

Original Research Article

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## Evaluation of Sugarcane Varieties against Pokkah boeng Disease and its Natural Occurrence

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### ABSTRACT

#### Keywords

Sugarcane, Varieties,  
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An extensive survey was conducted in sugarcane reserved area under north Bihar during cropping season of 2017-18 to study the incidence and severity of disease. During survey, Pokkah boeng disease was observed which was ranged in between 1.1 and 21.2 per cent under different localities in sugarcane crop. In initial stage, the disease showed whitish, curling, twisting symptoms and bending of leaves from the top portion. During course of evaluation, two varieties namely CoSe 95422 and CoSe 92423 were found highly susceptible, five varieties (CoS 8436, Bo 156, Co 1148, Co 0238 and Co 01148) were moderate and remaining varieties were recorded with mild incidence of Pokkah boeng disease out of twenty two varieties of sugarcane.

### Introduction

Sugarcane is the most important cash cum industrial and emerging multiproduct crop with a great demand in the country which is cultivated in the tropical and subtropical regions globally and contributes to 70 per cent of the world's sugar (Singh *et al.*, 2011). Besides sugar production, it has also produced byproducts like Bagasses and Molasses in the world (Islam *et al.*, 2001 and Vishwakarma *et al.*, 2013). About 55 diseases of sugarcane caused by fungi, bacteria, virus, phytoplasma

and nematode have been reported from India (Rao *et al.*, 2002). Pokkah boeng disease of sugarcane was observed for the first time at Java by Walker and Went in 1896.

Three to seven month old sugarcane is more susceptible to infection than the plants in later stages of growth (Siddique, 2007). The pathogen can survive for 12 months in the plant debris under natural conditions and it can remain viable for more than 10 months under laboratory conditions. It is also reported that survival of pathogen can observed for 12

months, although incidence is noticed low after nine months. Increasing trend of disease incidence was observed and it was ranged between 1 to 90 per cent in S 224/20 and 5 to 30 per cent was noticed in CoSe 01434 (Vishwakarma *et al.*, 2013). It was also found major constraints in sugarcane production and was becoming predominant disease in China during the recent year (Wang *et al.*, 2016).

## Materials and Methods

To assess the disease status and varietal susceptibility of Pokkah boeng disease, an extensive survey was conducted in sugarcane reserved areas of North Bihar *i.e.* Pusa, Kalyanpur, Hasanpur, Harinagar, Narkatiaganj, Manjhaulia and Madhopur during crop season of 2017-18. Ten plots in each area were visited and observations were recorded on randomly selected hundred canes from four different locations at each plot to assess the incidence of the disease, which was calculated by using the following formula:

$$\text{Disease incidence (\%)} = \frac{\text{Number of affected canes}}{\text{Total number of cane assessed}} \times 100$$

The status of Pokkah boeng disease was differentiated in three categories *viz.*, mild, moderate and severe infection based on symptoms observed as;

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 3<sup>rd</sup> or 4<sup>th</sup> 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.

Twenty two genotypes including one check of different maturity groups were evaluated on the basis of the resistance and susceptible reaction of the varieties in natural condition. Observations for disease development on the individual variety were taken to know their response to pathogen. The presence or absence of disease in field was identified on the basis of symptoms *i.e.* chlorosis, top rotting and knife cut stage, therefore, disease incidence was calculated as number of infected plants showing above mentioned any single symptom out of the total number of sugarcane plants observed. Disease incidence is the percentage of diseased plants in the sample or population of plants. Estimation of the plant disease incidence was done by using the formula mentioned above.

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## Results and Discussion

### Survey of disease

An extensive survey was conducted with special reference to the Pokkah boeng disease of sugarcane in reserved areas of sugarcane *viz.*, Pusa, Kalyanpur, Hasanpur, Harinagar,

Narkatiaganj, Majhaulia and Madhopur to observe the status of the disease. The incidence of the disease and its status were recorded and data presented in the table 1.

