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No. MSRS /H-2/Patho. Report./786-87 /2016 Navsari Date: 16 / 06 /2016

To,

Dr. R. Viswanathan,
Head &AICRP Principal Investigator (Plant Pathology),
Division of Crop Protection,
Sugarcane Breeding Institute,
Coimbatore (Tamilnadu),
Pin – 641 007.

Sub: Submission of Annual Report **2015-2016** of Plant Pathology.

Dear Sir,

I am submitting herewith the results of the technical programme of **Sugarcane Plant Pathology** conducted at this station during **2015-2016** (Hard & soft copy). Kindly include the same in the Annual Report and oblige.

Thanking you,

Yours sincerely

Encl : As above

(S.C. Mali)
I/C Research Scientist (Sugarcane)

Copy submitted with respect to:

(1) The Project Coordinator, AICRP on Sugarcane, Indian Institute of Sugarcane Research, Lucknow-226 002 for information.

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ANNUAL REPORT

ALL INDIA COORDINATED RESEARCH PROJECT ON SUGARCANE

PLANT PATHOLOGY

(2015-2016)

NAVSARI AGRICULTURAL UNIVERSITY

MAIN SUGARCANE RESEARCH STATION

NAVSARI AGRICULTURAL UNIVERSITY

NAVSARI – 396 450

Plant Pathology

PLANT PATHOLOGY

PROJECT NO. PP 14

1	**Title of the experiment**	: Identification of pathotypes in red rot pathogen		
2	**Objectives**	: To gather information on major pathotypes of red rot		
3	**Year**	: 2015-2016		
4	**Centre**	: Navsari		
5	**Differentials/ Varieties**	: 19		
		1. CoC 671	8. Co 62399	15. CoV 92102
		2. BO 91	9. Co 997	16. Co 7805
		3. Co 419	10. CoS 8436	17. Co 86002
		4. Co 975	11. Co 7717	18. CoSe 95422
		5. Khakai	12. CoS 767	19. Co 86032
		6. CoJ 64	13. Co 1148	
		7. SES 594	14. Baragua	

6. Inoculation

Local Gujarat isolate was used for inoculation. Freshly sporulating, 7 days old culture in petridishes was taken. The spore mass was washed with 100 ml of sterile distilled water and collected in a flask. Conidial suspension at spore strength of 1 million spores per ml of solution was prepared. Isolates chosen were only from local red rot collections.

7. No. of isolates: Virulent isolates selected locally of the area.

8. Method of inoculation

Plug method of inoculation was used (Details vide PP. 17). Inoculation with one isolate on all varieties with the same suspension. All inoculations were completed in 2 days. Inoculation was carried out by third week of August.

9. Observation: One observation at 60^{th} day of inoculation.

10. Evaluation:

The canes split open longitudinally. Inoculated canes free from borers and other damages were taken for evaluation. Based on parameters viz. nodal transgression, lesion width, white spots, top yellowing/drying, ring infection and sporulation over the rind. Host reaction is categorized into three groups viz., Resistant (R), Susceptible (S) and Intermediate (X) as follows:

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

Note: The various criteria are assessed in the one or two internodes above the inoculated internode. Identification of pathotypes is to be based on R and S reactions.

11. Results (Table.1)

At Navsari, three isolates collected from CoC 671 (Cf 06), Co 86032 (Cf 86032) and Co 86002 (Cf 86002) were inoculated on 19 recommended differentials/ varieties/ genotypes at the age of eight months. Results revealed that CoS 767, CoS 8436, BO 91, Baragua and SES 594 showed resistant reaction for all the isolates. Entries Co 997 and Co 7717 exhibited intermediate reaction to all the isolates. While entries Co 62399 and CoJ 64 showed intermediate reaction on Cf 06 but resistant reaction on Cf 86032 and Cf 86002 and also entries Co 7805 and CoSe 95422 showed intermediate reaction on Cf 06 and Cf 86002 but resistant reaction on Cf 86032. Only one entry Co 419 intermediate reaction on Cf 86032 and Cf 86002 and entry Co 975 intermediate reaction on Cf 06. Entries Co 1148, CoC 671, Khakai, CoV 92102, Co 86002 and C0 86032 Showed susceptible to all the isolates.

Table.1 Pathogenic behavior of isolates of red rot pathogen on a set of 19 differentials by plug method.

