

Evaluation of Promising Sugarcane Genotypes for Resistance to Red Rot Pathogen, *Colletotrichum falcatum* Went.

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ABSTRACT

A field experiment was conducted in order to study the level of resistance of sugarcane genotypes to red rot disease. Thirty nine genotypes were screened in the cropping years 2001-02 and 2002-03 against a mixed inoculum of red rot pathogen *Colletotrichum falcatum* at BSRI Ishurdi farm and RSRS, Thakurgaon farm. Mean results of two years showed Isd 24 and Isd 27 as resistant at BSRI farm but they gave moderately susceptible reaction at RSRS, Thakurgaon. No resistant genotype was found when the disease index of two locations was averaged. However, 12 genotypes, namely Isd 19, Isd 20, Isd 24, Isd 25, Isd 27, Isd 30, Isd 34, L. Jaba-C, I 12-95, I 131-97, I 183-97 and I 202-97 were found as moderately resistant. The genotypes Isd 2-54, Isd 21, Isd 26, Isd 32, Isd 33, I 8-95, I 13-96, I 37-96, I 164-95, I 20-96, I 52-96, I 137-96, I 4-97 and I 74-97 showed moderately susceptible reaction. The remaining genotypes Isd 16, Isd 18, Isd 22, Isd 29, I 22-94, I 22-95, I 34-96, I 143-96 and I 45-96 indicated susceptible and Isd 17, Isd 28, Isd 31 and I 200-96 displayed highly susceptible reaction against red rot pathogen.

Key words: Sugarcane, red rot, *Colletotrichum falcatum*.

INTRODUCTION

Red rot of sugarcane caused by *Colletotrichum falcatum* Went. is the most destructive disease of sugarcane in Bangladesh. It is a sett borne transmissible fungal disorder and one of the oldest known diseases of sugarcane mainly responsible for the deterioration and eradication of promising cultivars (Agnihotri, 1990). In some cases and under water logged condition, incidence of red rot was found 1-100% (Rahman *et al.*, 1998). In Bangladesh, some high yielding and high sugar content popular varieties have been withdrawn from commercial cultivation due to their susceptibility to red rot (Malek, 1985). The pathogen of red rot not only drastically reduces the cane yield but also deteriorates juice quality thus affecting the growers as well as sugar industry (Rahman *et al.*, 2001; Kalaimani *et al.*, 2003). There is no effective control measure to prevent the losses from the disease so far (Mishra and Singh, 2004; Joshiya *et al.*, 2005). Due to development of new races, the commercial varieties have become susceptible to this disease (Agnihotri, 1990). Hence, to overcome this problem development of new disease resistant varieties is the most appropriate approach to manage this disease (Agnihotri, 1990; Dattamajumdar and Singh, 1999). Therefore, screening of sugarcane germplasms against red rot pathogen is the most pre-requisite in the process of varietal development for commercial cultivation. Owing to changing of race of pathogen, evaluation process has to be continued so that

resistant/moderately resistant clones are ready in the pipeline to replace the susceptible ones (Shukla *et al.*, 2005). With this objective the varieties/clones were evaluated for their reaction to various isolates of red rot pathogen.

MATERIALS AND METHODS

A field experiment was conducted in two locations viz. BSRI farm, Ishurdi and RSRS, Thakurgaon farm during 2001-2002 and 2002-03 cropping seasons. In both locations 39 sugarcane genotypes including commercial varieties, advanced clones and clones under Zonal Yield Trial (ZYT) III, II and I were tested. At BSRI farm, Ishurdi, mixture of 8 different isolates (BSRI-1, BSRI-2, BSRI-3, ZBSM, NTSM, RSM, Carew & Co. and KSM) and at RSRS, Thakurgaon farm, mixture of 5 different isolates (PSM-1, PSM-2, TSM, NRS and STSM) were used as inocula of red rot pathogen. The isolates were collected from different sugarcane growing areas where red rot is quite common. Two budded setts of each genotype were planted in 30m rows and normal agronomical practices were carried out. The pathogenic isolate of *Colletotrichum falcatum* was grown in oat meal agar medium at $28 \pm 1^{\circ}\text{C}$ for 10 days. The conidia were harvested in sterilized water and adjusted to a concentration of 6×10^5 conidia/ml for inoculation. Ten canes of each genotype were inoculated by each isolate. When the plants became 8 months old, inoculation was done by Hypodermic Syringe method (Virk, 1985). A thin puncture was made in the 4th or 5th internode above the ground level of standing canes with the help of specially made inoculating needle (2 cm long and 2 mm dia) at suitable inclination upto pith region and 0.2 ml of spore suspension was injected inside the cavity with the help of hypodermic syringe and the puncture point was covered and wrapped by insulating tape. The inoculated canes were examined by splitting longitudinally after 60 days of inoculation and graded as per symptomatic method (Srinivasan and Bhat, 1961) with slight modification of criteria for calculating disease index. For each criterion, numerical ratings were assigned and disease index was calculated by adding all the numerical values of canes observed and finally disease index and disease reaction was determined.