It is evident from the data that the disease was prevalent in all the sugarcane growing areas which were surveyed during cropping season of 2017-18. The incidence of the disease varied from 1.1 to 21.2 per cent under different localities and varieties. However, maximum (21.2%) incidence was recorded with variety CoSe 95422 which was planted in Breeding experimental trial Sugarcane Research Institute, RPCAU, Pusa followed by the same variety (CoSe95422) and (Co1148) being 20.8 and 19.2 per cent, respectively, which were planted in the Plant pathology trials. The lowest (1.1%) incidence of the disease was observed with variety CoP 112 planted in trials of Entomology, Sugarcane Research Institute, RPCAU, Pusa, Samastipur.

The incidence of disease was observed in different localities of reserved areas of sugarcane which was indicated that severity of disease was on variety CoSe 95422 planted in

two locations *i.e.*, pathology and breeding trails. The incidence was observed from mild to moderate on remaining varieties which were located under Pusa, Kalyanpur, Hasanpur, Harinagar, Narkatiaganj, Majhaulia, and Madhopur sugarcane reserved areas. Among varieties, only one (CoSe 95422) variety was found under severe form, five varieties (CoS 8436, BO 156, Co 1148, Co 0238 and Co 0118) were observed under moderate incidence and remaining varieties (BO 139, CoP 9301, BO 91, BO 154, BO 153, CoP 16437, CoP 2061, CoP 112 and BO 141) were recorded with mild incidence.

Karuppaiyan, *et al.*, (2015) also reported Pokkah boeng disease incidence ranged from 6.9 to 25.30 per cent. Duttamajumdar (2004) also observed that incidence of Pokkah boeng disease from trace to moderate level on most of the commercial varieties.

Goswami *et al.*, (2013) reported that not only in India but the disease was present in most of the sugarcane producing areas of the world, causes yield losses in sugarcane varied from 40 to 60 per cent in the susceptible varieties.

Incidence percentage	Status
0-10	Mild
>10-20	Moderate
>20	Severe

### Disease reaction

Scale (%)	Rating
0 - 5	Resistant
> 5 - 10	Moderately susceptible
>10 - 20	Susceptible
> 20	Highly susceptible

**Table.1** Status of disease at different locations

Location		Varieties	Disease incidence (%)	Disease status
<b>A. PUSA</b>	<b>1. Plant pathology trial</b>	CoS8436	14.1	Moderate
		BO139	8.6	Mild
		CoP9301	5.0	Mild
		BO91	4.2	Mild
		BO154	6.0	Mild
		BO153	4.2	Mild
		CoSe95422	20.8	Severe
		BO156	12.0	Moderate
		Co1148	19.2	Moderate
		CoP16437	3.4	Mild
		CoP2061	3.0	Mild
	CoP112	2.1	Mild	
	<b>2. Entomology trial</b>	BO 154	8.2	Mild
		CoP 2061	4.2	Mild
		BO153	3.2	Mild
		CoP112	1.1	Mild
	<b>3. Breeding trial</b>	BO154	9.0	Mild
		BO153	3.4	Mild
		CoP9301	7.2	Mild
		BO91	6.2	Mild
CoP2061		6.1	Mild	
CoP112		3.0	Mild	
CoSe95422		21.2	Severe	
<b>4. Agronomy trial</b>	BO154	6.2	Mild	
	CoP2061	6.4	Mild	
	BO153	2.6	Mild	
	CoP112	1.8	Mild	
	CoP9301	6.2	Mild	
	CoP16437	4.1	Mild	
	BO141	8.2	Mild	
<b>5. Soil science trial</b>	BO154	5.2	Mild	
	CoP2061	2.0	Mild	
	CoP112	1.4	Mild	
<b>B. KALYANPUR</b>	BO153	4.4	Mild	
	BO154	6.2	Mild	
	CoP2061	8.1	Mild	
	CoP112	4.6	Mild	

