1	Co 09022	R
2	Co 15023	R
3	Co 15024	R
4	Co 15026	R
5	Co 15027	R
6	Co 12029	MS
7	Co 13034	MR
8	Co 14034	MR
9	CoA92081 (c)	R

**Table 36. Assessment of elite and ISH genotypes for resistance to red rot- Cuddalore**

Sl. No.	Genotypes	Red rot reaction	Sl. No.	Genotypes	Red rot reaction
1	ISH 501	MR	17	ISH 558	MR
2	ISH 502	MR	18	ISH 564	MR
3	ISH 512	-	19	ISH 567	R
4	ISH 513	-	20	ISH 584	MR
5	ISH 516	R	21	ISH 585	-
6	ISH 519	MS	22	ISH 587	-
7	ISH 524	MS	23	ISH 590	MS
8	ISH 526	MR	24	ISH 594	MR
9	ISH 528	MR	25	ISH 806	R
10	ISH 534	MS	26	ISH 816	MS
11	ISH 535	MR	27	ISH 823	MR
12	ISH 536	R	28	ISH 829	-
13	ISH 542	MR	29	ISH 833	R
14	ISH 545	HS	30	ISH 834	MS
15	ISH 548	R	31	CoC 671 (C)	HS
16	ISH 554	-	32	Co 86249 (C)	R

**Table 37. Assessment of elite and ISH genotypes for resistance to red rot– Navsari**

Sl. No.	Genotypes	CF06	CF12	Sl. No.	Genotypes	CF06	CF12
1.	ISH 501	MS	MS	19	ISH 585	R	R
2	ISH 502	MS	MS	20	ISH 587	MS	MS
3	ISH 512	MR	MS	21	ISH 590	MR	MR
4	ISH 513	MS	MS	22	ISH 594	MS	MR
5	ISH 516	MS	MS	23	IGH 806	MR	MR
6	ISH 519	MS	MS	24	IGH 816	MR	MR
7	ISH 524	MR	MS	25	IGH 823	MS	MS
8	ISH 526	MR	MR	26	IGH 829	MR	MR
9	ISH 528	MS	MS	27	IGH 833	MR	MR
10	ISH 534	MS	MS	28	IGH 834	MR	MR
11	ISH 535	MR	MR	29	Co 12029	MR	MS
12	ISH 542	MS	MR	30	Co 13034	MS	MS
13	ISH 545	MS	MS	31	Co 14034	MS	MS
14	ISH 548	MR	MR	32	Co 15023	MR	MR
15	ISH 558	MR	MR	33	Co 15024	MR	MS
16	ISH 564	R	R	34	Co 15026	MS	MS
17	ISH 567	MR	MR	35	Co 15027	MR	MR
18	ISH 584	MR	MR	36	Co 09022	MR	MR

**Table 38. Screening for red rot resistance in ISH and IGH clones of sugarcane-Coimbatore**

Sl. No.	Clone	CF06		CF12		Sl. No.	Clone	CF06		CF12	
		Plug	Nodal	Plug	Nodal			Plug	Nodal	Plug	Nodal
1	ISH 501	MR	R	R	R	17	ISH 558	MR	R	MS	R
2	ISH 502	MR	S	MS	S	18	ISH 564	R	R	MR	R
3	ISH 512	MR	R	MR	R	19	ISH 567	R	R	MR	R
4	ISH 513	MS	R	MS	-	20	ISH 584	MR	R	MR	R
5	ISH 516	R	R	R	R	21	ISH 585	R	R	MR	R
6	ISH 519	MS	R	MR	R	22	ISH 587	MS	R	MS	R
7	ISH 524	S	R	MS	R	23	ISH 590	MR	R	MR	R
8	ISH 526	MR	R	MR	R	24	ISH 594	MR	R	MR	R
9	ISH 528	MS	R	MS	R	25	IGH 806	R	R	MR	-
10	ISH 534	MS	S	MS	S	26	IGH 816	R	R	MR	R
11	ISH 535	MR	R	MR	R	27	IGH 823	MR	R	MR	R
12	ISH 536	MR	R	MR	R	28	IGH 829	R	R	MR	R
13	ISH 542	MS	R	MS	R	29	IGH 833	MR	R	MR	R
14	ISH 545	HS	S	HS	S	30	IGH 834	MS	S	MS	R
15	ISH 548	MR	R	MR	R	31	CoC 671	HS	S	HS	S
16	ISH 554	MR	R	MR	R	32	Co 94012	HS	S	HS	S

**Table 39. Effect of fungicides on management of Pokkah boeng - Shahjahanpur**

Treatments		Co 0238		CoS 08279	
		Germination (%)	Disease incidence (%)	Germination (%)	Disease incidence (%)
T <sub>1</sub>	Sett treatment - Overnight soaking with Carbendazim – 0.1% a.i.	64	24.63	56.25	18.51
T <sub>2</sub>	Foliar spray - Carbendazim – 0.05% a.i. (3 sprays at 15 days interval from May 15 <sup>th</sup> )	60	16.53	53.33	16.88
T <sub>3</sub>	Sett treatment (T <sub>1</sub> ) + Foliar spray with carbendazim (T <sub>2</sub> )	69	16.14	60.00	16.61
T <sub>4</sub>	Control	60	40.71	49.58	34.54
	C.D.	NS	6.01	NS	5.70
	SE (m)	3.22	1.85	6.80	1.76
	C.V.	10.20	15.13	24.82	16.24

**Table 40. Effect of fungicides on management of Pokkah boeng - Kapurthala**

Treatment		Co 0238		CoJ 85	
		Germination (%)	Disease Incidence (%)	Germination (%)	Disease Incidence (%)
T <sub>1</sub>	Sett treatment-Overnight soaking with Carbendazim (0.1% a.i.)	62.50	15.25	59.58	13.25
T <sub>2</sub>	Foliar spray-Carbendazim (0.05% a.i.-3 sprays at 15 days interval from May 15 <sup>th</sup> )	49.58	11.50	49.17	10.50
T <sub>3</sub>	Sett treatment (T <sub>1</sub> ) + Foliar spray with Carbendazim (T <sub>2</sub> )	61.67	6.25	59.79	5.00
T <sub>4</sub>	Control	48.33	29.25	47.92	24.25
	CD at 5%	3.4	3.68	5.72	2.72
	C.V.	3.84	14.77	6.61	12.83

**Table 41. Effect of fungicides on management of Pokkah boeng - Uchani**

Treatment		Per cent Germination		Per cent disease incidence	
		Co 0238	CoH 119	Co 0238	CoH 119
T <sub>1</sub>	Sett treatment (overnight soaking with carbendazim 0.1%)	47.4	46.1	16.1	10.5
T <sub>2</sub>	Foliar spray with Carbendazim 0.05% - 3 sprays at 15 days interval	37.8	37.5	9.6	5.6
T <sub>3</sub>	T <sub>1</sub> Sett treatment+ T <sub>2</sub> Foliar spray with Carbendazim 0.05%	48.5	45.7	5.6	3.9
T <sub>4</sub>	Control	37.6	38.2	32.6	18.3
CD at 5%		3.7	2.9	3.1	3.6

