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No. MSRS /H-2/Patho. Report./ 973 /2017

Navsari Date: 02/06/2017

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 **2016-2017** of Plant Pathology.

Dear Sir,

I am submitting herewith the results of the technical programme of **Sugarcane Plant Pathology** conducted at this station during **2016-2017** (Hard & soft copy). Kindly include the same in the Annual Report and oblige.

Thanking you,

Yours sincerely

Encl : As above

(S. C. Mali)
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

(2016-2017)



MAIN SUGARCANE RESEARCH STATION
NAVSARI AGRICULTURAL UNIVERSITY

NAVSARI – 396 450



Plant Pathology

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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	: 2016-2017		
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 60th 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.

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 CoJ 64, CoS 8436, BO 91, Baragua and SES 594 showed resistant reaction for all the isolates. Entries Co 7717 and Khakai and CoV 92102 exhibited intermediate reaction to all the isolates. While entries Co 1148 and Co 62399 showed resistant reaction on Cf 86032 but intermediate reaction on Cf 06 and Cf 86002 and also entries CoS 767 and CoSe 95422 showed resistant reaction on Cf 06 and Cf 86002 but intermediate reaction on Cf 86032. Only one entry Co 7805 resistant reaction on Cf 86002 and intermediate reaction on Cf 06 and Cf 86032. Entries Co 975 and Co 86032 intermediate reaction on Cf 86002 and susceptible reaction on Cf 06 and Cf 86032. Entries Co 975 intermediate reaction on Cf 86032 and Co 86002 intermediate reaction on Cf 06. Entries Co 419 and CoC 671 Showed susceptible reaction 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	S	S	I	I	I	S	R	R	R	R	R	I	R	I	I	I	R	S
2.	Cf 86032	Co 86032	S	I	S	R	I	R	S	R	I	R	R	R	I	R	I	I	S	I	S
3.	Cf 86002	Co 86002	S	S	I	I	I	I	S	R	R	R	R	R	I	R	I	R	S	R	I

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** : 2016-2017
- 5. Varieties** : **58-** 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. 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. 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).

Results (Table 2) :**Plug Method:**

Out of 58 varieties of zonal trial evaluated by plug method, none of the entries exhibited resistant reaction. Forty one entries viz., Co 13002, Co 13003, Co 13004, CoN 13071, CoN 13072 and MS 13081 (IVT-E), Co 13006, Co 13011, Co 13013, Co 13014, Co 13016, Co 13018, Co 13020, CoM 13082, CoN 13073, CoN 13074, CoSnk 13103, CoSnk 13106, PI 13131 and PI 13132 (IVT-ML), Co 11001, Co 11004, CoM 11082 and CoM 11084 (AVT-E I plant), Co 10005, Co 10006, Co 10026, Co 10027 and CoT 10367 (AVT-E II Plant), Co 11005, Co 11007, Co 11019 and CoM 11085 (AVT-ML I plant), Co 09009, Co 10015, Co 10031, CoM 10083, CoT 10368, Cot 10369, CoVC 10061 and PI 10131 (AVT-ML II plant) showed moderately resistant reaction against red rot. Ten entries viz. CoSnk 13101 and CoSnk 13102 (IVT-E), Co 13005, CoSnk 13104 and CoT 13366 (IVT-ML), CoM 11081 (AVT-E I Plant), Co 10024 (AVT-E II Plant), Co 11012 and CoM 11086 (AVT-ML I Plant), PI 10132 (AVT-ML II 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.

Cotton Swab Method :

Out of 58 varieties of zonal trial evaluated by Cotton Swab Method, 56 entries exhibited resistant reaction. Only one entry viz, CoM 11081 (AVT-E I Plant) was found moderately susceptible reaction and another one entry Co 10017 (AVT-ML II Plant) and also one check CoC 671 (IVT-E) were found susceptible reaction.

Table 2. PP 17(A) Evaluation of pre – zonal / IVT / Zonal varieties/ genotypes for resistance to red rot (*Colletotrichum falcatum*) (2016-2017).