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<b>C. HASANPUR</b>	<b>CoP2061</b>	<b>4.3</b>	<b>Mild</b>
	CoP112	1.4	Mild
	Co0238	12.2	Moderate
	Co0118	11.3	Moderate
	BO154	6.2	Mild
	CoP9301	3.2	Mild
<b>D. HARINAGAR</b>	CoP9301	4.1	Mild
	BO154	8.2	Mild
	BO153	4.6	Mild
	CoP113	1.6	Mild
	CoP2061	4.6	Mild
	Co0238	10.2	Moderate
	Co0118	11.8	Moderate
	BO91	4.4	Mild
<b>E. NARKATIAGANJ</b>	Co 0238	16.1	Moderate
	Co0118	12.6	Moderate
	BO91	4.2	Mild
	CoP2061	6.2	Mild
	CoP112	3.6	Mild
	CoP9301	4.1	Mild
	BO154	7.2	Mild
	BO153	6.4	Mild
<b>F. MAJHAULIA</b>	CoP2061	4.6	Mild
	CoP112	1.6	Mild
	BO91	6.2	Mild
	Co0238	18.2	Moderate
	Co0118	12.4	Moderate
	BO154	6.2	Mild
<b>G.. MADHOPUR</b>	CoP2061	3.6	Mild
	CoP112	1.8	Mild
	BO154	6.2	Mild
	BO153	2.4	Mild
	CoP9301	4.2	Mild

**Table.2** Evaluation of varieties against Pokkah boeng disease

S. No	Varieties	Incidence Percentage	Disease Reaction
1	BO139	3.2	R
2	CoP9301	2.0	R
3	BO91	3.6	R
4	CoS8436	18.2	S
5	BO153	1.6	R
6	BO154	3.4	R
7	CoP 16437	2.2	R
8	BO156	6.2	MS
9	Co1148	14.6	S
10	CoP2061	4.2	R
11	CoP112	2.1	R
12	CoP16440	3.8	R
13	BO155	8.4	MS
14	CoP11438	6.2	MS
15	BO130	18.6	S
16	CoSe92423	22.2	HS
17	CoSe13451	12.2	S
18	CoP13436	9.2	MS
19	CoP13437	2.4	R
20	CoP13438	4.6	R
21	CoSe13452	3.6	R
22	CoSe95422 (Check)	26.6	HS

R - Resistance, MS - Moderately Susceptible, S - Susceptible, HS - Highly Susceptible

### Evaluation of varieties

Twenty two varieties (Table 2) namely, BO139, CoP9301, BO91, CoS8436, BO153, BO154, CoP16437, BO156, Co1148, CoP2061, CoP112, CoP16440, BO155, CoP11438, BO130, CoSe92423, CoSe 13451, CoP13436, CoP13437, CoP13438, CoSe13452 including one check (CoSe95422) were evaluated under natural condition. Out of twenty two varieties, twelve varieties *viz.*, BO139, CoP9301, BO91, BO153, BO154, CoP16437, CoP2061, CoP112, CoP16440, CoP13437, CoP13438 and CoSe13452 were found resistant, four varieties *viz.*, BO156, BO155, CoP11438 and CoP13436 were observed moderately susceptible and four

varieties *viz.*, CoS8436, Co1148, BO130 and CoSe13451 were found susceptible. Only two varieties namely, CoSe92423 and CoSe95422 were observed highly susceptible to Pokkah boeng disease. The varieties found resistant reaction against Pokkah boeng disease may be used as a source of resistance for further breeding programme to develop resistant varieties. Wang *et al.*, (2017) and Vishwakarma *et al.*, (2013) also evaluated several varieties were resistant and moderately resistant reaction against the disease.

An extensive survey was carried out to know the disease status in different cane growing areas of Bihar and it was observed that the

prevalence of pathogen in Bihar with variable magnitude of incidence ranging from 1.1 to 21.2 per cent. The maximum (21.2%) incidence was recorded in variety CoSe95422 and minimum (1.1%) incidence was observed in variety CoP112.

Twenty two varieties were evaluated of which twelve varieties were found resistant, four varieties were moderately susceptible and four varieties were susceptible while, two varieties, namely CoSe92423 and CoSe95422 were observed highly susceptible to Pokkah boeng disease.

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