Sr. No.	Isolates	Source	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.	Cf 06	CoC 671	S	I	I	S	I	I	S	I	R	R	R	R	S	R	S	I	S	I	S
2.	Cf 86032	Co 86032	I	S	I	S	I	R	S	R	R	R	R	R	S	R	S	R	S	R	S
3.	Cf 86002	Co 86002	I	S	I	S	I	R	S	R	R	R	R	R	S	R	S	I	S	I	S

R= Resistant, I = Intermediate, S=Susceptible

PROJECT NO. PP 17 (A)

1. Title of the experiment : Evaluation of pre-zonal /IVT/zonal varieties / genotypes for resistance to red rot.

2. Objectives : To gather information on the relative resistance to red rot of the entries in pre zonal varietal trial / zonal varietal trials of the respective zones.

3. Location : Navsari **Zone :** Peninsular

4. Year : 2015-2016

5. Varieties : **53-** Zonal varieties

6. Inoculation

Local Gujarat isolate was used for inoculation. Freshly sporulating, 7 days old culture in petridishes was taken. The spore mass was washed with 100 ml of sterile water and collected in a flask. Conidial suspension at spore strength of 1 million spores per ml of solution was prepared. Isolate chosen was only from local red rot collection.

7. Method 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 is to be injected with a large syringe in each cane and sealed with plastic clay (plasticine) or modeling clay.

2. **Nodal cotton swab method:**

   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 over the swab.

8. Evaluation :

1. **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 ** (LW)	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 to inoculated internode is assigned the score 1, 2 or 3

‹ 3. White spot is 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 crossed; 2-if two nodes crossed; 3. if three nodes are crossed (maximum)

Average Score = Total Score/No. of canes evaluated

Disease reaction : 0-9 scale

0.0 to 2 - R
2.1 to 4 – MR
4.1 to 6 – MS
6.1 to 8 – S
Above 8 – HS

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

2. Nodal Cotton Swab Method : Remove cotton swab and scrap the node with a knife. Record presence/absence of lesions. In case lesions are progressing into stalk, the reaction is to be recorded as S (susceptible) and if no lesion development, then R (resistant).

9. Results : (Table 2)

Plug Method:

Out of 53 varieties of zonal trial evaluated by plug method, none of the entries exhibited resistant reaction. Twenty five entries viz., Co 12006, CoM 12081, CoM 12082 and CoN 12072 (IVT-E), Co 12009, Co 12014, Co 12016, Co 12019, CoN 12073 and VSI 12121 (IVT-ML), Co 10005, Co 10006, Co 10026, Co 10027 and CoT 10367 (AVT–E I plant)**,** Co 09004 and CoN 09072 (AVT-E II Plant), Co 09009, Co 10015, Co 10031,

CoM 10083, CoT 10368, CoT 10369, CoVC 10061 and PI 10131(AVT-ML I Plant) showed moderately resistant reaction against red rot. Seven entries viz. CoN 12071 (IVT-E),Co 12024,CoM 12086 and CoN 12074 (IVT-ML), Co 010024 and CoT 10366 (AVT-E I Plant), PI 10132 (AVT-ML I Plant) exhibited moderately susceptible reaction. Rest of the entries displayed susceptible to highly susceptible reaction to red rot by plug method.

Two checks Co 94008 (IVT-E) and Co 99004 (IVT-ML) exhibited moderately resistant reaction. One check Co 85004 (IVT-E) showed moderately susceptible reaction. While Two checks CoC 671 (IVT-E) and Co 86032 (IVT-ML) displayed highly susceptible reaction.

Nodal Cotton Swab Method

Out of 53 varieties of zonal trial evaluated by Nodal Cotton Swab Method, 51 entries exhibited resistant reaction. Only one entry viz, Co 10017 (AVT-ML I Plant) and one check viz, CoC 671 (IVT-E) exhibited susceptible reaction.

Table 2. PP 17(a) Evaluation of pre – zonal / IVT / Zonal varieties/ genotypes for resistance to red rot *(Colletotrichum falcatum)* (2015-2016).

