

SUGARCANE PATHOLOGY

PART-I: Ongoing Experiment:

Expt. No. 1. (PP-17B) Evaluation of zonal varieties / genotypes for resistance to smut

Objective: To gather information on the relative resistance of the entries in zonal varietal trial to smut disease.

Experimental Details

- | | |
|---|--|
| 1. Plot size: 6 M x 1 Rows | 5. Date of planting: 22/01/2015 |
| 2. Fertilizer dose: 250:115:115 Kg N, P ₂ O ₅ & K ₂ O/ ha | |
| 3. No. of genotypes: 49+ 11 Ch. = 60 | 6. Date of harvest: Jan-2016 |
| 4. Season: <i>Suru</i> | 7. Replications: 2 |

Smut Reaction Assessment key

Smut Reaction	Incidence (%)
1. Resistant (R):	0.00
2. Moderately Resistant (MR):	0.01 to 10.00
3. Moderately Susceptible (MS):	10.01 to 20.00
4. Susceptible (S):	20.01 to 30.0
5. Highly Susceptible (HS):	More than 30.00

Results: The results are presented in Table 1.

- 1) **IVT-(Early):** Out of 12 genotypes included in IVT (Early), **10 genotypes** i.e. Co 12001, Co 12003, Co 12007, CoM 12081, CoM 12082, CoM 12083, CoN 12071, CoN 12072, CoT 12366 and CoT 12367 showed **resistant** reaction to smut. **One** genotype Co 12006 showed **moderately resistant** reaction. **One** genotype Co 12008 showed **moderately susceptible** reaction to smut disease.
- 2) **AVT-Early (I Plant):** Out of 08 genotypes, **7 genotypes** viz., Co 10004, Co 10005, Co 10006, Co 10024, Co 10026, CoT 10366 and CoT 10367 showed **resistant** reaction whereas Co 10027 showed **moderately resistant** reaction to smut disease.
- 3) **AVT-Early (II Plant):** Out of 03 genotypes, **2 genotypes** viz., Co 09004 and Co 09007 showed **resistant** reaction whereas CoN 09072 showed **moderately susceptible** reaction to smut disease.
- 4) **IVT-Midlate:** Out of 15 genotypes tested, **09 genotypes** viz., Co 12014, Co 12016, Co 12017, Co 12019, Co 12021, CoM 12084, CoM 12085, CoM 12086 and CoN 12073 showed **resistant** reaction to smut. **Five** genotypes i.e. Co 12012, Co 12024, CoN 12074, CoT 12368 and VSI 12121 showed **moderately resistant** reaction where as one genotype i.e. Co 12009 showed **moderately susceptible** reaction to smut.
- 5) **AVT-Midlate I Plant:** Out of 11 genotypes included in AVT (Mid. I Plant), **04 genotypes** viz., Co 09009, CoM 10083, CoT 10368 and CoT 10369 showed **resistant** reaction to smut. **Three** genotypes i.e. Co 10031, Co 10033 and CoVc 10061 showed **moderately resistant** reaction where as two genotypes viz., Co 10017, PI 10132 and Co 10015, PI 10131 showed **moderately susceptible to susceptible** reaction to smut.

Thus, out of 60 zonal varieties/genotypes, **ten** genotypes i.e. Co 12001, Co 12003, Co 12007, CoM 12081, CoM 12082, CoM 12083, CoN 12071, CoN 12072, CoT 12366 and CoT 12367 from IVT Early, **7 genotypes** viz., Co 10004, Co 10005, Co 10006, Co 10024, Co 10026, CoT 10366 and CoT 10367 from AVT-Early (I Plant), **2 genotypes** viz., Co 09004 and Co 09007 from AVT-Early (II Plant), **09 genotypes** viz., Co 12014, Co 12016, Co 12017, Co 12019, Co 12021, CoM 12084, CoM 12085, CoM 12086 and CoN 12073 from IVT-Midlate and **04 genotypes** viz., Co 09009, CoM 10083, CoT 10368 and CoT 10369 from AVT-Midlate I Plant showed resistant reaction to smut disease.