Sr. No.	Varieties	Plug method		Cotton Swab method
		Score	Reaction	Reaction
1.	2.	3.	4.	5.
(I)	Initial Varietal Trial (Early)			
1.	Co 13002	2.8	MR	R
2.	Co 13003	3.6	MR	R
3.	Co 13004	3.2	MR	R
4.	CoN 13071	2.9	MR	R
5.	CoN 13072	3.0	MR	R
6.	CoSnk 13101	4.6	MS	R
7.	CoSnk 13102	5.5	MS	R
8.	MS 13081	3.0	MR	R
Standard				
1.	Co 85004	4.6	MS	R
2.	Co 94008	2.8	MR	R
3.	CoC 671	8.8	HS	S
(II)	Initial Varietal Trial (Midlate)			
1.	Co 13005	4.4	MS	R
2.	Co 13006	2.9	MR	R
3.	Co 13008	8.6	HS	R
4.	Co 13009	8.7	HS	R
5.	Co 13011	3.4	MR	R
6.	Co 13013	3.6	MR	R
7.	Co 13014	3.0	MR	R
8.	Co 13016	3.4	MR	R
9.	Co 13018	2.9	MR	R
10.	Co 13020	2.6	MR	R

11.	CoM 13082	3.0	MR	R
12.	CoN 13073	3.2	MR	R
13.	CoN 13074	2.8	MR	R
14.	CoSnk 13103	3.4	MR	R
15.	CoSnk 13104	5.0	MS	R
16.	CoSnk 13105	8.2	HS	R
17.	CoSnk 13106	3.2	MR	R
18.	CoT 13366	5.6	MS	R
19.	PI 13131	3.4	MR	R
20.	PI 13132	2.9	MR	R
Standard				
1.	Co 99004	3.4	MR	R
2.	Co 86032	8.2	HS	R
(III)	Advanced Varietal Trial- Early I Plant			
1.	Co 11001	3.6	MR	R
2.	Co 11004	3.2	MR	R
3.	CoM 11081	4.8	MS	MS
4.	CoM 11082	2.9	MR	R
5.	CoM 11084	3.4	MR	R
(IV)	Advanced Varietal Trial- Early II Plant			
1.	Co 10004	7.0	S	R
2.	Co 10005	3.4	MR	R
3.	Co 10006	3.2	MR	R
4.	Co 10024	4.8	MS	R
5.	Co 10026	3.6	MR	R
6.	Co 10027	3.2	MR	R
7.	CoT 10366	6.2	S	R
8.	CoT 10367	3.4	MR	R

9				
(V)	Advanced Varietal Trial- Midlate I Plant			
1.	Co 11005	3.2	MR	R
2.	Co 11007	3.0	MR	R
3.	Co 11012	5.2	MS	R
4.	Co 11019	3.6	MR	R
5.	CoM 11085	3.0	MR	R
6.	CoM 11086	4.8	MS	R
(VI)	Advanced Varietal Trial- Midlate II Plant			
1.	Co 09009	3.2	MR	R
2.	Co 10015	3.6	MR	R
3.	Co 10017	8.6	HS	S
4.	Co 10031	3.8	MR	R
5.	Co 10033	6.9	S	R
6.	CoM 10083	3.2	MR	R
7.	CoT 10368	3.4	MR	R
8.	CoT 10369	3.4	MR	R
9.	CoVC 10061	3.0	MR	R
10.	PI 10131	3.0	MR	R
11.	PI 10132	4.8	MS	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** : 2016-2017
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, 58 Zonal varieties/ entries from IVT (Early), IVT (Midlate), AVT (Early I & II Plant), AVT (Midlate I & II Plant), along with 8 checks (Co 97009, Co 85004, Co 86002, Co 86032, Co 99004, CoC 671, Co 94008 and Co 6806) were evaluated for resistance to smut.

Out of 58 varieties of zonal trial evaluated for smut disease, Thirty entries exhibited resistant reaction viz., Co 13002, Co 13004, CoN 13071, CoSnk 13102 and MS 13081 (IVT-E), Co 13006, Co 13008, Co 13009, Co 13011, Co 13014, Co 13016, Co 13018, CoM 13082, CoN 13073, CoN 13074, CoSnk 13105 and CoT 13366 (IVT-ML), Co 11001 and CoM 11084 (AVT-E I plant), Co 10005, Co 10006 and CoT 10366 (AVT-E II Plant), Co 11005, Co 11019, CoM 11085 and CoM 11086 (AVT-ML I plant), CoT 10369, CoVC 10061 and PI 10132 (AVT-ML II plant) exhibited resistant reaction. Similarly Eight entries viz., Co 13003 and CoN 13072 (IVT-E), CoSnk 13104 (IVT-ML), Co 10004 and CoT 10367 (AVT-E II Plant), Co 09009, CoM 10083 and PI 10131 (AVT ML II Plant) showed moderately resistant reaction to smut. Seven entries Co 13013, CoSnk 13103 and PI 13131 (IVT-ML), CoM 11081 (AVT-E I Plant), Co 10027 (AVT-E II Plant), Co 11017 (AVT ML I Plant), Co10031(AVT ML II 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 check 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, Co 85004 and Co 86002 were found highly susceptible reaction to smut.

