

**VASANTDADA SUGAR INSTITUTE,
PUNE, MAHARASHTRA**

**Annual report of AICRP (S) of Plant Pathology discipline for the year
2014-15**

Project No	: AICRP- PP17-B
Title of the experiment	: Evaluation of zonal varieties of sugarcane for resistance to smut disease under artificial disease condition.
Objectives	: To gather information on the relative resistance to smut of the entries in zonal varietal trials of the peninsular zone.
Year of commencement	: 1994-95
Year of report	: 2014-15
Location of the experiment	: VSI, Pune
Date of planting	: 02.01.2014
Date of Harvesting	: 09.02.2015
Type of soil	: Medium black
Plot No	: Vasantdada R & D Farm, VSI, Pune
No. of varieties	: 37 genotypes/ varieties (Including checks: Co740 & Co7219)
No. of replications	: 2
Design of the experiment	: Rod row trial
Inoculum	: <i>Sporisorium scitaminea</i> teliospores collected from commercially cultivated varieties of sugarcane in Maharashtra, which served as source of inoculum.
Method of inoculation	: The method of inoculation consists of dipping of 2 eye-budded setts for 30 to 45 minutes in a smut spore suspension of over 90 % viability and with the spore load of 1 million spores per milliliter.
Plot Size	: Two rows of 5 meter length. Spacing between 2 rows: 120 cm.
Observations	: I) Number of healthy and smut affected stools per row were recorded for disease reaction II) Smut incidence was recorded at fortnightly intervals up to the harvest

Table: 1. Evaluation of sugarcane genotypes under ZVT's for smut resistance at VSI

Sr. No.	Genotype	Smut incidence (%) (cumulative)	Disease Reaction
I : Initial Varietal Trial – Early (12)			
1.	Co 10004	0.0	R
2.	Co 10005	*	-
3.	Co 10006	28.57	S
4.	Co 10024	16.66	MS
5.	Co 10026	*	-
6.	Co 10027	0.0	R
7.	CoM 10081	6.21	MR
8.	CoM 10082	22.61	S
9.	CoN 10071	44.44	HS
10.	CoN 10072	28.57	S
11.	CoT 10366	28.57	S
12.	CoT 10367	0.0	R
II: Advanced Varietal Trial – Early II Plant – Early (2)			
1.	Co08001	33.33	HS
2.	VSI08121	14.28	MS
III. Initial Varietal Trial -Midlate (14)			
1.	Co 10015	19.84	MS
2.	Co 10017	9.09	MR
3.	Co 10031	28.57	S
4.	Co 10033	25.00	S
5.	CoM 10083	0.0	R
6.	CoM 10084	25.00	S
7.	CoN 10073	42.87	HS
8.	CoT 10368	25.00	S
9.	CoT 10369	28.57	S
10.	CoVc 10061	*	
11.	CoVSI 10121	45.00	HS
12.	CoVSI 10122	25.00	S
13.	PI 10131	14.28	MS
14.	PI 10132	14.28	MS
IV. Advanced Varietal Trial II Plant Midlate (5)			
1.	Co 08008	0.0	R
2.	Co 08009	5.55	MR
3.	Co 08016,	12.50	MS
4.	Co 08020,	0.0	R
5.	CoSnk 08101	0.0	R
Checks (AICRP)			
1.	Co86032	33.33	HS
2.	Co99004	28.57	S
3.	Co94008	25.00	S
4.	CoC671	23.80	S
5.	Co85004	5.0	MR

STD checks for smut screening			
1	Co740	42.50	HS
2	Co7219	45.00	HS

* - *Seed material was not available*

Results:

The data about disease incidence and disease reaction furnished in Table 1 reveals that, out of 37 genotypes including checks screened for their resistance to smut disease under artificial disease condition at VSI, Pune, 7 genotypes were found resistant (R), 4 genotypes were found moderately resistant (MR), 6 genotypes found moderately susceptible (MS), 13 genotypes were found susceptible and remaining 7 were found highly susceptible (HS).

Project No.	: AICRP, PP 22
Title of the experiment	: Survey of sugarcane diseases naturally occurring in the area on important sugarcane varieties in Maharashtra State.
Objective	: To gather the information on sugarcane diseases naturally occurring in the area on varieties for compiling an all India disease status report, yearly.
Location of the experiment:	Maharashtra, VSI (Peninsular zone), Pune
Year of start	: 1989-90
Year of report	: 2014-15

Observations:

During Survey, the major and minor diseases of sugarcane were recorded on different commercially cultivated varieties of sugarcane in Maharashtra State. The sugarcane disease situation in Maharashtra is given in Table 2.