**Table 42. Effect of fungicides on management of Pokkah boeng- Pusa**

Treatment		BO 154		CoSe 95422	
		Germination (%)	Disease incidence (%)	Germination (%)	Disease incidence (%)
T1	Sett treatment (Carbendazim 0.1%)	31.2	9.0	30.0	9.8
T2	Foliar spray (Carbendazim 0.1%) three sprays at 15 days interval	30.0	9.4	28.0	10.2
T3	T1+T2	34.4	7.6	31.6	8.6
T4	Control	20.2	16.4	24.0	13.0
	SEm±	1.08	0.39	1.13	0.52
	CD	3.81	1.39	3.98	1.81
	CV	6.46	6.46	6.88	8.57

**Table 43. Effect of fungicides on management of Pokkah boeng-Seorahi**

Treatments	Co 0238		CoS 08279	
	Germination %	Disease incidence %	Germination %	Disease incidence %
<b>T-1:</b> Sett treatment – Overnight soaking with Carbendazim (0.1% a.i.)	54.1	17.5	53.4	15.2
<b>T-2:</b> Foliar spray-Carbendazim (0.05% a.i. -3 spray at 15 days interval from May 15 <sup>th</sup> )	50.2	20.1.	51.6	19.0
<b>T-3:</b> Sett treatment (T-1)+ Foliar spray with Carbendazim (T-2)	56.2	10.4	54.2	11.2
<b>T-4:</b> Control	48.0	26.4	48.4	28.5

**Table 44. Effect of fungicides on management of Pokkah boeng- Anakapalle**

Treatment		Disease incidence (%)	Yield (t/ha)
T <sub>1</sub>	Sett treatment – Overnight soaking with Carbendazim @ 0.1%	15.16 (22.87)	104.20
T <sub>2</sub>	Foliar spray – Carbendazim @0.05% (3 sprays at 15 day interval from May 15 <sup>th</sup> )	7.94 (16.31)	104.50
T <sub>3</sub>	Sett treatment (T <sub>1</sub> ) + Foliar spray – Carbendazim @0.05% (T <sub>2</sub> )	8.79 (17.10)	106.20
T <sub>4</sub>	Control	24.97 (29.90)	99.30
	CD (0.05)	4.24	N.S.
	CV%	12.45	9.27

Table 45. Effect of fungicides on growth parameters and incidence of Brown spot disease of sugarcane - Pune

Sl. No	Treatment	Germination %	Total height (CM)	Mill. height (CM)	Internodes (Nos.)	Girth (CM)	Length (CM)	CCS %	Yield t/ha	CCS t/ha	PDI	Disease control %	B:C Ratio
1	T1	47.00	292.17	268.33	31.11	11.66	13.44	21.08	137.30	13.87	20.10 (4.47)	61.66 (51.80)	1:2.24
2	T2	44.33	286.11	258.89	30.77	10.22	13.33	20.45	125.76	14.49	26.70 (5.16)	49.29 (44.58)	1:2.07
3	T3	49.33	294.11	273.89	32.32	11.55	13.78	21.98	141.11	14.58	15.93 (3.98)	69.72 (56.65)	1:2.27
4	T4	55.17	290.77	266.67	32.17	11.33	12.33	18.89	127.74	14.55	22.82 (4.77)	56.90 (48.97)	1:2.10
5	T5	52.67	282.33	268.33	31.50	11.50	13.17	19.71	132.61	13.31	24.67 (4.96)	53.46 (46.98)	1:2.17
6	T6	45.83	268.88	248.89	30.43	11.11	12.33	17.69	117.13	14.21	52.89 (7.27)	0.00 (1.17)	1:1.94
	S.E ±	2.93	10.91	11.83	1.05	0.37	0.37	0.90	5.15	1.45	0.17	1.62	
	C.D.@ 5%	8.14	32.56	32.29	3.14	1.09	1.09	2.68	15.38	4.33	0.49	4.82	
	C.V	10.34	6.62	7.76	5.81	5.64	5.64	11.00	6.85	13.60	5.60	6.75	
		NS	NS	NS	NS	NS	NS	NS	NS	NS	S	S	

Figures in parenthesis are sine & square root transformed values

**Table 46. Effect of various treatments on sugarcane red rot incidence under field conditions – Shajahanpur**

Treatment	Germination (%)	Shoot Population (Per ha)	NMC (Per ha)	Percent mean incidences of red rot
T <sub>1</sub> - Sett treatment in STD with fungicide	50.00	61728	32099	4.41
T <sub>2</sub> - Sett treatment in STD with fungicide + Soil drenching by 45 <sup>th</sup> & 90 <sup>th</sup> day	54.44	85185	60185	1.79
T <sub>3</sub> - Infected setts/ Setts + Grain inoculum	6.67	8642	4321	20.07
T <sub>4</sub> - Healthy setts (Untreated)	63.33	115431	74074	0.82
CD	7.59	29512	14220	-
SE	2.15	8366	4031	-

**Table 47. Effect of various treatments on sugarcane red rot incidence under field conditions - Seorahi**

Treatments	Co 0238		CoJ 64	
	Germination %	% disease /crop survival	Germination %	Disease incidence %
T <sub>1</sub> : Sett treatment in STD with fungicide <i>Thiophanate methyl</i> (Hexa top 0.1%)	49.4	7.2	47.0	7.8
T <sub>2</sub> : Sett treatment in STD with fungicide <i>Thiophanate methyl</i> (Hexa top 0.1%) + Spray by 45 <sup>th</sup> & 90 <sup>th</sup> days	56.2	5.5	54.6	6.0
T <sub>3</sub> : Infected setts + Grain inoculums	26.0	12.6	24.8	13.2
T <sub>4</sub> : Healthy sett/Control	34.4	10.0	33.0	10.2



**Table 48. Effect of various treatments on sugarcane red rot incidence under field conditions - Anakkapalle**

Treatment	Particulars	Average red rot incidence
T1	Sett treatment in STD with Thiophanate methyl	8.5 (3.08)
T2	Sett treatment in STD with Thiophanate methyl + Soil drenching with Thiophanate methyl by 45 <sup>th</sup> & 90 <sup>th</sup> day	4.75 (2.36)
T3	Soil drenching with Thiophanate methyl by 45 <sup>th</sup> & 90 <sup>th</sup> day	6.00 (2.64)
T4	Infected setts	17.0 (4.24)
T5	Healthy setts	4.5 (2.34)
	CD (0.05)	0.47
	CV%	10.32