Table 3: Evaluation of Zonal varieties for whip smut (2016-17).

S.No	Genotype	Smut incidence (%)	Reaction	S.No	Genotype	Smut incidence (%)	Reaction
(I) Initial Varietal Trial (Early)							
1.	Co 13002	0.00	R	5.	CoN 13072	8.50	MR
2.	Co 13003	6.50	MR	6.	CoSnk 13101	34.5	HS
3.	Co 13004	0.00	R	7.	CoSnk 13102	0.00	R
4.	CoN 13071	0.00	R	8.	MS 13081	0.00	R
(II) Initial Varietal Trial (Midlate)							
1.	Co 13005	22.5	S	11.	CoM 13082	0.00	R
2.	Co 13006	0.00	R	12.	CoN 13073	0.00	R
3.	Co 13008	0.00	R	13.	CoN 13074	0.00	R
4.	Co 13009	0.00	R	14.	CoSnk 13103	14.5	MS
5.	Co 13011	0.00	R	15.	CoSnk 13104	8.50	MR
6.	Co 13013	13.5	MS	16.	CoSnk 13105	0.00	R
7.	Co 13014	0.00	R	17.	CoSnk 13106	36.5	HS
8.	Co 13016	0.00	R	18.	CoT 13366	0.00	R
9.	Co 13018	0.00	R	19.	PI 13131	12.5	MS
10.	Co 13020	24.5	S	20.	PI 13132	34.5	HS
(III) Advanced Varietal Trial- Early I Plant							
1.	Co 11001	0.00	R	4.	CoM 11082	26.5	S
2.	Co 11004	32.5	HS	5.	CoM 11084	0.00	R
3.	CoM 11081	13.5	MS				
(IV) Advanced Varietal Trial- Early II Plant							
1.	Co 10004	5.50	MR	5.	Co 10026	36.0	HS
2.	Co 10005	0.00	R	6.	Co 10027	12.5	MS
3.	Co 10006	0.00	R	7.	CoT 10366	0.00	R
4.	Co 10024	26.5	S	8.	CoT 10367	6.00	MR
(V) Advanced Varietal Trial- Midlate I Plant							
1.	Co 11005	0.00	R	4.	Co 11019	0.00	R
2.	Co 11007	14.5	MS	5.	CoM 11085	0.00	R
3.	Co 11012	21.5	S	6.	CoM 11086	0.00	R

13							
(VI)	Advanced Varietal Trial- Midlate II Plant						
1.	Co 09009	4.50	MR	7.	CoT 10368	0.00	R
2.	Co 10015	24.5	S	8.	CoT 10369	0.00	R
3.	Co 10017	22.5	S	9.	CoVC 10061	0.00	R
4.	Co 10031	10.5	MS	10.	PI 10131	7.00	MR
5.	Co 10033	32.5	HS	11.	PI 10132	0.00	R
6.	CoM 10083	8.00	MR				
Standard							
1.	Co 97009	38.0	HS	5.	Co 99004	14.0	MS
2.	Co 85004	38.5	HS	6.	CoC 671	5.80	MR
3.	Co 86002	34.5	HS	7.	Co 94008	0.00	R
4.	Co 86032	12.5	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** : 2016-2017
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 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 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.