Table 1. Incidence of smut on Sugarcane genotypes from AICRP trials under artificially inoculated conditions

Sr. No.	Genotype	Smut %	Reaction	Sr.No.	Genotype	Smut %	Reaction
IVT – Early (12)							
1	Co 12001	0.00	R	31	Co 12024	9.26	MR
2	Co 12003	0.00	R	32	CoM 12084	0.00	R
3	Co 12006	5.88	MR	33	CoM 12085	0.00	R
4	Co 12007	0.00	R	34	CoM 12086	0.00	R
5	Co 12008	10.94	MS	35	CoN 12073	0.00	R
6	CoM 12081	0.00	R	36	CoN 12074	5.08	MR
7	CoM 12082	0.00	R	37	CoT 12368	3.13	MR
8	CoM 12083	0.00	R	38	VSI 12121	9.38	MR
9	CoN 12071	0.00	R	AVT – Midlate I Plant (11)			
10	CoN 12072	0.00	R	39	Co 09009	0.00	R
11	CoT 12366	0.00	R	40	Co 10015	23.08	S
12	CoT 12367	0.00	R	41	Co 10017	17.86	MS
AVT – Early I Plant (08)				42	Co 10031	6.45	MR
13	Co 10004	0.00	R	43	Co 10033	4.62	MR
14	Co 10005	0.00	R	44	CoM 10083	0.00	R
15	Co 10006	0.00	R	45	CoT 10368	0.00	R
16	Co 10024	0.00	R	46	CoT 10369	0.00	R
17	Co 10026	0.00	R	47	CoVC 10061	7.81	MR
18	Co 10027	6.90	MR	48	PI 10131	20.31	S
19	CoT 10366	0.00	R	49	PI 10132	11.11	MS
20	CoT 10367	0.00	R	Checks			
AVT – Early II Plant (03)				50	Co 85004	10.00	MR
21	Co 09004	0.00	R	51	Co 94008	0.00	R
22	Co 09007	0.00	R	52	CoC 671	0.00	R
23	CoN 09072	10.94	MS	53	Co 86032	0.00	R
IVT– Midlate (15)				54	Co 99004	0.00	R
24	Co 12009	15.38	MS	55	CoM 265	0.00	R
25	Co 12012	4.92	MR	56	Co 740	23.08	S
26	Co 12014	0.00	R	57	Co 7219	15.87	MS
27	Co 12016	0.00	R	58	Co 7527	30.65	HS
28	Co 12017	0.00	R	59	MS 10001	0.00	R
29	Co 12019	0.00	R	60	CoVSI 3102	0.00	R
30	Co 12021	0.00	R				

Expt. No. 2. (PP-17D) Evaluation of zonal varieties / genotypes for resistance to YLD

Objective: To gather information on the relative resistance of the entries in zonal varietal trial to YLD disease.

Experimental Details

1. **Plot size:** 6 M x 1 Rows
2. **Fertilizer dose:** 250:115:115 Kg N, P₂O₅ &K₂O/ ha
3. **No. of genotypes:** 49+ 11 Ch. = 60
4. **Season:** *Suru*
5. **Date of planting:** 22/01/2015
6. **Date of harvest:** Jan-2016
7. **Replications:** 2

YLD severity grades:

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

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:

The results are presented in Table 2. Out of 60 genotypes, from AICRP trials under naturally conditions, **43** genotypes showed **resistant** reaction to YLD disease while **15** genotypes exhibited **moderately resistant** and **two** genotypes recorded **moderately susceptible**, reaction to YLD disease under natural conditions in the field

Table 2. Disease severity of YLD on sugarcane genotypes from AICRP trials under naturally conditions