Sr. No.	Varieties	Plug method		Nodal cotton swab method	
		Score	Reaction	Score	Reaction
1.	2.	3.	4.	5.	6.
(I)	**Initial Varietal Trial (Early)**				
1.	Co 12001	7.6	S	0.0	R
2.	Co 12003	6.5	S	0.0	R
3.	Co 12006	3.2	MR	0.0	R
4.	Co 12007	7.4	S	0.0	R
5.	Co 12008	7.6	S	0.0	R
6.	CoM 12081	3.0	MR	0.0	R
7.	CoM 12082	2.6	MR	0.0	R
8.	CoM 12083	8.6	HS	0.0	R
9.	CoN 12071	4.4	MS	0.0	R
10.	CoN 12072	3.4	MR	0.0	R

11.	CoT 12366	8.4	HS	0.0	R
12.	CoT 12367	6.3	S	0.0	R
Standard					
1.	Co 85004	6.4	MS	0.0	R
2.	Co 94008	3.0	MR	0.0	R
3.	CoC 671	9.0	HS	8.0	S
(II)	**Initial Varietal Trial (Midlate)**				
1.	Co 12009	2.8	MR	0.0	R
2.	Co 12012	9.0	HS	0.0	R
3.	Co 12014	3.0	MR	0.0	R
4.	Co 12016	2.8	MR	0.0	R
5.	Co 12017	8.8	HS	0.0	R
6.	Co 12019	3.0	MR	0.0	R
7.	Co 12024	5.5	MS	0.0	R
8.	CoM 12084	9.0	HS	0.0	R
9.	CoM 12085	8.6	HS	8.0	S
10.	CoM 12086	4.8	MS	0.0	R
11.	CoN 12073	2.9	MR	0.0	R
12.	CoN 12074	5.2	MS	0.0	R
13.	CoT 12368	8.4	HS	0.0	R
14.	VSI 12121	3.5	MR	0.0	R
Standard					
1.	Co 99004	3.0	MR	0.0	R
2.	Co 86032	8.2	HS	0.0	R
(III)	**Advanced Varietal Trial- Early I Plant**				
1.	Co 10004	6.4	S	0.0	R
2.	Co 10005	3.2	MR	0.0	R
3.	Co 10006	3.4	MR	0.0	R
4.	Co 10024	5.6	MS	0.0	R

5.	Co 10026	3.2	MR	0.0	R
6.	Co 10027	2.9	MR	0.0	R
7.	CoT 10366	5.2	MS	0.0	R
8.	CoT 10367	3.2	MR	0.0	R
(IV)	**Advanced Varietal Trial- Early II Plant**				
1.	Co 09004	3.2	MR	0.0	R
2.	Co 09007	6.4	S	0.0	R
3.	CoN 09072	3.2	MR	0.0	R
(V)	**Advanced Varietal Trial- Midlate I Plant**				
1.	Co 09009	3.6	MR	0.0	R
2.	Co 10015	3.2	MR	0.0	R
3.	Co 10017	8.4	HS	8.0	S
4.	Co 10031	3.2	MR	0.0	R
5.	Co 10033	7.6	S	0.0	R
6.	CoM 10083	3.4	MR	0.0	R
7.	CoT 10368	3.4	MR	0.0	R
8.	CoT 10369	3.6	MR	0.0	R
9.	CoVC 10061	3.4	MR	0.0	R
10.	PI 10131	3.0	MR	0.0	R
11.	PI 10132	5.4	MS	0.0	R

PROJECT NO. PP 17 (B)

1. **Title of the experiment** : **Evaluation of Zonal varieties for whip smut**
2. **Objective** : To gather information on the relative resistance to smut of the entries in pre-zonal/zonal trials of the zone
3. **Year** : 2015-2016

   Location: : Navsari
4. **Varieties** Entries of early and midlate genotypes under IVT and AVT of the zone

5. Plot size & planting : One three meter row, planted with 10 three bud, setts with minimum of two replications.

6. Storage & Inoculation : Freshly collected whips are dried by keeping under shade and smut teliospores are collected and filled in blotting paper bags and are stored in a desiccators under calcium chloride. Spore viability is to be examined before inoculation.

The method of inoculation consists of steeping of three budded setts for 30 minutes in spore suspension of over 90 per cent viability.

7. Observation : Number of clumps per row is to be recorded. Smut incidence at fortnightly interval has to be recorded up to 12 months age.

8. Evaluation : Evaluation is based on percentage of clumps infected. It is required to maintain at least 15 to 20 clumps in each genotype before arriving at the percentage infection. The following grade is to be followed.