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

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

Results (Table 4) :

At Navsari, 34 IVT (ML) and AVT varieties including susceptible check (CoC 671) were evaluated for resistance to wilt in wilt sick plot. Out of 34 IVT (ML) and AVT varieties, none of the entries showed resistant reaction. Twenty one entries viz., Co 13006, Co 13009 and CoN 13073 (IVT-ML), Co 11001, Co 11004, CoM 11082 and CoM 11084 (AVT-E I Plant), Co 10005, Co 10006, Co 10027, CoT 10366 and CoT 10367 (AVT-E II Plant), Co 11005, Co 11007, Co 11012, CoM 11085 and CoM 11086 (AVT-ML I Plant) , Co 10015, Co 10031, CoT 10368 and PI 10132 (AVT-ML II Plant) showed moderately resistant reaction. Eight entries viz., Co 13013 (IVT-ML), CoM 11081 (AVT-E I Plant), Co 10024 and Co 10026 (AVT-E II Plant), Co 09009, Co 10033, CoT 10369 and PI 10131 (AVT-ML II 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. (2016-17).

Sr. No.	Variety	Wilt	
		Index	Reaction
(I) Initial Varietal Trial (Midlate)			
1.	Co 13006	1.5	MR
2.	Co 13009	1.6	MR
3.	Co 13013	2.4	MS
4.	CoN 13073	1.7	MR
(II) Advanced Varietal Trial- Early I Plant			
1.	Co 11001	1.6	MR
2.	Co 11004	1.5	MR
3.	CoM 11081	2.3	MS
4.	CoM 11082	1.7	MR
5.	CoM 11084	1.6	MR
Standard			
1.	Co 85004	2.6	MS
2.	Co 94008	1.6	MR
3.	CoC 671	3.7	S
(III) Advanced Varietal Trial- Early II Plant			
1.	Co 10004	3.4	S
2.	Co 10005	1.7	MR
3.	Co 10006	1.6	MR
4.	Co 10024	2.4	MS
5.	Co 10026	3.4	S
6.	Co 10027	1.6	MR
7.	CoT 10366	2.2	MS
8.	CoT 10367	1.6	MR
Standard			
1.	Co 99004	1.3	MR
2.	Co 86032	2.8	MS

17			
(IV)	Advanced Varietal Trial- Midlate I Plant		
1.	Co 11005	1.4	MR
2.	Co 11007	1.5	MR
3.	Co 11012	1.6	MR
4.	Co 11019	3.2	S
5.	CoM 11085	1.6	MR
6.	CoM 11086	1.5	MR
(V)	Advanced Varietal Trial- Midlate II Plant		
1.	Co 09009	1.8	MR
2.	Co 10015	1.7	MR
3.	Co 10017	3.2	S
4.	Co 10031	1.4	MR
5.	Co 10033	2.1	MS
6.	CoM 10083	3.5	S
7.	CoT 10368	1.8	MR
8.	CoT 10369	2.7	MS
9.	CoVC 10061	3.4	S
10.	PI 10131	2.2	MS
11.	PI 10132	1.5	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 : 2016-2017

Varieties : **58-** 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 8th, 10th and 12th months). Each time, minimum of 25 canes (free from other biotic stresses) are to be scored.

YLD severity grades:

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

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

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

YLD severity scale :

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 5) :

At Navsari, 58 Zonal varieties/ entries from IVT (Early), IVT (Midlate), AVT (Early I & II Plant) , AVT (Midlate I & II 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 58 varieties of zonal trial evaluated by yellow leaf disease, 52 entries showed resistant reaction. Five entries viz., MS 13081 (IVT-E), Co 13005, CoT 13366, PI 13131 and PI 13132 (IVT-ML) were found moderately resistant reaction. Only one entry viz., Co 10368 (AVT-ML II Plant) displayed moderately susceptible reaction.

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

Table 5 : Evaluation of Zonal varieties for Yellow Leaf Disease (2016-17).