**Table 49. Effect of various treatments on sugarcane red rot incidence under field conditions - Cuddalore**

Treatment	Treatment	Germination (%)	NMC (000'/ha)	Red rot incidence (%)	Yield (t ha <sup>-1</sup> )
T <sub>1</sub>	Sett treatment in STD with thiophanate methyl 70 WP 0.1%	88.6 (70.30)	103.6	6.7 (15.04)	94.7
T <sub>2</sub>	Sett treatment in STD with thiophanate methyl 70WP 0.1% + Soil drenching by 45 <sup>th</sup> & 90 <sup>th</sup> day	87.4 (69.23)	112.3	4.8 (12.68)	102.4
T <sub>3</sub>	Setts + Grain inoculum	62.5 (52.27)	88.7	14.8 (22.67)	76.5
T <sub>4</sub>	Healthy setts	74.6 (59.79)	121.2	3.3 (10.53)	106.5
	SEd	2.85	4.24	0.64	3.69
	CD (0.05%)	6.20	9.23	1.40	8.04

**Table 50. Effect of various treatments on sugarcane smut incidence under field conditions - Seorahi**

Treatments	Co 0238		Co 1158	
	Germination %	Percent disease/crop survival	Germination %	Percent disease /crop survival
T-1: Setts treatment in STD with fungicide Propiconazole (Tilt-25Ec 0.4ml/lit or 100ppm)	62.0	5.6-	60.2	5.8-
T-2: Setts treatment in STD with fungicide Propiconazole (Tilt-25Ec 0.4ml/lit or 100ppm) + Spray by 45th & 90th days	63.8	4.8-	61.6	5.2-
T-3: Setts from infected clump	36	14.0-	33.8	12.4-
T-4: Healthy sett/Control	48.2	8.2-	44.6	8.6-

**Table 51. Effect of various treatments on sugarcane smut incidence under field conditions - Cuddalore**

Treatment		Germination (%)	NMC (000 <sup>3</sup> /ha)	Smut incidence (%)	Yield (t/ha)
T <sub>1</sub>	Setts treatment in STD with Propiconazole (25 EC) – 0.4ml/ lit	84.4 (66.75)	112.8	9.2 (17.70)	97.4
T <sub>2</sub>	Setts treatment in STD with Propiconazole (25 EC) – 0.4ml/ lit + spray by 45 <sup>th</sup> and 90 <sup>th</sup> day	82.3 (65.17)	121.1	6.6 (14.79)	106.8
T <sub>3</sub>	Setts from infected clump	80.2 (63.61)	84.5	28.4 (32.22)	78.3
T <sub>4</sub>	Healthy setts	86.5 (68.51)	128.0	3.8 (11.30)	110.3
	SEd	4.13	4.47	0.93	3.81
	CD (0.05%)	NS	9.74	2.04	8.29

**Table 52. Effect of various treatments on sugarcane wilt incidence under field conditions - Seorahi**

Treatments	Co 0238	
	Germination %	Percent disease /crop survival
T-1: Sett treatment in STD with fungicide Propiconazole (Tilt-25Ec 0.4ml/lit or 100ppm)	60.2	5.8
T-2: Sett treatment in STD with fungicide Propiconazole (Tilt-25Ec 0.4ml/lit or 100ppm) + Soil drenching Bavistin(1g/lit) at 45 <sup>th</sup> & 90 <sup>th</sup> days	62.0	5.0
T-3: Setts from infected clump	35.2	14.3
T-4: Healthy sett/Control	44.6	8.8

**Table 53. Effect of various treatments on sugarcane wilt incidence under field conditions - Anakkapalle**

Treatment	Particulars	Average wilt incidence
T1	Sett treatment in STD with Propiconazole (0.4ml/L)	8.60 (2.98)
T2	Sett treatment in STD with Propiconazole (0.4ml/L) + Soil drenching with carbendazim@0.1% by 45 <sup>th</sup> & 90 <sup>th</sup> day	3.57 (2.13)
T3	Soil drenching with carbendazim@0.1% by 45 <sup>th</sup> & 90 <sup>th</sup> day	4.12 (2.25)
T4	Infected setts	15.72 (4.06)
T5	Healthy setts	8.32 (2.96)
	CD (0.05)	0.74
	CV%	16.60

**Table 54. Effect of sett treatment with STD on settling vigour - Anakkapalle**

Treatment		Sett germination (%)	Average seedling length (cm)	Seedling vigour
T1	Treated (Sett treatment with STD using mixture of Urea – 0.5g /L + ZnSO <sub>4</sub> – 0.5g/L + FeSO <sub>4</sub> – 0.5g/L+ carbendazim-0.5g/L+Fipronil - 0.5ml/L	83.33	37.71	3141
T2	Untreated	70.83	30.01	2125

Table 55. Reaction of ZVT entries for red rot, smut and wilt (North West Zone-I)

Sl. No.	Genotype	Red rot												Smut			Wilt		YLD			
		Lucknow				Kapurthala				Uchani				Lucknow	Kapurthala	Uchani	Lucknow	Kapurthala	Lucknow	Kapurthala	Uchani	
		Plug		Nodal		Plug		Nodal		Plug		Nodal										
		CF08	CF09	CF08	CF09	CF08	CF09	CF08	CF09	CF08	CF09	CF08	CF09									
<b>Initial Varietal Trial (Early)</b>																						
1	CoLk 17201	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	R	MR	MR	-	R	-	MR	MR	
2	CoLk 17202	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	MS	R	R	W	R	Y	R	MS	
3	CoLk 17203	MR	MR	R	R	MS	MS	S	R	MR	MR	R	R	S	MR	MR		MS	-	MS	MS	
4	CoPant17221	S	S	S	S	S	S	S	S	MS	MS	R	R	MS	MS	MS	-	MR	-	MS	MS	
5	CoPb 17211	MR	MR	R	R	MR	MR	R	R	MR	MS	R	R	R	MR	MR	W	R	-	R	MS	
6	CoPb 17212	MR	MR	R	R	MS	MS	R	R	S	S	S	S	R	MR	MR	-	MR	-	MR	S	
7	CoS 17231	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	R	MR	MR	MR	-	R	-	R	MS
<b>Initial Varietal Trial (Midlate)</b>																						
1	Co 17018	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	S	MR	MR	W	R	-	R	S	
2	CoH 17261	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	R	MS	R	-	MS	-	MR	MR	
3	CoH 17262	S	S	S	S	MR	MR	R	R	MR	MR	R	R	R	MR	R	-	R	-	MR	MR	
4	CoLk 17204	MR	MR	R	R	MR	MR	R	R	MS	MR	R	R	R	R	R	-	R	-	R	S	
5	CoLk 17205	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	R	MR	MS	-	MR	-	MR	MS	
6	CoPant 17223	MR	MR	R	R	MR	MR	R	R	MR	MS	R	R	MR	MR	MS	W	R	Y	R	S	
7	CoPant 17224	HS	HS	S	S	HS	HS	S	S	S	S	S	S	MS	MR	MR	-	MR	Y	MR	MR	
8	CoPb 17213	S	S	S	S	MR	MR	R	R	MS	MR	R	R	MS	MR	MR	-	R	-	MR	MS	
9	CoPb 17214	MS	MS	R	R	MR	MR	R	R	MS	MS	R	R	MR	MR	MR	W	MS	-	MS	MS	
10	CoPb 17215	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	R	MR	MR	-	R	-	R	MS	
11	CoS 17233	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	R	MS	MS	W	R	Y	MR	S	
12	CoS 17234	MR	MR	R	R	MR	MR	R	R	MS	MS	R	R	R	MR	MS	W	R	-	R	S	
13	CoS 17235	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	MR	MR	MR	-	MR	-	R	MR	
14	CoS 17236	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	R	MR	MS	-	MS	-	MS	MS	
15	CoS 17237	MR	MR	R	R	HS	HS	S	S	HS	HS	S	S	R	MS	MS	W	MR	-	R	MR	
<b>Advanced Varietal Trial (Early)-I Plant</b>																						
1	Co 15025	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	R	R	MR	W	MS	-	MR	MR	
2	Co 16029	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	MS	MS	R	-	MR	-	MS	MS	
3	CoLk 14201	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	R	MS	MS	-	MR	-	R	MR	