0 per cent	**:**	**Resistance**
0.1 to 10 per cent	**:**	**Moderately Resistance**
10.1 to 20 per cent	**:**	**Moderately Susceptible**
21.1 to 30 per cent	**:**	**Susceptible**
> 30 per cent	**:**	**Highly susceptible**

Results: (Table 3)

At Navsari, 55 Zonal varieties/ entries from IVT (Early), IVT (Midlate), AVT (Early I & II Plant), AVT (Midlate I Plant), along with 8 checks (Co 97009, CoSi 95071, Co 86002, Co 86032, Co 99004, CoC 671, Co 94008 and Co 6806) were evaluated for resistance to smut.

Out of 55 varieties of zonal trial evaluated for smut disease, Thirty one entries exhibited resistant reaction viz., Co 12001, Co 12003, Co 12006, Co 12007, CoM 12081,CoM 12083, CoN 12071, CoN 12072, CoT 12366 and CoT 12367 (IVT-E), Co 12012, Co 12014, Co 12016, Co 12017,Co 12019,Co 12024,CoM 12084,CoM 12085,

CoN 12073,CoN 12074, CoT 12368 and VSI 12121 (IVT-ML), Co 10005, Co 10006 and CoT 10366 (AVT-E I Plant), Co 09004 and CoN 09072 (AVT-E II Plant), CoT 10368, CoT 10369, CoVC 10061 and PI 10132 (AVT ML I Plant) exhibited resistant reaction. Similarly Seven entries viz., CoM 12082 (IVT-E), Co 10004 and CoT 10367 (AVT-E I Plant), Co 09007 (AVT-E II Plant), Co 09009, CoM 10083 and PI 10131 (AVT ML I Plant) showed moderately resistant reaction to smut. Five entries Co 12008 (IVT-E), Co 12009 and CoM 12086 (IVT-ML), Co 10027 (AVT-E I Plant), Co 10031 (AVT ML I Plant) exhibited moderately susceptible reaction. Rest of the entries showed susceptible to highly susceptible reaction to smut. Among the eight checks Two viz, Co 94008 and Co 6806 gave resistant reaction, Only one CoC 671 exhibited moderately resistant reaction. Two checks viz., Co 86032 and Co 99004 showed moderately susceptible reaction, whereas rest of 3 checks viz.,Co 97009, CoSi 95071 and Co 86002 showed highly susceptible reaction to smut.

Table 3: Evaluation of Zonal varieties for whip smut (2015-16).

S.No	Genotype	Smut incidence (%)	Reaction	S.No	Genotype	Smut incidence (%)	Reaction
(I)	**Initial Varietal Trial (Early)**						
1.	Co 12001	0.00	R	7.	CoM 12082	4.50	MR
2.	Co 12003	0.00	R	8.	CoM 12083	0.00	R
3.	Co 12006	0.00	R	9.	CoN 12071	0.00	R
4.	Co 12007	0.00	R	10.	CoN 12072	0.00	R
5.	Co 12008	11.5	MS	11.	CoT 12366	0.00	R
6.	CoM 12081	0.00	R	12.	CoT 12367	0.00	R
(II)	**Initial Varietal Trial (Midlate)**						
1.	Co 12009	10.5	MS	8.	CoM 12084	0.00	R
2.	Co 12012	0.00	R	9.	CoM 12085	0.00	R
3.	Co 12014	0.00	R	10.	CoM 12086	14.5	MS
4.	Co 12016	0.00	R	11.	CoN 12073	0.00	R
5.	Co 12017	0.00	R	12.	CoN 12074	0.00	R
6.	Co 12019	0.00	R	13.	CoT 12368	0.00	R
7.	Co 12024	0.00	R	14.	VSI 12121	0.00	R

(III)	**Advanced Varietal Trial- Early I Plant**						
1.	Co 10004	6.50	MR	5.	Co 10026	32.0	HS
2.	Co 10005	0.00	R	6.	Co 10027	15.5	MS
3.	Co 10006	0.00	R	7.	CoT 10366	0.00	R
4.	Co 10024	24.5	S	8.	CoT 10367	4.50	MR
(IV)	**Advanced Varietal Trial- Early II Plant**						
1.	Co 09004	0.00	R	3.	CoN 09072	0.00	R
2.	Co 09007	5.50	MR				
(V)	**Advanced Varietal Trial- Midlate I Plant**						
1.	Co 09009	3.50	MR	6.	CoT 10368	0.00	R
2.	Co 10015	22.5	S	7.	CoT 10369	0.00	R
3.	Co 10031	12.5	MS	8.	CoVC 10061	0.00	R
4.	Co 10033	34.5	HS	9.	PI 10131	6.50	MR
5.	CoM 10083	6.50	MR	10.	PI 10132	0.00	R
Standard							
1.	Co 97009	36.0	HS	5.	Co 99004	13.5	MS
2.	CoSi 95071	34.0	HS	6.	CoC 671	8.20	MR
3.	Co 86002	32.5	HS	7.	Co 94008	0.00	R
4.	Co 86032	15.5	MS	8.	Co 6806	0.00	R

