SUGARCANE PATHOLOGY

1) Title:Evaluation of zonal varieties/genotypes for resistance to smut (PP 17B).

1.	Title of the project	:	Plant Protection.
2.	Name of the Scientists	:	Prof. D.M. Veer. Miss.K.B.Patil. Shri.N.B.Ghodake
3.	Name of experiment	:	Evaluation of zonal varieties/ genotypes for resistance to smut.
4.	Object	:	To gather information on relative resistance to smut of the entries included under crop improvement programme.
5.	Location	:	Regional Sugarcane and Jaggery Research Station, Kolhapur.
6.	Experimental Details	:	
	i) Year of start	:	1994-95- long term experiment
	ii) Genotypes and varieties	:	Total genotypes- 30 Check varieties - 10
	iii) Inoculum	:	*Ustilago scitaminea* teliospores collected from commercially cultivated susceptible varieties Co 740 and Co 7527 for artificial inoculation.
	iv) Inoculation	:	The method of inoculation consists of deeping of setts for 30 minutes in spore suspension of over 90% viability and with spore load of one million spores per milliliter (10^6).
	v) Plot size and planting	:	Plot size-11 meter row length (3x11m), Planting – 12 buds per meter of each variety were planted after inoculation. Date: 25/12/13
	vi) Observations	:	Number of smut infected clumps of each genotype was recorded periodically.
	vii) Evaluation	:	Evaluation is based on percentage clumps infected. The following grading criteria was used.

0.0 per cent	:	Resistant (R)
0.1 - 10 per cent	:	Moderately resistant (MR)
10.1- 20 percent	:	Moderately susceptible (MS)
20.1- 30 per cent	:	Susceptible (S)
Above 30 per cent	:	Highly susceptible (HS)

Table 1: Incidence of smut on sugarcane genotypes / varieties

Sr. No	Name of genotype	Smut incidence (%)	Reaction
(I) IVT Early			
1	**Co 11001**	1.79	MR
2	**Co 11004**	23.33	S
3	**Co 11016**	8.63	MR
4	**Co 11017**	27.45	S
5	**Co 11018**	9.03	MR
6	**CoM 11081**	0.00	R
7	**CoM 11082**	37.13	HS
8	**CoM 11083**	42.72	HS
9	**CoM 11084**	28.33	S
10	**CoN 11071**	29.81	S
11	**CoN 11072**	37.78	HS
12	**CoT 11366**	19.63	MS
13	**PI 11131**	17.50	MS
(II) AVT Early I Plant			
1	**Co 09004**	0.00	R
2	**Co 09007**	0.00	R
3	**CoN 09072**	8.63	MR
(III) IVT Midlate			
1	**Co 11005**	0.00	R
2	**Co 11007**	23.33	S
3	**Co 11012**	0.00	R
4	**Co 11019**	11.53	MS
5	**Co 11020**	9.03	MR
6	**Co 11021**	0.00	R
7	**Co 11022**	0.00	R
8	**Co 11023**	0.00	R
9	**Co 11024**	0.00	R
10	**CoM 11085**	0.00	R
11	**CoM 11086**	0.00	R
12	**CoM 11087**	0.00	R
13	**CoN 11073**	26.83	S
14	**CoN 11074**	0.00	R
(V) Checks			
1	**Co 85004**	9.03	MR
2	**CoC 671**	7.72	MR
3	**Co 94008**	0.00	R
4	**Co 99004**	0.00	R
5	**Co 86032**	0.00	R
6	**CoM 0265**	0.00	R
7	**Co 7527**	60.13	HS
8	**Co 740**	48.67	HS
Other genotypes			
1	**MS 10001**	0.00	R
2	**CoM 09057**	0.00	R

Results:

The results are presented in Table 1. Under evaluation of zonal varieties/genotypes for resistance to smut disease project, total 40 sugarcane genotypes including check varieties were tested. Trial wise results are presented below.

1) IVT Early: Among the tested 13 genotypes, sugarcane genotype CoM 11081 found resistant to smut. Three genotypes Co 11001, Co 11016 and Co 11018 were shown moderately resistant reaction to smut. Two genotypes *viz.*, CoT 11366 and PI 11131 were moderately susceptible whereas, Co 11004, Co 11011, CoM 11084 and CoN 11071 were susceptible to smut disease. The genotypes CoM 11082, CoM 11084 and CoN 11072 were found highly susceptible to smut disease.