Table 2: Major and minor diseases recorded on different commercially cultivated varieties of sugarcane in Maharashtra State 2014-15

Sr. No.	Disease	Name of area surveyed	% Disease incidence	Varieties affected	Crop Stage when observed	Any other information
1	Whip Smut	Dist.: Latur, Jalna, Beed, Jalgaon	up to 7 %	Co86032, CoC671, CoM 0265	All stages	The incidence of the disease in Marathawada, Khandesh and Vidarbha region is more.
2	Grassy Shoot	Throughout Maharashtra	Up to 10 %	CoC671, Co86032, CoM 0265, CoVSI9805, VSI 434	All crop stages	The incidence of GSD is increasing.
3	Pineapple	Throughout Maharashtra	Up to 5 %	CoC671, Co86032, CoM0265	Germination	Observed in ill-drained soils.
4	Sett rot	Central and North-East part	-	CoC671, Co86032, CoM 0265	Germination	Observed in ill-drained soils. The disease incidence is minor.
Foliar Diseases and abnormality						
1	Pokkah boeng	Throughout Maharashtra	Up to 20 % (Leaf basis)	CoC671, CoVSI 9805, CoM 0265 CoVSI 434, Co86032	Monsoon period, especially severe in suru season planted crop.	Disease stages viz., Chlorosis, top rot and knife cut stages.
2	Rust	Throughout Maharashtra	Up to 15 % (Leaf basis)	CoC671, CoVSI 9805, VSI 434, Co92005 CoVSI 434, Co86032, CoM 0265	After the monsoon period.	The disease is being observed throughout the year. <i>Till 2013, varieties viz., CoM 0265 and Co86032 were free from the rust, but either due to breaking of resistance in the variety or occurrence of new race, the varieties are became susceptible to brown rust.</i>
3	Eye spot	Southern Zone: Kolhapur, Sindudurg, Sangli, Satara districts	Up to 10 % (Leaf basis)	CoC671, Co7527, Co 86032, CoM0265, Co92005	After monsoon period and maturity period	The disease is restricted in Southern zone.
4	Mosaic	Throughout Maharashtra	-	CoC671, Co86032, VSI434	Throughout the year	The disease incidence is minor.
5	Brown spot caused by <i>Cercospora longipes</i>	South Maharashtra- Kolhapur and Sangli Districts	Up to 20 %	CoM0265, Co86032	The incidence is being noticed throughout the year but the intensity is high after monsoon.	The severity of the disease was more in CoM0265 in Southern part of the state.
6	Banded chlorosis	Central part of Maharashtra	-	CoC671, Co86032	Limited in February and March months	Light- green to white or yellow horizontal patches/ bands on younger leaves. The single patch of 2 to 3 inch length was observed on individual leaf.

Project No. : AICRP- PP 28 (a)
Title of Experiments : Management of rust disease of sugarcane.
Objecives : To find out the effective chemical method of rust management.
Location : Vasantdada R&D Farm
Year of Start : 2004-2005
Year of Report : 2014-15 (Revised in 2011-12)
Experimental Details : RBD / R-4 / T5 / DP: 02.01.2014, DOH: 12.02.2015
Treatment details :
I: Variety of sugarcane: CoVSI9805
II: Fungicides
T1: Chlorothalonil (Kavach) - 0.25%
T2: Propineb (Antracol) - 0.25%
T3: Triadimefon (Bayleton) - 0.10%
T4: Mancozeb (Dithane M-45) - 0.20 %
T5: Control (untreated)
III: Time of application of fungicides
Sprays of the fungicides were carried out after the initiation of the disease. Consecutive three sprays at an interval of 15 days (as per the AICRP (S) Programme)

Method of observations:

Observations regarding disease incidence were recorded before each spray. The percent disease incidence was worked on the basis of number of infected and disease free leaves per cane. Ten (10) canes in each treatment were selected randomly for the observations. The other observations regarding the different parameters were recorded at the time of harvesting of the crop. The detail observations are presented in Table 3.