PROJECT NO. PP 17 (C)

1. **Title of the experiment** : Reproduction of sugarcane wilt syndrome and screening for wilt resistance.
2. **Objective** : To study the feasibility of artificially reproducing wilt syndrome by inoculating the associated fungi and applying stress factors and use same in screening for wilt resistance.
3. **Year** : 2015-2016

   Location: : Navsari
4. **Test clones** Entries of AVT -E I & II Plant / AVT -ML I & II Plant
5. **Plot size & planting** : Two rows of 6 m length, planted under wilt sick plot

   : **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 he 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 death 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.

$$\textbf{Mean wilt severity index} = \frac{\text{Sum of wilt indices of individual stalks}}{\text{Number of stalks sampled}}$$

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

7. Results

At Navsari, 27 AVT varieties including susceptible check (CoC 671) were evaluated for resistance to wilt in wilt sick plot. Out of 27 AVT varieties, none of the entries showed resistant reaction. Fourteen entries viz., Co 10005, Co 10006, Co 10024, Co 10026, Co 10027, CoT 10366 and CoT 10367 (AVT-E I Plant), Co 09004, Co 09007, CoN 09072 (AVT-E II Plant), Co 10015, Co 10031, CoT 10368 and PI 10132 (AVT-ML I Plant) showed moderately resistant reaction. Only one entry viz., PI 10131 (AVT-ML I Plant) exhibited moderately susceptible reaction to wilt. Remaining entries showed susceptible reaction to wilt.

Data indicate that Two zonal checks viz Co 94008 (AVT-E I Plant) and Co 99004 (AVT-E II Plant) showed moderately resistance reaction. While Two checks Co 85004 (AVT-E I Plant) and Co 86032 (AVT-E II plant) exhibited moderately susceptible reaction. Only one check CoC 671 (AVT-E I plant) displayed susceptible reaction to wilt.

Table 4: Evaluation of sugarcane varieties against wilt diseases in wilt sick plot. (2015-16).

Sr. No.	Variety	Wilt	
		Index	Reaction
(I)	**Advanced Varietal Trial- Early I Plant**		
1.	Co 10004	3.1	S
2.	Co 10005	1.6	MR
3.	Co 10006	1.8	MR
4.	Co 10024	1.7	MR
5.	Co 10026	1.5	MR
6.	Co 10027	1.4	MR
7.	CoT 10366	1.5	MR
8.	CoT 10367	1.7	MR
Standard			
1.	Co 85004	2.3	MS
2.	Co 94008	1.4	MR
3.	CoC 671	3.6	S
(II)	**Advanced Varietal Trial- Early II Plant**		
1.	Co 09004	1.4	MR
2.	Co 09007	1.8	MR
3.	CoN 09072	1.4	MR
Standard			
1.	Co 99004	1.4	MR
2.	Co 86032	2.6	MS
(III)	**Advanced Varietal Trial- Midlate I Plant**		
1.	Co 09009	3.3	S
2.	Co 10015	1.8	MR
3.	Co 10017	3.6	S
4.	Co 10031	1.6	MR
5.	Co 10033	3.4	S
6.	CoM 10083	3.4	S
7.	CoT 10368	1.6	MR
8.	CoT 10369	3.2	S
9.	CoVC 10061	3.2	S
10.	PI 10131	2.3	MS
11.	PI 10132	1.8	MR

PROJECT NO. PP 17 (D)

Title of the experiment **:** Evaluation of pre-zonal /IVT/zonal varieties / genotypes for resistance to yellow leaf disease.

Objectives **:** To gather information on the relative resistance to yellow leaf disease of the entries in pre zonal varietal trial / zonal varietal trials of the respective zones.

Location **:** Navsari **Zone :** Peninsular

Year **:** 2015-2016

Varieties **:** **52-** Zonal varieties

YLD symptoms of mid rib yellowing are expressed during 6-8 months crop stage. If disease severity increases, the yellowing spreads to laminar region and later there will be drying of affected mid rib and adjoining laminar tissue from leaf tip downwards along the mid rib. Another important symptom would be bunching of leaves in the crown. Highly susceptible variety will exhibit severe foliage drying during maturity stage. In place of yellow discoloration, purple or pinkish purple discoloration may also be seen on the mid rib and lamina. Canes of the affected plant do not dry.