2) IVT Early I: Only three genotypes were tested against smut disease under artificial condition. Among the genotypes, Co 09004 and Co 09009 were found resistant to smut and remaining genotype CoN 09072 was found moderately resistant to smut.

3) IVT Midlate: Among the tested 14 genotypes, almost sugarcane genotypes showed the resistant reaction to smut except, Co 11007 and CoN 11073 which were found susceptible. Co 11019 and Co 11020 were found moderately susceptible and moderately resistant reaction to smut disease, respectively.

4) Checks: Among check varieties belonging to early and midlate groups, Co 85004 and CoC 671 were found moderately resistant and Co 94008 was found resistant to smut disease. Check varieties from midlate group, Co 86032, Co 99004 and CoM 0265 were found resistant to smut disease whereas, Co 7527 and Co 740 were found highly susceptible.

2) Title: Evaluation of zonal varieties/genotypes for resistance to YLD (PP 17D).

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

Experimental Details:

1. **Plot size:** 11 M x 1 Rows
2. **Fertilizer dose:** 250:115:115 Kg N, P_2O_5 &K_2O/ ha
3. **No. of genotypes:** 30+ 10 Ch. = 40
4. **Season:** *Suru*
5. **Date of planting:** 25/12/2013
6. **Date of harvest:** 23/02/2015
7. **Replications:** 3

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:

IVT Early: Thirteen sugarcane genotypes were screened for YLD disease. Among them, two sugarcane genotypes Co 11017 and Co 11018 were found moderately resistant, two genotypes CoN 11071 and CoT 11366 were moderately susceptible, one genotype Co 11016 was found susceptible to YLD disease. Remaining 8 genotypes were found resistant to YLD.

AVT Early I: Three genotypes were screened for resistance to YLD. Among them, Co 09004 was found resistant and other two genotypes showed moderately resistant reaction to YLD.

IVT Midlate: Out of 14 sugarcane genotypes, 12 sugarcane genotypes were found resistant to YLD. Genotype Co 11023 was found moderately resistant whereas, Co 11021 showed moderately susceptible reaction to YLD.

Check: Among the checks and other sugarcane varieties, five check varieties and two other varieties showed resistant reaction to YLD. Check varieties Co 85004 and Co 94008 were found moderately resistant and Co 86032 was found susceptible to YLD.

Table 2: Incidence of YLD on sugarcane genotypes / varieties

Sr. No	Name of genotype	Smut incidence (%)	Reaction
(I) IVT Early			
1	**Co 11001**	0.00	R
2	**Co 11004**	0.00	R
3	**Co 11016**	3.3	S
4	**Co 11017**	1.5	MR
5	**Co 11018**	1.6	MR
6	**CoM 11081**	0.3	R
7	**CoM 11082**	0.6	R
8	**CoM 11083**	0.00	R
9	**CoM 11084**	0.00	R
10	**CoN 11071**	2.7	MS
11	**CoN 11072**	0.6	R
12	**CoT 11366**	2.7	MS
13	**PI 11131**	0.00	R
(II) AVT Early I Plant			
1	**Co 09004**	0.00	R
2	**Co 09007**	1.6	MR
3	**CoN 09072**	1.2	MR
(III) IVT Midlate			
1	**Co 11005**	0.00	R
2	**Co 11007**	0.00	R
3	**Co 11012**	0.6	R
4	**Co 11019**	0.3	R
5	**Co 11020**	0.00	R
6	**Co 11021**	2.1	MS
7	**Co 11022**	0.00	R
8	**Co 11023**	1.2	MR
9	**Co 11024**	0.00	R
10	**CoM 11085**	0.00	R
11	**CoM 11086**	0.00	R
12	**CoM 11087**	0.6	R
13	**CoN 11073**	0.3	R
14	**CoN 11074**	0.9	R
(V) Checks			
1	**Co 85004**	1.8	MR
2	**CoC 671**	0.9	R
3	**Co 94008**	0.3	MR
4	**Co 99004**	0.00	R
5	**Co 86032**	3.3	S
6	**CoM 0265**	0.00	R
7	**Co 7527**	0.00	R
8	**Co 740**	0.00	R
Other genotypes			
1	**MS 10001**	0.00	R
2	**CoM 09057**	0.00	R

3) Title: Survey of sugarcane diseases naturally occurring in the area on important sugarcane varieties (PP-22).