Table 3: Effect of fungicides on growth parameters and incidence of rust disease of sugarcane

Sr. No.	Treatments	Germination (%)	Total height of cane (cms)	Mill able height of cane (cm)	Internodes per cane (nos.)	Length of internodes (cm)	Girth of Internode (cm)	Cane yield (t/ha)	CCS (t/ha)	Disease Control (%)	Cost Benefit ratio
1.	T1: Chlorothalonil (Kavach) 0.25%	65.00	250.75	220.75	21.82	12.99	10.20	115.00	18.89	46.08	1: 1.69
2.	T2: Propineb (Antracol) - 0.25 %	69.00	270.40	239.00	25.08	14.50	13.76	126.00	21.05	64.94	1: 1.85
3.	T3: Triadimefon (Bayleton) - 0.10 %	64.50	263.50	232.75	24.21	13.41	11.78	110.00	18.75	47.50	1: 1.61
4.	T4: Mancozeb (Dithane M-45) - 0.20%	68.50	256.00	224.00	23.77	15.50	12.15	115.00	17.12	63.98	1.1.69
5	T5: Control (Untreated)	64.00	241.50	210.75	19.88	11.91	10.50	105.50	16.25	0.00	1:1.55
	S.E. \pm	1.34	1.35	1.35	1.13	0.47	0.49	4.06	1.11	0.45	
	CD at 5%	NS	4.16	4.17	3.50	1.45	1.52	12.53	NS	1.38	
	C.V.%	4.05	1.05	1.20	9.90	6.91	8.45	7.11	12.10	2.09	

Result and discussion:

- i. Germination:** The germination percentage did not influence significantly due to fungicides under study. However, maximum germination was recorded in T2 (Propineb @ 0.25 % i.e. 69.00 %).
- ii. Total height of cane:** There was highly significant difference in treated and untreated plots. The total height of cane was maximum in T2 (Propineb @ 0.25 %) i.e.270.40 cm. While, lowest cane height was noticed in control i.e. 241.50 cms.
- iii. Mill able height of cane:** There was significant difference in treated and untreated plots. The mill able cane height was maximum in T2 (Propineb @ 0.25%) i.e. 239.00 cms.
- iv. No. of internodes per cane:** There was significant difference in treated and untreated plots. The numbers of internodes at higher side in T2 i.e. 25.08, while, lowest in control (19.88).
- v. Length of internode:** The difference in length of internodes was significant in treated and untreated plots. In treatment T4 (Mancozeb - 0.20%) the length of internodes was more (15.50 cms) than all other the treatments and followed by T2 (14.50 cms).
- vi. Girth of internode:** There is significant influence on girth of internodes due to treatments under study. The internode girth was maximum in T2 (Propineb @ 0.25%) i.e. 13.76 cms compared to all other the treatments including control.
- vii. Yield of cane:** The cane yield differed significantly due to various treatments under study. The cane yield was maximum in T2 (Propineb 0.25%) i.e. 126.00 t/ha. This was significantly superior over the control (105.50 t/ha.). The second highest yield was obtained in T4 (Mancozeb @ 0.20%) i.e.115.00 t/ha.
- viii. CCS (t/ha.):** There is non-significant difference in treated and untreated plots. The CCS (t/ha.) was found maximum in T2 (Propineb @ 0.25%) i.e.21.05 t/ha.
- ix. Rust disease control:** There is significant difference in treated and untreated plots. The maximum disease control was observed in T2 (Propineb @ 0.25%) i.e. 64.94 %. It is followed by T4 (Mancozeb @ 0.20 %) where disease control is 63.98.

- x. **Cost Benefit Ratio:** The maximum disease BC ratio was obtained from T2 (Propineb @ 0.25%) i.e.1: 1.85 which is superior over rest of the treatments including control.

Conclusion:

All the fungicides viz. chlorothalonil (Kavach @ 0.25%), Propineb (Antracol @ 0.25%), Triadimefon (Bayleton @ 0.10 %) and Mancozeb (Dithane M-45 @ 0.20%) are found effective in minimizing the rust disease incidence. But none of the fungicides found effective to control the rust disease cent percent. The Propineb @ 0.25% was found superior for controlling the disease up to 64.94 % than other fungicides in testing.

Project No.	: AICRP PP 28 (b)
Title of the Project	: Methodology for screening sugarcane genotypes for resistance to brown rust (<i>Puccinia melanocephala</i>)
Objective	: To standardize methodology for inoculation of urediniospores of brown rust and rating of resistance.
Year of start	: 2013-14
Location	: Vasantdada R & D Farm, VSI,Pune
Date of Planting	: 02.01.2014
Date of Inoculation	: 10.08.2014

Inoculation methodology:

- a. Clip inoculation in leaf whorl:** After brown rust appearance in field on CoVSI 9805, selected rust affected leaves and leaf bits measuring 8 cm were prepared. Inserted 3 clips in the leaf whorl of each shoot of ten rust-free plants of this variety.
- b. Leaf whorl inoculation:** After initiation of brown rust in field on CoVSI9805, collected rust affected leaves. Suspension of urediniopores in sterilized distilled water was prepared. Poured 1 ml freshly prepared urediniospore suspension in each leaf whorl of same variety. Inoculated 10 clumps (three shoots per clump) of same variety.