Sr. No.	Genotype	Score	Reaction	Sr. No.	Genotype	Score	Reaction
IVT – Early (12)							
1	Co 12001	0.00	R	31	Co 12024	1.2	MR
2	Co 12003	2.00	MS	32	CoM 12084	0.00	R
3	Co 12006	1.4	MR	33	CoM 12085	0.00	R
4	Co 12007	0.50	R	34	CoM 12086	0.7	R
5	Co 12008	1.2	MR	35	CoN 12073	0.8	R
6	CoM 12081	0.00	R	36	CoN 12074	0.0	R
7	CoM 12082	0.00	R	37	CoT 12368	3.13	MR
8	CoM 12083	0.00	R	38	VSI 12121	1.6	MR
9	CoN 12071	0.00	R	AVT – Midlate I Plant (11)			
10	CoN 12072	1.8	MR	39	Co 09009	0.00	R
11	CoT 12366	1.6	MR	40	Co 10015	0.00	R
12	CoT 12367	0.9	R	41	Co 10017	1.00	MR
AVT – Early I Plant (08)				42	Co 10031	0.00	R
13	Co 10004	1.4	MR	43	Co 10033	0.00	R
14	Co 10005	0.00	R	44	CoM 10083	0.00	R
15	Co 10006	1.0	R	45	CoT 10368	0.00	R
16	Co 10024	1.2	MR	46	CoT 10369	1.1	MR
17	Co 10026	1.4	MR	47	CoVC 10061	0.00	R
18	Co 10027	0.00	R	48	PI 10131	2.4	MS
19	CoT 10366	0.00	R	49	PI 10132	1.2	MR
20	CoT 10367	0.8	R	Checks			
AVT – Early II Plant (03)				50	Co 85004	0.5	R
21	Co 09004	0.00	R	51	Co 94008	1.4	MR
22	Co 09007	0.7	R	52	CoC 671	0.5	R
23	CoN 09072	1.2	MR	53	Co 86032	0.5	R
IVT– Midlate (15)				54	Co 99004	1.0	R
24	Co 12009	0.00	R	55	CoM 265	0.00	R
25	Co 12012	0.00	R	56	Co 740	0.00	R
26	Co 12014	0.00	R	57	Co 7219	0.00	R
27	Co 12016	0.00	R	58	Co 7527	0.00	R
28	Co 12017	0.00	R	59	MS 10001	0.00	R
29	Co 12019	0.00	R	60	CoVSI 3102	0.00	R
30	Co 12021	0.00	R				

Expt. No. 3. Survey of sugarcane diseases naturally occurring in the area on important sugarcane varieties (PP-22)

Objective: To gather information on the diseases naturally occurring in the area on varieties for compiling an all India disease status report yearly.

Results: The results have been presented in Table 3.

Sugarcane disease surveys were conducted in Kolhapur, Satara Sangli, Pune, Solapur and Ahmednager districts of Maharashtra during 2015-16. During the course of survey, the incidence of different diseases like smut, grassy shoot, Pokka boeng, rust, YLD, brown spot and ring spot was noticed in different area. The abstract of area surveyed and diseases naturally occurring on different varieties are given in Table 5.

Smut was observed on Co 7527 ratoon crop up to 10% at Ajara, Dist. Kolhapur. Yellow leaf disease (YLD) was observed in Kasbe bavada, Radhanagri, Gadhinglaj from Kolhapur district on CoM 86032. The grassy shoot disease (GSD) was recorded in Bhuinj, Bavadhan, Kikali from Wai tahsil of Satara districts on the sugarcane variety CoM 265 (ratoon). Pokka boeng was noticed on CoVSI 9805, Co 92005 in Satara and Kolhapur district. The incidence of rust disease was noticed all district from western part of Maharashtra up to 20- 40 %. Brown spot was a major problem observed predominantly in Sangli and Kolhapur districts because of frequent rains and high humidity during rainy season. The incidence of ring spot disease was noticed up to 5-15% in Gadhinglaj, Radhanagri and Karveer district Kolhapur on the sugarcane variety Co 92005, whereas trace incidence was noticed on Co 7527.

Table 3: Survey of naturally occurring sugarcane diseases in Maharashtra region during 2015-16

Sl. No.	Disease	Name of area surveyed	% Disease incidence (clump basis)	Varieties affected	Crop stage when observed
1	Smut	Ajara Dist. Kolhapur	10%	Co 7527	4 months
2	YLD	Kasbe bavada, Radhanagri, Gadhinglaj Dist. Kolhapur	8- 10%	Co 86032	11 months
3	GSD	Bhuinj, Bavadhan, Kikali Tal. Wai Dist, Satara	5-10%	CoM 265 (Ratoon) VSI 434 CoVSI 3102	4- 5 months

contd

Table 3 contd...