Sl. No.	Genotype	Red rot												Smut			Wilt		YLD		
		Lucknow				Kapurthala				Uchani				Lucknow	Kapurthala	Uchani	Lucknow	Kapurthala	Lucknow	Kapurthala	Uchani
		Plug		Nodal		Plug		Nodal		Plug		Nodal									
		CF08	CF09	CF08	CF09	CF08	CF09	CF08	CF09	CF08	CF09	CF08	CF09								
4	CoLk 16201	R	R	R	R	MR	MR	R	R	MR	MR	R	R	MS	MR	MS	-	MR	-	MS	MS
5	CoLk 16202	MR	MR	R	R	MR	MR	R	R	MS	MR	R	R	R	MR	MR	-	MS	-	MR	MR
6	CoPb 16181	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	R	MR	MR	-	R	-	R	MR
<b>Advanced Varietal Trial (Early)-II Plant</b>																					
1	Co 15023	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	R	MR	MR	-	MS	-	MR	MR
2	Co 15024	MS	MS	R	R	MS	MR	R	R	MS	MR	R	R	R	MS	R	W	MR	-	MS	MS
3	Co 15027	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	R	MR	MS	W	R	-	MR	MR
4	CoLk 15201	MR	MR	R	R	MR	MR	R	R	MS	MS	R	R	R	MS	MS	-	MR	-	R	S
5	CoLk 15205	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	R	MS	MR	-	R	-	MR	MR
6	CoPb 15212	MS	MS	R	R	MR	MS	R	R	MR	MR	R	R	R	MR	MR	-	R	-	MR	MR
<b>Advanced Varietal Trial (Mid late)-I Plant</b>																					
1	Co 16030	MS	MS	R	R	MR	MR	R	R	MR	MS	R	R	R	R	MR	-	MS	-	MR	MS
2	CoLk 16203	MR	MR	R	R	MR	MR	R	R	MS	MR	R	R	R	MS	MR	-	MR	-	MS	MR
3	CoLk 16204	R	R	R	R	MR	MR	R	R	MR	MR	R	R	R	MS	MR	-	MR	-	MR	MR
4	CoS 16232	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	R	MR	MR	-	MS	-	MR	MR
5	CoS 16233	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	R	MS	MR	-	MR	-	R	MR
<b>Advanced Varietal Trial (Mid late)-II Plant</b>																					
1	Co 15026	MR	MR	R	R	MR	MR	R	R	MR	MR	R/S	R/MS	R	MS	MS	W	MR	-	MR	MR
2	CoLk 15206	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	MR	MR	MR	-	R	-	R	MS
3	CoLk 15207	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	MR	MS	MS	-	MR	-	MR	MR
4	CoLk 15209	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	MS	MS	MS	-	R	-	MR	MR
5	CoPb 15213	MR	MR	R	R	MR	MR	R	R	MS	MR	R	R	R	MR	MR	W	MR	-	MS	S
6	CoS 15232	MR	MR	R	R	MR	MS	R	R	MS	MR	R	R	R	MS	MR		MS	-	MR	MS
7	CoS 15233	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	R	MR	MR	-	R	-	R	MR
<b>Checks</b>																					
1	CoJ 64	HS	S	-	-	HS	HS	S	S	HS	HS	S	S	-	MS	MS	-	-	-	-	MS
2	CoS 767	S	S	-	-	S	S	S	S	S	S	S	S	-	S	S	-	-	-	MR	S
3	Co 1158	-	-	-	-	-	-	-	-	-	-	-	-	S	HS	-	-	-	-	-	-
4	CoLk 7701	-	-	-	-	-	-	-	-	-	-	-	-	S	-	-	-	-	-	-	-

Sl. No.	Genotype	Red rot												Smut			Wilt		YLD		
		Lucknow				Kapurthala				Uchani				Lucknow	Kapurthala	Uchani	Lucknow	Kapurthala	Lucknow	Kapurthala	Uchani
		Plug		Nodal		Plug		Nodal		Plug		Nodal									
		CF08	CF09	CF08	CF09	CF08	CF09	CF08	CF09	CF08	CF09	CF08	CF09								
5	Co 0238	-	-	-	-	MR	MR	R	R	MR	MR	R	R	-	S	S	-	-	-	MS	S
6	Co 05009	-	-	-	-	MR	MR	R	R	MS	MR	R	R	-	MR	MR	-	-	-	MS	S
7	Co 05011	-	-	-	-	MR	MR	R	R	MR	MR	R	R	-	MR	MR	-	-	-	-	MS
8	CoPant 97222	-	-	-	-	S	S	S	S	S	S	S	S	-	S	S	-	-	-	-	S
9	Co 740	-	-	-	-	-	-	-	-	-	-	-	-	-	HS	-	-	-	-	-	-
10	Co 62175	-	-	-	-	-	-	-	-	-	-	-	-	-	HS	-	-	-	-	-	-
11	NCo 310	-	-	-	-	-	-	-	-	-	-	-	-	-	HS	-	-	-	-	-	-
12	Katha	-	-	-	-	-	-	-	-	-	-	-	-	-	HS	-	-	-	-	-	-
13	Co 7717	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	HS	-	-	-
14	Co 89003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	HS	-	-	-

Table 56. Reaction of ZVT entries for red rot, smut and wilt (North West Zone-II)