Observations: After one months period after inoculation recorded the symptoms of brown rust on leaves by counting average number of rust pustules per square inch and number of leaves bearing rust pustules.

Table 4: Inoculation method wise rust pustules on inoculated leaves

Clip inoculation method		Leaf whorl method	
Shoot Number	No.of rust pustules per sq.inch (Av.of 3 leaves)	Shoot Number	No. of rust pustules per sq.inch (Av. of 3 leaves)
1	15	1	25
2	18	2	27
3	14	3	25
4	11	4	30
5	18	5	23
7	12	7	23
8	13	8	26
9	13	9	25
10	17	10	27
Total	131	Total	231
Average	13.10	Average	23.10

Results: After one month of inoculation the observations regarding the number of pustules on leaves were recorded. Observations in Table No.4 indicates that, out of 2 methods, number of rust pustules (23.10/sq.inch²) on inoculated were higher under leaf whorl method. In clip inoculation, the average numbers of rust pustules per square inch

were 13.10. Therefore, leaf whorl inoculation method is far superior over clip inoculation method.

Project No. : AICRP: PP31 (a & b)
Title of the Project : Screening, epidemiology and management of pokkah boeng in sugarcane
Title of the experiment : **A. Varietal Screening**
 Screening of promising genotypes of sugarcane against the pokkah boeng disease of sugarcane
Location : Vasantdada R & D Farm.
Date of Planting : 02.01.2014
Date of Harvesting : 23.02.2015
Soil type : Medium Black
No. of treatments : 12 genotypes/ varieties
Design of the experiment : Rod Row trial. **No. of replications** : 2
Plot size : Two rows of 6 m length, spacing betⁿ rows:120 cm
Treatment Details : As per the AICRP (S) program, 12 genotypes were screened against pokkah boeng disease in sugarcane under natural condition.

Results and Discussion:

The data regarding disease incidence (%) of genotypes, tested against pokkah boeng disease under natural condition presented in Table 5. Out of the 12 genotypes, 2 genotype viz., CoVSI0309 and Co419 were observed free from the disease, while remaining 10 viz., CoVSI9805, CoC671, Co86032, VSI434, CoVSI0405, Co85004, CoM0265, CoVSI03102, CoVSI2000-01 and Co94012 were found susceptible during the year under natural condition.

Table 5: Variety wise incidence and disease reaction of pokkah boeng disease under natural condition.

Sr. No.	Name of the variety	% Disease Incidence	Sr. No.	Name of the variety	% Disease Incidence
1	CoVSI9805	21.36	7	Co85004	17.22
2	VSI434	14.28	8	CoVSI0309	0.00
3	CoC671	10.25	9	CoM0265	10.42
4	Co86032	16.78	10	CoVSI03102	18.64
5	Co419	0.0	11	CoVSI2000-01	16.66
6	CoVSI0405	21.30	12	Co94012	19.64

B. Epidemiology of disease

The incidence of pokkah disease was initiated in the second week of June 2014. This area received pre-monsoon rains in 2nd fortnight of May (Meteorological week – 24th). The minimum and maximum temperature of 24 °C and 36.20°C was noted during these meteorological weeks, humidity ranges from 34.00 to 77.57 %, while rainfall was 9.00 mm in 24th meteorological week. Maximum disease incidence was observed in the month

of July & August months (27th to 35th meteorological weeks). The incidence of the disease was reduced after 36th meteorological week.

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Agriculture Meteorological Data From April 2014 to March 2015

Month	Air temperature (°C)		Relative Humidity (%)		Rainfall (mm)	No. of rainy days
	Min	Max	Min	Max		
April 2014	18.19	39.41	14.55	73.39	7.80	02
May 2014	22.94	38.73	22.21	73.46	9.40	02
June 2014	23.67	35.35	41.05	81.30	20.80	06
July 2014	22.75	30.44	60.17	88.33	163.60	23
August 2014	21.35	31.04	62.82	95.93	202.00	27
September 2014	20.05	32.04	54.10	95.32	34.60	16
October 2014	17.54	33.16	40.51	82.67	25.80	12
November 2014	15.39	30.43	36.43	92.35	44.00	01
December 2014	8.30	30.68	32.92	97.31	2.20	03
January 2015	8.18	31.58	28.86	94.81	0.20	01
February 2015	9.67	35.80	16.89	85.62	20.80	01
March 2015	18.99	36.18	24.00	94.92	47.80	08
TOTAL					579	102