1.	Title of the project	:	Plant Protection.
2.	Name of the Scientists	:	Prof. D.M. Veer. Miss. K. B. Patil. Shri.N.B.Ghodake
3.	Name of experiment	:	Survey of sugarcane diseases naturally occurring in the area on important sugarcane varieties.
4.	Object	:	To gather information of diseases of sugarcane varieties grown on commercially basis.

5. **Preamble** :

Most of the cultivators are bringing the infected seed material of recommended or not recommended sugarcane varieties/genotypes in the region from adjoining states *viz.* Karnataka and Gujarat. Hence, there are chances to develop new flora of insects pest and diseases in the region and sometime it is too difficult to control their spread up in the region. It is therefore, essential to undertake the survey of sugarcane diseases. The information on occurrence and their intensity on different sugarcane varieties/genotypes to be required for preparation of disease status at national level. Therefore, the survey work was undertaken in the region and recorded the natural occurrence of diseases on commercially grown sugarcane varieties.

6. **Results** :

In Kolhapur region, the recommended sugarcane varieties belonging to early group i.e., CoC 671, Co 92005 and Co 8014 are almost under *suru* cultivation. Whereas, midlate group sugarcane varieties Co 86032 and CoM 0265 under preseasonal and Adsali season. However, the area under sugarcane variety Co 86032 is increased whereas, the area under CoM 0265 is slightly reduced. Co 92005 is cultivated in Submontane zone and it is suitable variety for paddy base sugarcane system. This variety introduced in some part of southern Konkan and Goa. At present, this variety is playing vital role in achieving high recovery of some sugar factories located in Submontane zone.

The survey of sugarcane diseases was carried out before onset of south-west monsoon and after over monsoon in the region. Among the cultivated sugarcane varieties, none of the variety is not found disease free. The incidence of seed borne disease *viz.*, Grassy shoot disease is increased due to use of unhealthy

seed material. It is, noticed that the smut disease is not much observed in the zone except Co 7527 (Maximum 5%). The non recommended sugarcane genotype CoM 0261 which is highly susceptible to smut disease is observed in each tahsil of Kolhapur district.

Among the foliar diseases, rust and ring spot, fungal diseases are predominant in the region because of weather condition. The intensity of these diseases were noticed in the range of 25-80 % (Rust) and 10-25 % (Ring Spot). The Pokkah boeng disease was noticed in all sugarcane varieties after receiving Pre-monsoon shower in May. But, it is, disappeared after starting of South West Monsoon.

The brown spot disease has been noticed every year on CoM 0265 sugarcane variety with high intensity upto 60%. This is foliar disease which is caused by *Cercospora longipes.* It sprayed through air in Monsoon season when there is drizzling rains with more R.H.(> 80%). The another detrimental disease is Yellow Leaf Disease which is caused by virus. The sugarcane variety Co 86032 is highly susceptible to YLD. The intensity of YLD is more on Co 86032 after attaining the age of eight to twelve months. Hence, the following plant protection measures were suggested for control of fungal, phytoplasmal and viral diseases.

1. To use disease free material.
2. To follow thermotherapy for control of seed borne diseases.
3. To undertake seed production by adopting three tier system.
4. To plant disease resistance varieties.
5. Seed treatment with Carbendanzim (0.1 %).
6. Field sanitation.
7. To apply proper dose of Nitrogen.
8. Drain out excess water.
9. To follow Quarantine Law within the States regarding transportation of seed material.
10. To bring awareness among the farmers for control of diseases.
11. To develop disease resistance varieties through Genetic Engineering Technology.

Table 3: The survey of sugarcane diseases.