To assess YLD severity, the following disease severity grades are to be given during maturity stages of the crop (3 observations by 8^{th}, 10^{th} and 12^{th}months). Each time, minimum of 25 canes (free from other biotic stresses) are to be scored.

YLD severity grades:

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

Disease grade	Description
0	No symptom of the disease
1	Mild yellowing of midrib in one or two leaves, no sign of typical bunching of leaves caused by YLD
2	Prominent yellowing of midrib on all the leaves in the crown. No bunching of leaves

3	Progress of midrib yellowing to laminar region in the whorl, yellowing on the upper leaf surface, and bunching of leaves
4	Drying of laminar region from leaf tip downwards along the midrib, typical bunching of leaves as a tuft
5	Stunted growth of the cane combined with drying of symptomatic leaves

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

YLD severity scale :

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: (Table 4)

At Navsari, 52 Zonal varieties/ entries from IVT (Early), IVT (Midlate), AVT (Early I Plant), AVT (Midlate I Plant), along with 5 checks (CoC 671, Co 94008 , Co 85004, Co 86032 and Co 99004) were evaluated for resistance to yellow leaf disease.

Out of 52 varieties of zonal trial evaluated by yellow leaf disease, 37 entries showed resistant reaction. Nine entries viz., Co 12003 and CoT 12367 (IVT-E), Co 12009, Co 12012, Co 12014, Co 12019, Co 12024, CoM 12085 and CoT 12368 (IVT-ML) were found moderately resistant reaction. Only one entry viz., Co 10368 (AVT-ML I Plant) displayed moderately susceptible reaction.

Four checks out of them Only one check viz, Co 94008 (IVT-E) gave resistant reaction. While Two checks viz., CoC 671 (IVT-E) and Co 99004 (IVT-ML) were found moderately resistant reaction. One check Co 85004 (IVT-E) exhibited moderately susceptible reaction and also Co 86032 (IVT-ML) was observed susceptible reaction in yellow leaf disease.

Table 4: Evaluation of Zonal varieties for Yellow Leaf Disease (2015-16).

S.No	Genotype	YLD incidence (%)	Reaction	S.N	Genotype	YLD incidence (%)	Reaction
(I)	**Initial Varietal Trial (Early)**						
1.	Co 12001	0.0	R	7.	CoM 12082	0.0	R
2.	Co 12003	1.3	MR	8.	CoM 12083	0.0	R
3.	Co 12006	0.0	R	9.	CoN 12071	0.0	R
4.	Co 12007	0.0	R	10.	CoN 12072	0.0	R
5.	Co 12008	0.0	R	11.	CoT 12366	0.0	R
6.	CoM 12081	0.0	R	12.	CoT 12367	1.5	MR
(II)	**Initial Varietal Trial (Midlate)**						
1.	Co 12009	1.2	MR	8.	CoM 12084	0.0	R
2.	Co 12012	1.3	MR	9.	CoM 12085	1.7	MR
3.	Co 12014	1.5	MR	10.	CoM 12086	0.0	R
4.	Co 12016	0.0	R	11.	CoN 12073	0.0	R
5.	Co 12017	0.0	R	12.	CoN 12074	0.0	R
6.	Co 12019	1.6	MR	13.	CoT 12368	1.3	MR
7.	Co 12024	1.4	MR	14.	VSI 12121	0.0	R
(III)	**Advanced Varietal Trial- Early I Plant**						
1.	Co 10004	0.0	R	5.	Co 10026	0.0	R
2.	Co 10005	0.0	R	6.	Co 10027	0.0	R
3.	Co 10006	0.0	R	7.	CoT 10366	0.0	R
4.	Co 10024	0.0	R	8.	CoT 10367	0.0	R
(IV)	**Advanced Varietal Trial- Early II Plant**						
1.	Co 09004	0.0	R	3.	CoN 09072	0.0	R
2.	Co 09007	0.0	R				
(V)	**Advanced Varietal Trial- Midlate I Plant**						
1.	Co 09009	0.0	R	6.	CoT 10368	2.3	MS
2.	Co 10015	0.0	R	7.	CoT 10369	0.0	R
3.	Co 10031	0.0	R	8.	CoVC 10061	0.0	R
4.	Co 10033	0.0	R	9.	PI 10131	0.0	R
5.	CoM 10083	0.0	R	10.	PI 10132	0.0	R
Standard							
1.	CoC 671	1.3	MR	4.	Co 86032	3.6	S
2.	Co 85004	2.4	MS	5.	Co 99004	1.4	MR
3.	Co 94008	0.0	R				