S.No	Genotype	YLD incidence (%)	Reaction	S.N	Genotype	YLD incidence (%)	Reaction
(I)	Initial Varietal Trial (Early)						
1.	Co 13002	0.0	R	5.	CoN 13072	0.0	R
2.	Co 13003	0.0	R	6.	CoSnk 13101	0.0	R
3.	Co 13004	0.0	R	7.	CoSnk 13102	0.4	R
4.	CoN 13071	0.0	R	8.	MS 13081	1.2	MR
(II)	Initial Varietal Trial (Midlate)						
1.	Co 13005	1.4	MR	11.	CoM 13082	0.0	R
2.	Co 13006	0.5	R	12.	CoN 13073	0.0	R
3.	Co 13008	0.6	R	13.	CoN 13074	0.0	R
4.	Co 13009	0.0	R	14.	CoSnk 13103	0.0	R
5.	Co 13011	0.0	R	15.	CoSnk 13104	0.0	R
6.	Co 13013	0.4	R	16.	CoSnk 13105	0.0	R
7.	Co 13014	0.0	R	17.	CoSnk 13106	0.0	R
8.	Co 13016	0.0	R	18.	CoT 13366	1.6	MR
9.	Co 13018	0.0	R	19.	PI 13131	1.4	MR
10.	Co 13020	0.0	R	20.	PI 13132	1.7	MR
(III)	Advanced Varietal Trial- Early I Plant						
1.	Co 11001	0.4	R	4.	CoM 11082	0.0	R
2.	Co 11004	0.0	R	5.	CoM 11084	0.0	R
3.	CoM 11081	0.0	R				
(IV)	Advanced Varietal Trial- Early II 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
(V)	Advanced Varietal Trial- Midlate I Plant						
1.	Co 11005	0.0	R	4.	Co 11019	0.0	R
2.	Co 11007	0.0	R	5.	CoM 11085	0.0	R
3.	Co 11012	0.0	R	6.	CoM 11086	0.0	R

(VI) Advanced Varietal Trial- Midlate II Plant							
1.	Co 09009	0.0	R	7.	CoT 10368	2.1	MS
2.	Co 10015	0.0	R	8.	CoT 10369	0.0	R
3.	Co 10017	0.0	R	9.	CoVC 10061	0.0	R
4.	Co 10031	0.0	R	10.	PI 10131	0.0	R
5.	Co 10033	0.0	R	11.	PI 10132	0.0	R
6.	CoM 10083	0.0	R				
Standard							
1.	CoC 671	0.8	R	4.	Co 86032	3.8	S
2.	Co 85004	2.2	MS	5.	Co 99004	1.1	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** : South Gujarat
- 3. Year** : 2016-2017
- 4. Observation** : Periodic observations in various Sugar factory areas were recorded on the natural incidence of diseases on all the varieties under cultivation.

Results (Table 6) :

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 2.02, 1.63 and 4.92 per cent respectively (Table 7). 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 9.70 % in Bardoli Sugar factory area. The wilt incidence noticed in CoC 671, Co 86032, Co 86002, CoM 0265 and CoSi 95071 varieties and was maximum to the tune of 6.54 % in Gandevi Sugar factory. The red rot was recorded in the varieties of CoC 671, Co 86032, Co 86002, Co 0323, CoVSI 03102, CoVSI 0434 and Co 97009 and it was to the tune of 1-2 % in All Sugar factories 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, Chalthan and Kamrej Sugar factory areas. Grassy shoot, yellow leaf disease were found in traces at Chalthan, Mahuva, Narmada, Bardoli sugar factory areas and also Navsari surrounding area. Grassy shoot was observed on Co 86032, CoC 671 and CoM 0265 and yellow leaf disease was noticed on Co 86032 and Co 99004.

Table 6. Survey of sugarcane diseases naturally occurring in the area on important sugarcane varieties (2016-2017)

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, Chalthan, Madhi, and Copper
2.	Red rot	CoC 671, Co 86032, Co 86002, Co 97009, Co 0323, CoVSI 0434, CoVSI 03102	Gandevi, Bardoli, Sayan, Kamrej, Narmada, Mahuva, Valsad, Chalthan, Madhi, and Copper
3.	Whip smut	CoSi 95071, Co 97009, Co 86002, Co 99004	Gandevi, Bardoli, Sayan, Kamrej, Narmada, Mahuva, Valsad, Chalthan, Madhi, and Copper
4.	Pokkhah boeing	Co 99004	Bardoli, Gandevi, Chalthan and Kamrej Sugar factory area
5.	Grassy shoot	Co 86032, CoM 0265, CoC 671	Chalthan, Valsad, Bardoli and Navsari surrounding area
6.	Yellow leaf disease	Co 86032, Co 99004	Bardoli, Chalthan, Gandevi, Narmada and Mahuva sugar factory area

PP 22 (Table 7): Survey of naturally occurring Sugarcane disease in South Gujarat (2016-17).