Sr. No.	Name of Tahsil	Name of Variety	Smut (%)	GSD (%)	Brown spot (%)	Rust (%)	Ring Spot (%)	Eye Spot (%)	Pokkah boeng (%)	Yellow Leaf Disease (%)
1	Tal. Kagal Dist. Kolhapur	Co 86032	-	3	-	-	-	-	-	10
		CoM 0265	-	3	60	-	10	-	-	-
		Co 92005	-	2	-	50	30	-	5	-
		CoC 671	-	2	-	60	25	-	10	-
		Co 7527	-	-	-	55	30	-	5	-
2	Tal. Gadhinglaj Dist. Kolhapur	Co 86032	-	3	-	-	-	-	-	15
		CoM 0265	-	3	50	-	-	-	-	-
		Co 92005	-	2	-	40	20	-	5	-
		CoC 671	-	2	-	50	25	-	15	-
3	Tal. Chandgad Dist. Kolhapur	Co 86032	-	5	-	-	-	-	-	15
		CoM 0265	-	5	60	-	10	-	-	-
		Co 92005	-	2	-	60	20	-	10	-
		CoC 671	-	3	-	65	20	-	15	-
		Co 7527	-	-	-	70	25	-	5	-
4	Tal. Ajara Dist. Kolhapur	Co 86032	-	4	-	-	-	-	-	15
		CoM 0265	-	5	60	-	10	-	-	-
		Co 92005	-	2	-	80	20	-	10	-
		CoC 671	-	-	-	65	20	-	15	-
5	Tal. Bhudargad Dist. Kolhapur	Co 86032	-	3	-	-	-	-	-	20
		CoM 0265	-	3	80	-	10	-	-	-
		Co 92005	-	2	-	60	20	-	15	-
6	Tal. Radhanagari Dist. Kolhapur	Co 86032	-	2	-	-	-	-	-	20
		CoM 0265	-	2	80	-	10	-	-	-
		Co 92005	-	-	-	60	20	-	10	-
		CoC 671	-	2	-	60	20	-	15	-

Sr. No.	Name of Tahsil	Name of Variety	Smut (%)	GSD (%)	Brown spot (%)	Rust (%)	Ring Spot (%)	Eye Spot (%)	Pokkah boeng (%)	YellowLeaf Disease (%)
7	Tal. Karveer Dist. Kolhapur	Co 86032	-	3	-	-	-	-	-	20
		CoM 0265	-	5	50	-	-	-	-	-
		Co 92005	-	3	-	45	10	-	5	-
		CoC 671	-	2	-	50	20	-	10	-
8	Tal. Hatkanagale Dist. Kolhapur	Co 86032	2	-	-	-	-	-	-	25
		CoM 0265	-	4	-	-	-	-	-	-
		CoC 671	2	-	30	-	-	-	5	-
9	Tal.Shirol Dist. Kolhapur	Co 86032	-	5	40	-	-	-	-	25
		CoM 0265	-	5	-	-	-	-	-	-
		CoM 0261	5	-	-	45	-	-	-	-
10	Tal. Gaganbawada Dist. Kolhapur	Co 92005	-	3	-	75	20	-	10	-
		Co 86032	-	3	-	-	-	-	-	20
11	Tal. Shahuwadi Dist. Kolhapur	Co 92005	-	3	-	60	20	-	10	-
		Co 86032	-	5	-	-	-	-	-	20
		CoM 0265	-	3	60	-	10	-	-	-
12	Tal. Panhala Dist. Kolhapur	Co 92005	-	2	-	65	20	-	10	-
		Co 86032	-	3	-	-	-	-	-	20
		CoC 671	-	2	-	60	20	-	-	-
13	Tal. Shirala Dist. Sangli	CoM 0265	-	3	60	-	-	-	-	-
		Co 86032	-	3	-	-	-	-	-	20
		Co 92005	-	2	-	50	20	-	10	-

Sr. No.	Name of Tahsil	Name of Variety	Smut (%)	GSD (%)	Brown spot (%)	Rust (%)	Ring Spot (%)	Eye Spot (%)	Pokkah boeng (%)	YellowLeaf Disease (%)
14	Tal. Palus Dist. Sangli	CoM 0265	-	5	50	-	-	-	-	-
		Co 86032	-	5	-	-	-	-	-	25
15	Tal. Miraj Dist. Sangli	CoM 0265	-	5	40	-	-	-	-	-
		Co 86032	-	5	-	-	-	-	-	25
16	Tal. Walwa Dist. Sangli	Co 86032	5	-	-	-	-	-	-	20
		CoM 0265	5	5	-	-	-	-	-	-
		CoC 671	-	-	45	-	-	-	5	-
18	Tal. Karad Dist. Satara	Co 86032	-	5	-	-	-	-	-	20
		CoM 0265	-	5	45	-	-	-	-	-
		Co 92005	-	-	-	35	-	-	5	-
		Co 7527	-	-	-	45	10	-	5	-
19	Tal. Patan Dist. Satara	Co 86032	-	5	-	-	-	-	-	20
		CoM 0265	-	3	50	-	-	-	-	-
		Co 92005	-	-	-	55	20	-	10	-

4) Title: Management of rust of sugarcane (PP-28a).

Objective : To find out effective method of rust management through chemicals.