PROJECT NO. PP 22

1. **Title of the experiment** : Survey of Sugarcane diseases naturally occurring in the area on important Sugarcane varieties.
2. **Location** : Gujarat region
3. **Year** : 2015-2016
4. **Observation** : Periodic observations in various Sugar factory areas were recorded on the natural incidence of diseases on all the varieties under cultivation.

5. Results (Table 5)

Surveys were undertaken in ten sugarcane growing sugar factories area of South Gujarat region. The survey indicated that wilt, red rot and whip smut were the major diseases in South Gujarat region. Area affected under wilt, red rot and whip smut was 2.41, 1.94 and 4.93 per cent respectively. The incidence of smut was recorded on varieties like CoSi 95071, Co 86002, Co 97009 and Co 99004. Maximum incidence of smut was recorded in the varieties CoSi 95071, Co 86002 and Co 97009 and it was to the tune of 15.40 % in Kamrej Sugar factory area. The wilt incidence noticed in CoC 671, Co 86032, Co 86002 and CoSi 95071 varieties and was maximum to the tune of 4.45 % in Gandevi Sugar factory. The red rot was recorded in the varieties of CoC 671, Co 86032, Co 86002, and Co 97009 and it was to the tune of 3.70 % in Bardoli Sugar factory area. Highest wilt and red rot incidence was noticed in variety CoC 671 and minimum in Co 86032. In addition to these diseases, the incidence of Pokkhah boeing disease was observed in Co 99004 in Bardoli, Gandevi, Valsad and Sayan Sugar factory areas. Grassy shoot, yellow leaf disease were found in traces at Mahuva, Valsad and Bardoli sugar factory areas. Grassy shoot was observed on Co 86032 and CoM 0265 and yellow leaf disease was noticed on Co 86032 and Co 99004 .

Table 5. Survey of sugarcane diseases naturally occurring in the area on important sugarcane varieties (2015-2016)

Sr. No.	Name of disease	Varieties	Location
1.	**Wilt**	Co 86032, CoC 671, Co 97009,Co 86002, CoSi 95071,CoM 0265 FL-2005	Gandevi, Bardoli, Sayan, Kamrej,Narmada, Mahuva, Valsad, Kantha Vibhag Madhi, and Coper
2.	**Red rot**	CoC 671 , Co 86032 Co 86002, FL-2005	Gandevi, Bardoli, Sayan, Kamrej,Narmada, Mahuva, Valsad, Kantha Vibhag Madhi, and Coper
3.	**Whip smut**	CoSi 95071, Co 97009, Co 86002, Co 99004,	Gandevi, Bardoli, Sayan, Kamrej,Narmada, Mahuva, Valsad, Kantha Vibhag Madhi, and Coper
4.	**Pokkhah boeing**	Co 99004	Bardoli, Gandevi,Valsad and Sayan Sugar factory area
5.	**Grassy shoot**	Co 86032, CoM 0265	Mahuva, Valsad and Bardoli Sugar factory area
6.	**Yellow leaf disease**	Co 86032, Co 99004	Bardoli and Mahuva sugar factory area

PP 22. Survey of naturally occurring Sugarcane disease in South Gujarat (2015-16).