Sl. No.	Genotype	Red rot												Smut		Wilt		YLD		
		Shahjahanpur				Pantnagar				Karnal				Shahjahanpur	Pantnagar	Shahjahanpur	Pantnagar	Shahjahanpur	Pantnagar	Karnal
		Plug		Nodal		Plug		Nodal		Plug		Nodal								
		CF08	CF09	CF08	CF09	CF08	CF09	CF08	CF09	CF08	CF09	CF08	CF09							
<b>Initial Varietal Trial (Early)</b>																				
1	CoLk 17201	MR	MR	R	R	MS	MS	R	R	MR	MR	R	R	MR	R	R	-	R	MR	R
2	CoLk 17202	MR	MR	R	R	MR	MS	R	R	MR	MR	R	R	R	MR	R	-	S	R	R
3	CoLk 17203	S	MS	S	R	MR	MR	R	R	MR	MR	R	R	R	HS	R	-	MR	R	MR
4	CoPant 17221	MS	MS	R	R	MR	MR	R	R	MS	MS	R	R	R	MR	S	-	MR	R	MS
5	CoPb 17211	MS	MR	R	R	MS	MS	R	R	MR	MR	R	R	R	R	HS	-	R	R	R
6	CoPb 17212	S	MS	S	R	Not-Planted				HS	S	S	S	S	NP	HS	-	MR	NP	-
7	CoS 17231	MR	MR	R	R					MR	R	R	R	MR	NP	R	-	R	NP	-
<b>Initial Varietal Trial (Midlate)</b>																				
1	Co 17018	MR	MR	R	R	MS	MR	R	R	MR	MR	R	R	R	MS	S	-	MR	R	MR
2	CoH 17261	MR	MS	R	R	MR	MR	R	R	MR	MR	R	R	R	R	MR	-	MR	R	R
3	CoH 17262	MR	MR	R	R	MR	R	R	R	MR	MR	R	R	MS	R	MR	-	MR	MR	MR
4	CoLk 17204	MR	MR	R	R	MS	MR	R	R	MS	MR	R	R	MS	S	R	-	MR	R	MS
5	CoLk 17205	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	S	MS	R	-	R	R	R
6	CoPant 17223	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	R	MR	MS	-	MS	R	MR
7	CoPant 17224	S	S	S	S	MR	MR	R	R	S	HS	S	S	R	MR	MS	-	MR	R	R
8	CoPb 17213	MR	MS	R	R	MS	MR	R	R	MS	MR	R	R	MR	MR	S	-	S	R	MR
9	CoPb 17214	MR	MS	R	R	MR	MS	R	R	MS	MS	R	R	MR	MS	S	-	MR	MS	S
10	CoPb 17215	MR	MR	R	R	MS	MS	R	R	MR	MR	R	R	R	HS	MS	-	MR	R	R
11	CoS 17233	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	R	R	MR	-	MR	R	S
12	CoS 17234	MR	MR	R	R	MS	MS	R	R	MS	MS	R	R	R	MS	MR	-	S	R	MS
13	CoS 17235	MR	MR	R	R	MS	MR	R	R	MR	MR	R	R	R	MS	MR	-	MR	R	R
14	CoS 17236	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	MR	MS	MS	-	MR	R	R
15	CoS 17237	HS	HS	S	S	MS	MS	R	R	HS	HS	S	S	R	MS	MS	-	MS	R	MS
<b>Advanced Varietal Trial (Early)-I Plant</b>																				
1	Co 15025	MR	MR	R	R	R	R	R	R	MR	MR	R	R	MR	R	S	-	MR	R	MR
2	Co 16029	R	MR	R	R	MR	R	R	R	R	MR	R	R	MR	HS	HS	-	MR	R	R

Sl. No.	Genotype	Red rot												Smut		Wilt		YLD		
		Shahjahanpur				Pantnagar				Karnal				Shahjahanpur	Pantnagar	Shahjahanpur	Pantnagar	Shahjahanpur	Pantnagar	Karnal
		Plug		Nodal		Plug		Nodal		Plug		Nodal								
		CF08	CF09	CF08	CF09	CF08	CF09	CF08	CF09	CF08	CF09	CF08	CF09							
3	CoLk 14201	MR	MR	R	R	MR	MR	R	R	-	-	-	-	MS	MR	R	-	MR	R	-
4	CoLk 16201	MR	MR	R	R	MS	MR	R	R	R	MR	R	R	MS	S	MS	-	MR	R	MS
5	CoLk 16202	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	R	MR	MR	-	R	R	R
6	CoPb 16181	MS	MR	R	R	MS	MS	R	R	MR	MR	R	R	MS	HS	MS	-	R	R	MS
<b>Advanced Varietal Trial (Early)-II Plant</b>																				
1	Co 15023	MR	R	R	R	MR	MR	R	R	R	MR	R	R	R	MR	HS	-	MR	R	MR
2	Co 15024	MS	MR	R	R	MR	MR	R	R	MR	MR	R	R	R	R	HS	-	R	R	R
3	Co 15027	MR	MR	R	R	MR	R	R	R	R	MR	R	R	R	MS	S	-	R	R	R
4	CoLk 15201	MR	MS	R	R	MS	MS	R	R	MS	MS	R	R	MS	MS	R	-	MS	MS	R
5	CoLk 15205	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	MS	MS	R	-	R	R	MR
6	CoPb 15212	MS	MS	R	R	MR	MR	R	R	MS	MS	R	R	MR	R	R	-	MR	R	R
<b>Advanced Varietal Trial (Mid late)-I Plant</b>																				
1	Co 16030	MR	MR	R	R	MR	MR	R	R	R	MR	R	R	MR	R	MS	-	R	R	R
2	CoLk 16203	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	MS	MS	R	-	R	R	R
3	CoLk 16204	MR	R	R	R	MR	MR	R	R	MR	MR	R	R	S	S	R	-	R	R	MR
4	Cos 16232	MR	R	R	R	MR	MR	R	R	MR	MR	R	R	MS	MS	MS	-	R	R	R
5	CoS 16233	MR	R	R	R	MR	MR	R	R	MR	MR	R	R	MR	MS	MR	-	MR	R	R
<b>Advanced Varietal Trial (Mid late)-II Plant</b>																				
1	Co 15026	MR	R	R	R	MS	MR	R	R	R	MR	R	R	MS	MS	S	-	R	R	MR
2	CoLk 15206	MR	MR	R	R	MR	MR	R	R	MR	MS	R	R	MR	R	MR	-	R	R	MR
3	CoLk 15207	MR	R	R	R	MR	MR	R	R	MR	MR	R	R	MS	MS	MR	-	MS	R	R
4	CoLk 15209	MR	MR	R	R	MR	MR	R	R	R	MR	R	R	S	HS	MR	-	R	MR	R
5	CoPb 15213	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	MR	HS	HS	-	MR	R	MS
6	CoS 15232	MR	MR	R	R	MS	MS	R	R	MR	MR	R	R	R	MS	MS	-	R	R	MR
7	CoS 15233	MR	R	R	R	MR	R	R	R	R	MR	R	R	MR	MR	MS	-	R	R	MS
<b>Checks</b>																				
1	Co 0238	MR	MR	R	R	MS	MR	R	R	MR	MR	R	R	MS	HS	R	-	MR	R	MR
2	Co 05009	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	R	MS	MR	-	MR	R	R
3	CoJ 64	HS	HS	S	S	S	S	R	R	S	MR	S	R	MR	MR	MR	-	R	R	MS