Year of Start: 2013-14

Treatment :

I. Variety : Rust susceptible variety of the area (CoC 671)

II. Fungicides

T.1	- Chlorothalonil	-	0.25 %
T.2	- Propineb	-	0.20 %
T.3	- Triadimefon	-	0.10 %
T.4	- Mancozeb	-	0.30 %
T.5	- Control (Untreated)		

III. Time of application of fungicides: To be applied just after appearance of rust pustules followed by two sprays at 15 days interval.

Plot size : 6 x 7 sq. m

Design : RBD

Replications : Three

Observations :

1. Germination %
2. Disease severity (% leaf area covered with rust pustules based on observations of 10 leaves per clump; total no. of clumps to be observed at least 10)
3. Cane yield per plot and per hectare
4. Brix, Pol %, Purity and CCS %
5. Cost-benefit ratio

Note: The experiment is vitiated due to non feasibility of spraying different fungicides during rainy season. In the month of June and July the amount of total rainfall received was 486.1 mm in 31 rainy days. However, first spray of fungicidal treatments were undertaken after appearance of rust pustules, it was observed that, each fungicide shown the effect in controlling rust. But during the later period of rainy season due to high intensity of rainfall it was not possible to undertake the spraying of fungicide. However, Mancozeb (0.30%) fungicide is found effective for control of rust after first spraying.

5) Title: Screening of sugarcane genotypes for resistance to brown rust (*Puccinia melanocephala*) (PP-28b).

Objective: To identify the resistant sugarcane genotypes to brown rust.

Year of Start: 2013-14

Date of Planting: 25/12/2013

Period of Disease appearance: First week of June.

Considering the congenial natural conditions (Temperature and humidity) for development of foliar diseases. There is no need to go for artificial inoculation in rust screening experiment.

At Kolhapur center, after onset of south-east monsoon increasing the disease intensity of foliar diseases. The weather condition in Kolhapur region is really favourable for development of foliar diseases. Hence, it is a good place for screening of sugarcane genotypes rather than other centres in the zone.

Results:

IVT Early: among the tested 13 sugarcane genotypes, eight genotypes were found free from rust disease, whereas remaining five sugarcane genotypes showed rust disease intensity in the range of 10-50% under natural condition.
AVT Early I: Among the tested three genotypes, Co 09004 is found free from rust and remaining two showed medium rust disease intensity.
IVT Midlate: Out of 14 sugarcane genotypes, five sugarcane genotypes were found free from rust disease whereas, remaining genotypes showed the rust disease intensity in the range of 25-45% under natural condition.
Check varieties and other genotypes: Among the check varieties Co 86032, Co 740 and MS 10001 were found rust free.

Observations of other foliar diseases *viz.*, Brown spot and Ring spot also recorded. Out of 40 sugarcane genotypes (including checks and promising genotypes) nine and six genotypes were found free from brown spot and Ring spot disease respectively.

Table 4: Occurrence of brown rust and other foliar diseases on sugarcane genotypes/ Varieties under natural condition.

Sr. No	Name of genotype	Incidence (%)		
		Rust	Brown spot	Ring spot
IVT Early				
1	Co 11001	-	25	-
2	Co 11004	35	-	10
3	Co 11016	-	-	25
4	Co 11017	-	-	15
5	Co 11018	10	-	-
6	CoM 11081	25	-	-
7	CoM 11082	-	30	35
8	CoM 11083	-	-	15
9	CoM 11084	-	25	-
10	CoN 11071	-	-	45
11	CoN 11072	50	-	25
12	CoT 11366	-	-	65
13	PI 11131	40	-	-
IVT Early I				
1	Co 09004	-	-	10
2	Co 09007	35	-	45
3	CoN 09072	15	35	-
IVT Midlate				
1	Co 11005	45	-	25
2	Co 11007	-	-	55
3	Co 11012	30	25	-
4	Co 11019	-	-	10
5	Co 11020	-	-	25
6	Co 11021	-	-	10
7	Co 11022	-	-	-
8	Co 11023	40	-	35
9	Co 11024	45	-	5
10	CoM 11085	-	5	5
11	CoM 11086	25	-	20
12	CoM 11087	-	-	5
13	CoN 11073	-	-	60
14	CoN 11074	-	-	35
Checks				
1	Co 85004	35	-	35
2	CoC 671	55	-	10
3	Co 99004	25	-	-
4	Co 86032	-	-	-
5	CoM 0265	15	45	-
6	Co 94008	15	-	5
7	Co 7527	60	-	30
8	Co 740	-	-	-
Other Genotypes				
1	MS 10001	-	Trace	-
2	CoM 09057	10	-	5

6) Title: Screening, epidemiology and management of pokkah boeng in sugarcane (PP-31).