Sr No.	Disease	Name of area Surveyed	% disease incidence	Varieties affected
1.	Red rot	Bardoli Sugar factory Dist: Surat	2.56	CoC 671, Co 86032, Co 97009, Co 86002, Co 0323
	Wilt		0.70	CoC 671, Co 86032, CoM 0265, Co 97009, Co 86002
	Whip smut		9.70	Co 86002, CoSi 95071, Co 99004,
2.	Red rot	Kamrej Sugar factory Dist: Surat	1.60	Co 86032, CoC 671, Co 97009
	Wilt		1.80	Co 86032, Co 86002, FL-2005, CoM 0265
	Whip smut		8.30	Co 86002, CoSi 95071, Co 99004, Co 97009
3.	Red rot	Sayan Sugar Factory Dist: Surat	2.08	CoC 671, Co 86032, Co 86002, FL-2005, Co 97009
	Wilt		1.04	CoC 671, Co 86032, Co 86002, Co 97009, CoM 0265
	Whip smut		1.04	Co 86002, CoSi 95071, Co 99004, Co 97009
4.	Red rot	Gandevi Sugar Factory Dist: Navsari	3.65	CoC 671, Co 86032, Co 86002, Co 97009
	Wilt		6.54	CoC 671, Co 86032, Co 86002, Co 97009, CoM 0265
	Whip smut		6.82	Co 86002, CoSi 95071, Co 97009
5.	Red rot	Narmada Sugar Factory, Dharikheda, Dist: Narmada	1.50	CoC 671, Co 86032, Co 86002
	Wilt		1.85	CoC 671, Co 86032, Co 86002,
	Whip smut		8.20	Co 86002, CoSi 95071
6.	Red rot	Valsad Sugar Factory Dist: Valsad	1.90	CoC 671, Co 86032
	Wilt		3.00	CoC 671, Co 86032, CoM 0265
	Whip smut		6.10	Co 86002, Co 99004, Co 97009
7.	Red rot	Madhi Sugar Factory Dist: Surat	1.62	Co 86002, Co 86032, CoC 671
	Wilt		2.53	Co 86032, CoC 671, CoM 0265, Co 86002
	Whip smut		5.65	Co 86002, Co 97009
8.	Red rot	Coper Sugar Factory Dist: Tapi	1.07	CoC 671, Co 86032, Co 97009
	Wilt		2.45	CoC 671, Co 86002, Co 86032, Co 86249, Co 97009
	Whip smut		2.80	Co 86002, CoSi 95071, Co 86249
9.	Red rot	Mahuva Sugar Factory Dist: Surat	0.30	CoC 671, Co 86032, Co 86002, Co 97009
	Wilt		0.30	Co 86032, Co 86002, CoC 671, CoM 0265
	Whip smut		0.60	CoSi 95071, Co 86002, Co 97009
10.	Red rot	Chalthan Sugar Factory Dist: Surat	1.02	CoC 671, Co 86032, CoVSI 03102, CoVSI 0434
	Wilt		3.60	CoC 671, Co 86032
	Whip smut		5.50	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** : 2016-2017
4. **Test clones/No.** : 26
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.

Results (Table 8) :

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

Table 8. Assessment of elite and ISH genotypes for resistance to red rot (*Colletotrichum falcatum*) (2016-17).

Sr.No.	Genotypes	Red rot (Plug method)	
		Score	Reaction
1	ISH 111	3.2	MR
2	ISH 175	5.8	MS
3	ISH 58	3.4	MR
4	ISH 100	3.8	MR
5	ISH 287	2.8	MR
6	ISH 12	3.0	MR
7	ISH 50	3.6	MR
8	ISH 41	8.6	HS
9	ISH 147	3.3	MR
10	ISH 69	7.0	S
11	ISH 267	3.4	MR
12	ISH 229	4.4	MS
13	ISH 176	8.4	HS
14	ISH 118	3.6	MR
15	ISH 9	8.2	HS
16	ISH 43	8.8	HS
17	ISH 117	3.6	MR
18	ISH 114	3.5	MR
19	SES 594	1.0	R
20	ISH 115	3.4	MR
21	AS 04-2097	4.8	MS
22	MA 5/5	5.2	MS
23	MA 5/99	7.2	S
24	MA 5/51	5.6	MS
25	AS 04-1687	3.0	MR
26	GU 07-2276	2.9	MR