Sl. No.	Genotype	Red rot												Smut		Wilt		YLD		
		Shahjahanpur				Pantnagar				Karnal				Shahjahanpur	Pantnagar	Shahjahanpur	Pantnagar	Shahjahanpur	Pantnagar	Karnal
		Plug		Nodal		Plug		Nodal		Plug		Nodal								
		CF08	CF09	CF08	CF09	CF08	CF09	CF08	CF09	CF08	CF09	CF08	CF09							
4	CoPant 97222	MR	MR	R	R	MS	MS	R	R	MS	MR	R	R	MS	MS	MS	-	R	R	MS
5	Co 05011	MR	MR	R	R	MS	MR	R	R	R	MR	R	R	S	MR	MS	-	MR	MS	R
6	CoS 767	HS	HS	S	S	S	S	R	R	R	MR	R	R	MS	MR	MR	-	R	MS	MS
7	Co 1158	-	-	-	-	-	-	-	-	-	-	-	-	S	-	-	-	-	-	-
8	CoPant 84211	S	R	MR	R	-	-	-	-	-	-	R	R	-	-	-	-	-	-	MR
9	CoS 8436	MR	R	MR	R	-	-	-	-	-	-	R	R	-	-	-	-	-	-	R

Table 57. Reaction of ZVT entries for red rot, smut and wilt (North Central & North East Zones)

Sl. No	Genotypes	Red rot																Smut			Wilt		YLD		
		Motipur				Seorahi				Pusa				Buralikson				Motipur	Seorahi	Pusa	Motipur	Pusa	Motipur	Seorahi	Pusa
		Plug		Nodal		Plug		Nodal		Plug		Nodal		Plug		Nodal									
		CF07	CF08	CF07	CF08	CF07	CF08	CF07	CF08	CF07	CF08	CF07	CF08	CF07	CF08	CF07	CF08								
<b>IVT (Early)</b>																									
1	CoBln 17501	MR	MR	R	R	MR	MR	R	R	MR	MR	S	R	MR	MR	R	R	R	R	MR	W	MS	-	MR	MS
2	CoP 17436	MR	MR	R	R	MR	MR	R	R	MR	R	R	R	-	-	-	-	R	R	R	-	MR	Y	R	R
3	CoP 17437	MS	MS	S	S	MR	MR	R	R	MR	R	R	R	-	-	-	-	R	MR	R	-	MR	-	MS	R
4	CoP 17438	MR	MR	R	R	MR	MR	R	R	MS	MR	S	S	-	-	-	-	R	R	MR	-	MS	-	MS	R
5	CoP 17440	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	-	-	-	-	R	MR	MR	-	MR	Y	MR	R
6	CoP 17441	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	-	-	-	-	MS	R	MR	W	MR	-	MR	R
7	CoSe 16454	MR	MR	R	R	MR	MR	R	R	MS	MR	R	R	-	-	-	-	R	R	MR	-	MR	-	R	R
8	CoSe 17451	MR	MR	R	R	MR	MR	R	R	MR	MR	R	R	-	-	-	-	MR	R	MR	W	MR	Y	MR	R
<b>IVT (Mid late)</b>																									
1	CoBln 17502	S	S	S	S	S	MS	S	S	MS	MS	S	R	MS	MS	S	S	MR	MR	MR	-	S	Y	R	MS
2	CoP 17444	MS	MS	S	S	MR	MR	R	R	MS	MS	S	S	-	-	-	-	R	MR	MR	-	S	Y	R	R
3	CoP 17446	MR	MR	R	R	MR	MR	R	R	R	R	R	R	-	-	-	-	R	MR	R	-	MR	-	R	R
4	CoSe 16455	MS	MS	S	S	MR	MR	R	R	MR	MR	R	R	-	-	-	-	R	MR	R	-	MS	Y	R	MR
5	CoSe 16456	MR	MR	R	R	MR	MR	R	R	MR	R	R	R	-	-	-	-	MS	R	MR	-	MR	-	R	R
6	CoSe 17452	MS	MS	R	R	MR	MR	R	R	S	MS	S	R	-	-	-	-	R	R	MR	-	S	-	MS	R
<b>AVT (Early) I Plant</b>																									
1	CoLk 16466	MR	MR	R	R	MR	MR	R	R	-	-	-	-	MS	MR	S	R	MR	S	-	-	-	-	MR	-
2	CoLk 16468	MR	MR	R	R	MR	MR	R	R	-	-	-	-	MR	R	R	R	MR	R	-	-	-	-	R	-
3	CoP 16437	MR	MR	R	R	MR	MR	R	R	-	-	-	-	MR	MR	R	R	R	R	-	-	-	-	R	-
4	CoP 16438	MR	MR	R	R	MS	MR	R	R	-	-	-	-	-	-	-	-	MR	MS	-	W	-	-	R	-
5	CoSe 16451	MS	MS	S	S	MR	MR	R	R	-	-	-	-	-	-	-	-	R	R	-	-	-	-	R	-

Sl. No	Genotypes	Red rot																Smut			Wilt		YLD		
		Motipur				Seorahi				Pusa				Buralikson				Motipur	Seorahi	Pusa	Motipur	Pusa	Motipur	Seorahi	Pusa
		Plug		Nodal		Plug		Nodal		Plug		Nodal		Plug		Nodal									
		CF07	CF08	CF07	CF08	CF07	CF08	CF07	CF08	CF07	CF08	CF07	CF08	CF07	CF08	CF07	CF08								
<b>AVT (Early) II Plant</b>																									
1	CoLk 15466	MR	MR	R	R	-	-	-	-	-	-	-	-	-	-	-	-	R	-	-	-	-	-	-	-
2	CoLk 15467	MR	MR	R	R	-	-	-	-	-	-	-	-	-	-	-	-	MR	-	-	-	-	-	-	-
3	CoP 15436	MR	MR	R	R	-	-	-	-	-	-	-	-	-	-	-	-	MS	-	-	-	-	-	-	-
4	CoSe 15452	MR	MR	R	R	-	-	-	-	-	-	-	-	MS	MS	S	S	MR	-	-	-	-	-	-	-
5	CoSe 15455	MR	MR	R	R	-	-	-	-	-	-	-	-	MR	MS	R	S	MR	-	-	-	-	-	-	-
<b>AVT (I-Plant Mid Late)</b>																									
1	CoBlN 16502	MR	MR	R	R	MS	MS	R	R	-	-	-	-	MR	MR	R	R	R	S	-	W	-	-	R	-
2	CoLk 16470	MR	MR	R	R	MS	MS	R	R	-	-	-	-	MR	MR	S	R	R	MS	-	-	-	Y	R	-
3	CoP 16439	MR	MR	R	R	MR	MR	R	R	-	-	-	-	R	R	R	R	MS	MS	-	-	-	Y	MS	-
4	CoSe 16452	MR	MR	R	R	MR	MR	R	R	-	-	-	-	MR	MR	R	R	MR	R	-	-	-	-	R	-
<b>AVT (II-Plant Mid Late)</b>																									
1	CoLk 15468	MR	MR	R	R	-	-	-	-	-	-	-	-	MR	MR	R	R	R	-	-	-	-	-	-	-
2	CoLk 15469	MR	MR	R	R	-	-	-	-	-	-	-	-	R	MR	R	R	R	-	-	-	-	-	-	-
3	CoP 15438	MR	MR	R	R	-	-	-	-	-	-	-	-	MR	MR	R	R	R	-	-	-	-	Y	-	-
4	CoP 15439	MR	MR	R	R	-	-	-	-	-	-	-	-	MR	MR	R	R	R	-	-	-	-	Y	-	-
5	CoP 15440	MR	MR	R	R	-	-	-	-	-	-	-	-	MR	MR	R	R	MS	-	-	-	-	Y	-	-
6	CoSe 15453	MR	MR	R	R	-	-	-	-	-	-	-	-	-	-	-	-	MR	-	-	-	-	-	-	-
7	CoSe 15454	MR	MR	R	R	-	-	-	-	-	-	-	-	-	-	-	-	R	-	-	W	-	Y	-	-
<b>Checks</b>																									
1	CoJ 64	HS	HS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	R	-	-	-	-	-	-	-
2	CoSe 95422	S	S	S	S	MS	S	R	R	HS	S	S	S	S	S	S	S	MR	MR	MR	-	S	-	R	-
3	Co 1158	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	HS	S	-	-	-	-	-	-
4	CoLk 7701	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	S	-	-	-	-	-	-	-
5	BO 91	-	-	-	-	MR	MR	R	R	MR	R	R	R	MR	MR	R	R	-	R/ MR	R	-	MR	-	R	R