Objectives: To study the development of pokkah boeng disease in relation to weather parameters and its management in sugarcane crop.

Year of start: 2011-2012

Observations to be recorded:

i. Screening the desirable varieties for the incidence of pokkah boeng.
ii. Correlation of climatic factors in relation to disease development and management of boeng under field conditions if the disease reaches acute phase.

(i) Screening:

Symptoms to be observed

Mild - Green plants with pokkah boeng (curling/ twisting of spindle leaves, tearing of leaves, whitish/chlorotic streaks on the leaves) at varying intensities.

Moderate - Yellowing of 3rd/ 4th leaf followed by complete yellowing of foliage and expression of top rot symptom

Severe - Yellowing of leaves + Discolouration (Light coloured) of stalks + Wilting symptom in opened stalks

(ii) Epidemiology

Record temperature, relative humidity and rainfall from May to September and establish correlation with disease incidence

INTRODUCTION :

Pokkah Boeng is a Javanease term denoting a malformed or distorted top and it was originally described in 1896 by Wakker and went in Java. Bolle (1927) was the first to demonstrate by repeated isolation and isolation studies, that the disease is caused by Fungus, *Fusarium moniliforme* Sheldon. The occurrence of Pokkah Boeng disease has been recorded in almost countries where Sugarcane is growing commercially.

The disease is common during monsoon months in the field. Under normal studies it may not cause significant field loss but it has the potential to arrest the crop growth temporarily. The disease occurs throughout India and severe forms of the disease are recorded in Maharashtra, Gujarat, Karnataka and Kerala.

The disease manifest in two phases.*viz*. Pokkah Boeng and Top rot. The most common symptom is malformed on twisted top. Symptoms develop during rainy periods which coincide with grand growth period. In Maharashtra, the incidence of P.B. is recorded in all planting seasons i.e. Adsali, Preseasonal and Suru.

The earliest symptom of Pokkah Boeng is chlorotic condition towards the base of young leaves and occasionally on other parts of the blades. Frequently the malformed or distortion of the young leaves is accompanied by pronounced wrinkling, twisting and shortening of the leaves and distoration of the stalk.

SYMPTOMS

Initially, young leaves are chlorotic at their base and patchy elsewhere on the blade. Chlorosis is most oblivious on the lower surface of the leaf or twisted in laminar regions. Affected leaves tend to be narrow at the base. Development of further symptoms is dependent on the susceptibility of the variety and environmental conditions conducive to the pathogen. Young leaves may become infected in the spindle, resulting in pronounced wrinkling, twisting and shortening of leaves. Sometimes leaves are shortened to few inches without lamina having malformed midrib or growth of the leaves ceased to few inches without malformation giving d-topped spindle. As the leaves mature, irregular reddish stripes and specks develop within the chlorotic areas. Infection in the spindle may reach growing point and continue into the stalk. Sometime growing point is killed leading to development of top rot. Due to death of spindle, sprouting of the lateral buds occurs. Most of the pokkah boeng infected canes generally recover from the symptoms but into top rot recovery is not there. Upon recovery we notice the normal whorl with remnants of twisted leaf portions of affected leaves still around the spindle.

EPIDEMOLOGY

The disease is favored by warm, moist growing conditions. Symptoms development begins early in the monsoon season, which normally coincides with rapid and vigorous growth of cane. The three to seven months sugarcane crops are most susceptible to the disease. Conidia are air borne and are deposited on the plants, then washed by rains into infection site.

TRANSMISSION

The transmission of the disease is largely by the movement of the spores from one locality to another by air currents. Conidia which enter the spindle during dry weather are later carried down by rain to the susceptible region where they germinate. The mycelium passes through the still soft cuticle of these spindle leaves to the inner tissues. The incubation time is about one month.

ECONOMIC IMPORTANCE

The pokkah boeng disease was noticed in Java country on large scale. Cane three to seven months old and growing vigorously is more susceptible to infection than older cane and infection is found in many late tillers suppressed by the older stalks. Varietal susceptibility to pakkah boeng has in some instance be increased by late applications of ammonium sulphate producing a soft succulent growth, or by heavy watering following dry weather.