Sl. No.	Disease	Name of area surveyed	% Disease incidence (clump basis)	Varieties affected	Crop stage when observed
4	Pokkah boeng	Kuditrae Tal. Karveer Dist. Kolhapur	25%	Co 92005	5 months
		Pimpore, Asale, Pande Dist. Satara	15%	Co VSI9805	6 months
5	Rust	Gadhinglaj, Radhanagri, Jayshingpur Dist. Kolhapur	15-20%	Co 92005 Co 86032	8 -10 months
		Avsari Bk. Tal. Ambegaon Navare Tal. Shirur Dist. Pune	20%	CoM 265	06 months
		Akluj, Malinager, Panivi, Sadashivnager Dist. Solapur	20%	CoM 265	10 months
		Malegaon, Bhavaninager, Sangavi Dist. Baramati	30%	CoM 265 Co 86032	8 -10 months
		Wai, Pachwad, Dhom, Sakarwadi, Murum Dist. Satara	10-40%	CoM 265 Co 86032	8 -10 months
		Kundal Tal. Palus Dist. Sangali	10%	CoM 265	8 -10 months
6	Brown Spot	Kasbe-bavada, Jayshingpur, Radhanagri Dist. Kolhapur	40%	CoM 265	8-10 months
		Chimangaon, Borjaiwadi, Rui Tal. Koregaon Dist. Satara	20%	CoM 265	8 months
		Umbraj, Vihe, Karad Tal. Karad Dist. Satara	20%	CoM 265	8 months
		Kundal Tal. Palus Dist. Sangali	30%	CoM 265	8-10 months
7	Ring Spot	Gadhinglaj, Radhanagri Dist. Kolhapur	15%	Co 92005	8 months
		Kuditre Tal. Karveer Dist. Kolhapur	2-5%	Co 7527	8 months

Expt. No. 4. (PP-28B) Methodology for screening sugarcane genotypes for resistance to brown rust (*Puccinia melanocephala*)

Objective: To standardize methodology for inoculation of urediniospores of sugarcane brown rust and rating of resistance.

Year of Start: *Suru* 2015-16

Date of Planting: 15/01/2015

Date of first disease appearance: 12/08/2015

Date of Inoculation: 19/08/2015

Inoculation Methodology:

1) Clip Inoculation in Leaf Whorl:

As soon as brown rust appeared in the field, rust affected leaves were selected and leaf bits (clips) measuring 8-10 cm were prepared. Ten rust free plants of same susceptible variety were selected in different location. In 3 shoots of each plant (clump), 2-3 clips were inserted in the leaf whorl of each shoot.

2) Leaf Whorl Inoculation:

As soon as brown rust appeared in the field, rust affected leaves were selected. Suspension of urediniospores (10^4 - 10^5 spores/ml) was prepared in sterilized distilled water and 1 ml freshly prepared suspension was poured in each leaf whorl. A total of 10 clumps were inoculated @ 3 shoots per clump.

The inoculated plants were marked by cutting 1/3rd of the tips of the uppermost leaves to identify them for recording observations.

Observations: After 4 weeks, following observations were recorded.

- i) Average no. of rust pustules per square inch and
- ii) No. of leaves bearing rust pustules

Results: The results are presented in Table 4. Clip inoculation in leaf whorl with rusted leaf clips and inoculation of rust urediniospores suspension in leaf whorl were suggested as per ICAR programme. It is evident from the results that in the leaf whorl inoculation method, higher average no. of rust pustules (38.34 per sq. inch) and higher no. of leaves bearing rust pustules (9.4) was recorded as compared to the clip inoculation method (26.08 per sq. inch and 9.2 respectively). This indicates that the leaf whorl inoculation method is better for screening than the clip inoculation method.

Table 4. Evaluation of inoculation methods for screening sugarcane genotypes against brown rust

Sr. No.	Inoculation Methodology	Average no. of rust pustules/inch ²	No. of leaves bearing rust pustules
1.	Clip Inoculation in Leaf Whorl	26.08	9.2
2.	Leaf Whorl Inoculation	38.34	9.4

Expt. No. 5. (PP 32) Management of brown spot disease of sugarcane

Objective: To find out effective chemical for management of sugarcane brown spot.

Experimental Details

Design: R.B.D.

Replications: Four

Plot size: 6.0 x 7.0 m (5 Rows of 7 m) **Fertilizer dose:** 250:115:115 Kg N, P₂O₅ & K₂O/ ha

Season: *Suru* 2015-16

Variety: CoM 0265

Treatment details:

Treat. No.	Fungicide a.i.	Spray conc. (%)	Trade name
T ₁	Propiconazole	0.10	Tilt 10 EC
T ₂	Hexaconazole	0.10	Contaf 5 EC
T ₃	Triadimefon	0.10	Bayleton 25 WP
T ₄	Mancozeb	0.30	Indofil M-45 75 WP
T ₅	Carbendazim	0.10	Bavistin
T ₆	Azoxystrobin	0.05	Amistar
T ₇	Tebuconazole	0.10	Folicure
T ₈	Water sprayed control	-	

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

Result: In the chemical management of brown spot of sugarcane experimental trial is vitiated due least incidence of brown spot on experimental plot.