Sr No.	Disease	Name of area Surveyed	% disease incidence	Varieties affected
1.	Red rot	Bardoli Sugar factory Dist: Surat	3.70	CoC 671, Co 86032,Co 97009
	Wilt		2.60	CoC 671,Co 86032, CoM 0265
	Whip smut		9.75	Co 86002,CoSi 95071, Co 99004,
2.	Red rot	Kamrej Sugar factory Dist: Surat	1.59	Co 86032, CoC 671
	Wilt		1.64	Co 86032, Co 86002, FL-2005
	Whip smut		15.40	Co 86002, CoSi 95071, Co 99004, Co 97009
3.	Red rot	Sayan Sugar Factory Dist: Surat	3.30	CoC 671, Co 86032, Co 86002, FL-2005
	Wilt		1.73	CoC 671,Co 86032,Co 86002, Co 97009
	Whip smut		1.00	Co 86002,CoSi 95071, Co 99004,Co 97009
4.	Red rot	Gandevi Sugar Factory Dist: Navsari	2.50	CoC 671,Co 86032, Co 86002, Co 97009
	Wilt		4.45	CoC 671,Co 86032, Co 86002, Co 97009
	Whip smut		4.74	Co 86002, CoSi 95071, Co 97009
5.	Red rot	Narmada Sugar Factory, Dharikheda, Dist: Narmada	1.37	CoC 671, Co 86032, Co 86002
	Wilt		0.61	CoC 671,Co 86032, Co 86002,
	Whip smut		7.25	Co 86002,CoSi 95071
6.	Red rot	Valsad Sugar Factory Dist: Valsad	2.13	CoC 671, Co 86032
	Wilt		2.84	CoC 671, Co 86032, CoM 0265
	Whip smut		6.14	Co 86002, Co 99004
7.	Red rot	Madhi Sugar Factory Dist: Surat	1.58	Co 86002, Co 86032, CoC 671
	Wilt		2.36	Co 86032, CoC 671
	Whip smut		5.24	Co 86002, Co 97009
8.	Red rot	Coper Sugar Factory Dist: Tapi	0.39	CoC 671,Co 86032, Co 86002
	Wilt		0.68	CoC 671, Co 86002, Co 86032
	Whip smut		3.00	Co 86002
9.	Red rot	Mahuva Sugar Factory Dist: Surat	0.53	CoC 671, Co 86032,Co 86002, Co 97009
	Wilt		0.64	Co 86032, Co 86002, CoC 671, CoM 0265
	Whip smut		0.57	CoSi 95071,Co 86002,Co 97009
10.	Red rot	Kantha Vibhag Sugar Factory Dist: Surat	3.20	CoC 671, Co 86032
	Wilt		2.83	CoC 671, Co 86002, Co 86032
	Whip smut		5.40	CoSi 95071,Co 86002

PROJECT NO. PP 23

1. **Title of the experiment** : Assessment of elite and ISH genotypes for resistance to red rot.
2. **Objective** : To gather information on ***Saccharum* sp.** and elite genotypes for resistance to red rot so that resistant genotypes could be used in breeding programme as possible donors for resistance.
3. **Year** : 2015-2016
   : **Location:** Navsari
4. **Test clones/No.** : **20**
5. **Plot size** : Six meter row of each entry
6. **No. of isolates** : Local isolate

7. **Method of Inoculation** : Plug method as per PP 17.

   Inoculum: Freshly sporulating, one week old culture on petridishes 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 load of one million spores per ml of solution will be prepared.

8. **Method of evaluation** : As per details in PP17.

9. **Results (Table 6)**

At Navsari 20 elite and ISH genotypes were evaluated for resistance to red rot, one genotype SES 594 gave resistant reaction. Thirteen genotypes, viz., ISH 111, ISH 58, ISH 100, ISH 287, ISH 12, ISH 50, ISH 147, ISH 267, ISH 229, ISH 118, ISH 117, ISH 114 and ISH 115 were observed with moderately resistant reaction. Only one genotype viz., ISH 175 showed moderately susceptible reaction. Two genotypes viz., ISH 69 and ISH 9 displayed susceptible reaction. Three genotypes viz., ISH 41, ISH 176 and ISH 43 exhibited highly susceptible reaction by plug method.

Table 6. Assessment of elite and ISH genotypes for resistance to red rot (*Colletotrichum falcatum*) (2015-16).

Sr.No.	Genotypes	Red rot (Plug method)	
		Score	Reaction
1	ISH 111	3.6	MR
2	ISH 175	5.2	MS
3	ISH 58	2.9	MR
4	ISH 100	3.2	MR
5	ISH 287	3.0	MR
6	ISH 12	3.2	MR
7	ISH 50	3.1	MR
8	ISH 41	8.4	HS
9	ISH 147	3.0	MR
10	ISH 69	6.8	S
11	ISH 267	3.6	MR
12	ISH 229	3.8	MR
13	ISH 176	8.2	HS
14	ISH 118	3.0	MR
15	ISH 9	7.4	S
16	ISH 43	8.7	HS
17	ISH 117	2.9	MR
18	ISH 114	3.2	MR
19	SES 594	1.0	R
20	ISH 115	2.8	MR