Table 5: Occurrence of Pokkah Boeng disease in varietal trials under natural conditions.

Sr. No	Name of genotype	Per cent infected plants				Disease Reaction
		Mild	Moderate	Severe	Total Incidence	
IVT Early						
1	**Co 11001**	1.00	-	-	1.00	R
2	**Co 11004**	3.00	-	-	3.00	R
3	**Co 11016**	3.00	-	-	3.00	R
4	**Co 11017**	4.00	-	-	4.00	R
5	**Co 11018**	-	8.00	-	8.00	MS
6	**CoM 11081**	4.00	-	--	4.00	R
7	**CoM 11082**	2.00	--	-	2.00	R
8	**CoM 11083**	2.00	-	-	2.00	R
9	**CoM 11084**	3.00	-	-	3.00	R
10	**CoN 11071**	-	6.00	-	6.00	MS
11	**CoN 11072**	-	7.00	-	7.00	MS
12	**CoT 11366**	-	8.00	-	8.00	MS
13	**PI 11131**	3.00	-	-	3.00	R
IVT Early I						
1	**Co 09004**	-	15.00	-	15.00	S
2	**Co 09007**	-	-	-	0.0	R
3	**CoN 09072**	-	-	-	0.0	R
IVT Midlate						
1	**Co 11005**	-	-	-	0.00	R
2	**Co 11007**	-	-	-	0.00	R
3	**Co 11012**	-	-	-	0.00	R
4	**Co 11019**	-	-	12.00	12.00	S
5	**Co 11020**	-	7.00	-	7.00	MS
6	**Co 11021**	5.00	-	-	5.00	R
7	**Co 11022**	-	-	-	0.00	R
8	**Co 11023**	3.00	-	-	3.00	R
9	**Co 11024**	-	-	-	0.00	R
10	**CoM 11085**	-	-	-	0.00	R
11	**CoM 11086**	-	-	-	0.00	R
12	**CoM 11087**	4.00	-	-	4.00	R
13	**CoN 11073**	2.00	-	-	2.00	R
14	**CoN 11074**	-	6.00	-	6.00	MS
Checks						
1	**Co 85004**	4.00	-	-	4.00	R
2	**CoC 671**	-	7.00	-	7.00	MS
3	**Co 99004**		15.00		15.00	S
4	**Co 86032**	2.00	-	-	2.00	R
5	**CoM 0265**	2.00	-	-	2.00	R
6	**Co 7527**	-	10.00	-	10.00	MS

7	**Co 740**	-	-	-	0.00	R
Other Genotypes						
1	**MS 10001**	-	8.00	-	8.00	MS
2	**CoM 09057**	-	9.00	-	9.00	MS
3	**Co 05002**	1.00	-	-	1.00	R

Disease Reaction:

0-5% - Resistant; >5-10% - Mod. Susceptible; >10-20% - Susceptible; > 20% - Highly Susceptible

Results:

1) **IVT Early:** Among the tested 13 sugarcane genotypes, 9 and 4 sugarcane genotypes were shown the resistant and moderately resistant reaction to pokkah boeng, respectively.
2) **AVT Early (I Plant):** in this trial three sugarcane genotypes tested for pokkah boeng under natural condition. Among them, one was found susceptible and remaining two genotypes were found resistant.
3) **IVT Midlate:** Out of 14 sugarcane genotypes, 11 resistant, two moderately susceptible and one susceptible were found to pokkah boeng.
4) **Checks:** Among the sugarcane check varieties, Co 85004, Co 86032, CoM 0265 and Co 740 were found resistant to pokkah boeng disease. Whereas, CoC 671 and Co 7527 were found moderately susceptible. In promising sugarcane varieties, Co 05002 was found resistant whereas, MS 10001 and CoM 09057 were found moderately susceptible to pokkah boeng disease.

TECHNICAL PROGRAMME

2015-2016

PP 17B Evaluation of zonal varieties for resistance to smut.

PP 17D Evaluation of zonal varieties for resistance to Yellow leaf disease (YLD).

PP 22 Survey of sugarcane diseases naturally occurring in the area on important sugarcane varieties.

PP 28B Methodology for screening sugarcane genotypes for resistance to brown rust (*Puccinia melanocephala*).

PP 31 Screening, epidemiology and management of pokkah boeng in sugarcane.

PP 32 Management of brown spot disease of sugarcane.