Sl. No	Genotypes	Red rot																Smut			Wilt		YLD		
		Motipur				Seorahi				Pusa				Buralikson				Motipur	Seorahi	Pusa	Motipur	Pusa	Motipur	Seorahi	Pusa
		Plug		Nodal		Plug		Nodal		Plug		Nodal		Plug		Nodal									
		CF07	CF08	CF07	CF08	CF07	CF08	CF07	CF08	CF07	CF08	CF07	CF08	CF07	CF08	CF07	CF08								
6	CoLk 94184	-	-	-	-	MR	MR	R	R	-	-	-	-	MR	MR	R	R	-	R	-	-	-	-	R	-
7	CoP 9301	-	-	-	-	MR	MR	R	R	-	-	-	-	MR	R	R	R	-	R	-	-	-	-	R	-
8	CoP 06436	-	-	-	-	MS/ MR	MR	R	R	-	-	-	-	MR	MR	R	R	-	R/ MR	-	-	-	-	R	-
9	CoSe 01421	-	-	-	-	MR	MR	R	R	-	-	-	-	MR	MR	R	R	-	MR	-	-	-	-	MR	-

Table 58. Reaction of ZVT entries for red rot, smut and wilt (East Coast Zone)

Sl. No.	Genotypes	Anakapalle					Cuddalore			
		Red rot (CF06)		Smut	Wilt	YLD	Red rot (CF06)		Smut	YLD
		Plug	Nodal				Plug	Nodal		
<b>IVT – Early</b>										
1	CoOR 18346	R	R	MR	R	R	MR	R	MR	R
2	CoV 18356	R	R	MR	R	R	MR	R	MR	R
3	CoV 18357	R	R	MR	MR	R	MR	R	MR	R
<b>AVT – Early I Plant</b>										
1	CoA 17321	R	R	MS	MS	R	MR	R	S	R
2	CoA 17323	R	R	HS	MS	R	MR	R	MS	R
3	CoC 17336	R	R	S	MS	MR	MR	R	MS	MR
<b>AVT – Early II Plant</b>										
1	CoA 16321	R	R	MS	S	R	MR	R	MR	MR
2	CoC 16336	MS	R	MR	MS	R	MS	R	MS	MR
3	CoC 16337	MS	R	S	MR	R	MR	R	MS	MR
4	CoV 16356	MR	R	S	S	R	MR	R	MS	R
<b>AVT- Midlate Plant I</b>										
1	CoC 15339	MR	R	HS	MR	R	MR	R	MS	MR
2	CoC 16338	MS	R	HS	MR	R	MS	R	S	MR
3	CoC 16339	MR	R	MR	MS	MR	MR	R	MR	MR
4	CoOR 15346	R	R	MR	MR	R	MR	R	MR	R
5	CoV 16357	R	R	MS	S	R	MR	R	S	MR
<b>Checks</b>										
1	Co 06030	MR	R	MR	R	R	-	-	-	-
2	Co 86249	R	R	MR	R	MR	R	R	HS	S
3	CoA 11321	R	R	MR	S	S	-	-	-	-

4	CoA 92081	R	R	HS	MS	R	-	-	-	-
5	CoC 01061	MR	R	MR	MS	MS	-	-	-	-
6	CoOR 03151	MR	R	S	MR	MR	-	-	-	-
7	CoV 92102	MR	R	MR	S	MR	-	-	-	-
8	Co 419	HS	S	HS	-	-	-	-	-	-
9	Co 997	HS	S	MS	-	-	-	-	-	-
10	Co 6907	S	S	MS	-	-	-	-	-	-
11	Co 7219	S	R	MS	-	-	-	-	-	-
12	Co 7706	S	R	S	-	-	-	-	-	-
13	CoA 89085	MS	R	MS	-	-	-	-	-	-
14	CoC 671	HS	S	MS	-	-	HS	S	HS	HS
15	CoA 14321	-	-	-	S	-	-	-	-	-
16	2012A 246	-	-	-	HS	-	-	-	-	-
17	2012A 249	-	-	-	S	-	-	-	-	-
18	CoV 09356	-	-	-	-	MS	-	-	-	-
19	2001A 63	-	-	-	-	MS	-	-	-	-

Table 59. Reaction of ZVT entries for red rot, smut and YLD (Peninsular Zone)

Sl No.	Genotypes	Red rot										Smut			YLD		
		Coimbatore		Thiruvalla				Navsari				Coimbatore	Navsari	Pune	Coimbatore	Navsari	Thiruvalla
		Plug	Nodal	Plug		Nodal		Plug		Nodal							
		CF06	CF06	CF06	CF12	CF06	CF12	CF06	CF12	CF06	CF12						
<b>IVT Early</b>																	
1	Co 17001	MR	R	R	R	R	R	R	R	R	R	HS	MS	HS	2.6	-	-
2	Co 17002	R	R	MR	MR	R	R	MR	MR	R	R	R	R	R	2.3	-	-
3	Co 17003	MR	R	MR	MR	R	R	R	R	R	R	HS	MS	MS	2.6	-	-
4	Co 17004	MR	R	S	MS	R	R	MR	MR	R	R	R	R	R	3.0	-	-
5	Co 17005	R	R	MR	MR	R	R	MR	MR	R	R	S	R	R	0.0	-	-
6	Co 17006	R	R	MR	MR	R	R	MR	MR	R	R	HS	S	S	4.0	-	-
7	Co 17008	R	R	-	-	-	-	R	R	R	R	HS	MS	MS	0.0	-	-
8	Co 17010	R	R	MR	MR	R	R	MR	MR	R	R	S	R	R	0.6	-	-
9	Co 17012	MR	R	-	-	-	-	MR	MR	R	R	MR	MS	MS	0.0	-	-
10	Co 17013	MR	R	MR	MR	R	R	MR	MR	R	R	HS	MR	MS	4.3	-	-
11	Co 17014	MR	R	MR	MR	R	R	MR	MR	R	R	HS	S	HS	0.0	-	-
12	CoN 17071	HS	S	S	S	S	S	MS	MS	R	R	MS	R	R	3.0	-	-
13	CoN 17072	MS	R	MS	MS	R	R	MR	MR	R	R	MS	R	R	0.0	-	-
14	CoT 17366	MR	R	-	MR	R	R	MR	MR	R	R	HS	MR	R	3.0	-	-
15	CoVC 17061	R	R	R	R	R	R	MS	MR	R	R	HS	MS	MS	0.0	-	-
16	CoVSI 17021	HS	S	-	S	S	S	HS	HS	S	S	MS	MR	MS	0.0	-	-
17	MS 17081	MR	R	MR	MR	R	R	MS	MS	R	R	R	MS	R	3.0	-	-
18	MS 17082	MS	R	-	-	-	-	HS	S	S	R	R	MR	R	1.0	-	-
<b>AVT (I plant)</b>																	
1	Co 11015	MS	R	MS	MS	R	R	MS	MS	R	R	S	MR	R	2.0	R	R
2	Co 14005	MR	R	MS	MR	R	R	MR	MR	R	R	HS	MS	R	0.0	MS	R

Sl No.	Genotypes	Red rot										Smut			YLD		
		Coimbatore		Thiruvalla				Navsari									
		Plug	Nodal	Plug		Nodal		Plug		Nodal		Coimbatore	Navsari	Pune	Coimbatore	Navsari	Thiruvalla
		CF06	CF06	CF06	CF12	CF06	CF12	CF06	CF12	CF06	CF12						
3	Co 15005	R	R	MR	MR	R	R	MR	MR	R	R	S	MS	HS	2.0	R	R
4	Co 15006	MS	R	MR	MR	R	R	MS	MS	R	R	MR	R	R	4.6	S	R
5	Co 15007	MS	R	MR	MR	R	R	MS	MS	R	R	S	S	S	0.0	MS	R
6	Co 15009	R	R	MR	MS	R	R	MS	MS	R	R	R	R	R	0.0	R	R
7	Co 15010	MS	R	MS	MS	R	R	MR	MR	R	R	MR	MR	MS	2.6	MR	R
8	Co 15017	MS	R	MR	MR	R	R	MR	MR	R	R	R	MR	R	0.5	R	R
9	Co 15021	MR	R	MR	MS	R	R	MR	MR	R	R	HS	MR	MS	0.0	MS	R
10	CoN 15071	HS	S	S	S	S	R	MR	MR	R	R	HS	R	MS	1.6	R	R
11	CoSnk 15102	MS	R	S	S	R	R	HS	S	S	R	MR	S	MS	0.0	MS	R
12	PI 15131	MR	R	MS	MS	R	R	S	HS	R	S	HS	MR	R	1.0	S	R
<b>AVT (II plant)</b>																	
1	Co 14002	-	-	MR	MS	R	R	MS	MS	R	R	-	MR	-	R	R	R
2	Co 14004	-	-	MR	MR	R	R	MR	MR	R	R	-	S	-	R	MR	R
3	Co 14012	-	-	MR	MR	R	R	MR	MR	R	R	-	HS	-	R	R	R
4	Co 14016	-	-	MR	MR	R	R	MR	MS	R	R	-	HS	-	R	MR	R
5	Co 14027	-	-	MS	MS	R	R	MS	MS	R	R	-	HS	-	R	HS	R
6	Co 14030	-	-	MS	MR	R	R	MR	MR	R	R	-	MR	-	R	MS	R
7	Co 14032	-	-	MR	MR	R	R	MR	MR	R	R	-	R	-	R	MS	R
8	CoN 14073	-	-	MS	MS	R	R	MR	MR	R	R	-	R	-	R	R	R
9	CoSnk 14102	-	-	MS	MS	R	R	MR	MR	R	R	-	MS	-	R	MS	R
10	CoSnk 14103	-	-	MR	MR	R	R	MR	MR	R	R	-	MS	-	R	MS	R
11	CoT 14367	-	-	MR	MR	R	R	MS	S	R	R	-	R	-	R	R	R
12	CoTI 14111	-	-	R	R	R	R	R	MR	R	R	-	MS	-	R	MS	R
13	CoVc 14062	-	-	MR	MR	R	R	MR	MR	R	R	-	MR	-	R	S	R



Sl No.	Genotypes	Red rot										Smut			YLD		
		Coimbatore		Thiruvalla				Navsari									
		Plug	Nodal	Plug		Nodal		Plug		Nodal		Coimbatore	Navsari	Pune	Coimbatore	Navsari	Thiruvalla
		CF06	CF06	CF06	CF12	CF06	CF12	CF06	CF12	CF06	CF12						
14	MS 14081	-	-	MR	MR	R	R	MR	MR	R	R	-	MR	-	R	MR	R
15	MS 14082	-	-	MR	MR	R	R	R	MR	R	R	-	MR	-	R	R	R
<b>Checks</b>																	
1	Co 86032	-	-	MS	MS	R	R	S	S	R	R	-	MR	MS	3.0	S	-
2	Co 09004	-	-	MR	R	R	R	MR	MR	R	R	-	MS	R	1.3	-	-
3	CoC 671	HS	S	S	S	S	S	HS	HS	S	S	-	MR	S	2.0	R	-
4	CoSnk 05103	-	-	MR	MR	R	R	MR	MR	R	R	-	MR	-	-	MR	-
5	Co 85004	-	-	-	-	-	-	-	-	-	-	-	S	-	-	-	-
6	Co 86002	-	-	-	-	-	-	-	-	-	-	-	HS	-	-	-	-
7	Co 97009	-	-	-	-	-	-	-	-	-	-	HS	HS	-	-	MS	-
8	Co 96007	-	-	-	-	-	-	-	-	-	-	HS	-	-	-	-	-
9	CoM 0265	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MS	-
10	Co 94012	HS	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	Co 740	-	-	-	-	-	-	-	-	-	-	-	-	S	-	-	-
12	Co 7219	-	-	-	-	-	-	-	-	-	-	-	-	MS	-	-	-