Disease Index:

Sl. no.	Criteria	Numerical rating
1	Lesion width above inoculated internode (1-3):	
	a) Rare lesion (1/3rd or less spread of full width)	1
	b) Medium lesion (more than 1/3rd to 2/3rd spread of full width)	2
	c) High lesion (covered the full width)	3
2	Nodal transgression (0-4):	
	a) Lesion restricted in inoculated internode	0
	B) One node crossed	1
	C) Two node crossed	2
	D) Three or more node crossed	3

3	Presence of white patches (0-2):	
	a) white patch absent	0
	B) white patch restricted	1
	C) white patch progressive	2
4	Top condition (0-1):	
	a) Green	0
	b) yellow/dry	1

The mean of the total numerical ratings of 10 canes was taken to assign the disease index and disease reaction to each genotype against each isolate based on following scale:

Disease Index	Disease Reaction
0.0 - 2.0	Resistant (R)
2.1 – 4.0	Moderately Resistant (MR)
4.1 – 6.0	Moderately Susceptible (MS)
6.1 – 8.0	Susceptible (S)
Above 8.0	Highly Susceptible (HS)

RESULTS AND DISCUSSION

The results of disease index against mixed isolates of red rot pathogen with various genotypes are presented in Table 1. Among the 39 tested genotypes/clones, at BSRI farm, Ishurdi location, only 2 genotypes Isd 24 and Isd 27 were found to be resistant (R) whereas both of them showed moderately susceptible (MS) reaction at RSRS farm, Thakurgaon location. The variance of the disease reaction is probably due to the difference of climate and virulence of the pathogen.

The overall disease index was assessed based on the average disease index of two locations did not give any resistant (R) reaction in any genotypes. However, 12 genotypes namely Isd 19, Isd 20, Isd 24, Isd 25, Isd 27, Isd 30, Isd 34, L. Jaba-C, I 12-95, I 131-97, I 183-97 and I 202-97 were found as moderately resistant (MR). The genotypes Isd 2-54, Isd 21, Isd 26, Isd 32, Isd 33, I 8-95, I 13-96, I 37-96, I 164-95, I 20-96, I 52-96, I 137-96, I 4-97 and I 74-97 showed moderately susceptible (MS) reaction. The result indicated Isd 16, Isd 18, Isd 22, Isd 29, I 22-94, I 22-95, I 34-96, I 143-96 and I 45-96 as susceptible (S) and the remaining genotypes viz. Isd 17, Isd 28, Isd 31 and I 200-96 as highly susceptible (HS) against red rot pathogen. Among the susceptible and highly susceptible groups Isd 17 and Isd Isd 18 varieties have been withdrawn from commercial cultivation and the varieties Isd 28 and Isd 31 are being discouraged to cultivate. That is why, continuous breeding for resistance is inevitable to avoid epiphytotics to red rot (Kalaimani *et al.*, 2003). However, the genotypes showing moderately resistant reaction may either be released for general

cultivation with proper management practice or used as a source of resistance in breeding program for developing red rot resistant varieties.

Table 1: Reaction (disease ratings) of different sugarcane genotypes against mixed isolates of *Colletotrichum falcatum* causing red rot disease at BSRI and RSRS, Thakurgaon farm during 2001-02 and 2002-03 cropping season.

Sl. No.	Sugarcane Genotypes	Disease index (mean of two years) and disease reaction against mixed isolate of <i>C. falcatum</i> at BSRI, Ishurdi farm		Disease index (mean of two years) and disease reaction against mixed isolate of <i>C. falcatum</i> at RSRS, Thakurgaon farm		verage Disease Index of two locations	Overall Disease Reaction
		Disease Index	Disease Reaction	Disease Index	Disease Reaction		
01.	Isd 2-54	4.55	MS	4.75	MS	4.65	MS
02.	Isd 16	6.15	S	7.20	S	6.67	S
03.	Isd 17	7.40	S	9.00	HS	8.20	HS
04.	Isd 18	7.80	S	7.90	S	7.85	S
05.	Isd 19	2.05	MR	3.65	MR	2.85	MR
06.	Isd 20	2.20	MR	3.60	MR	2.90	MR
07.	Isd 21	5.45	MS	4.30	MS	4.87	MS
08.	Isd 22	7.30	S	6.85	S	7.08	S
09.	Isd 24	1.80	R	5.10	MS	3.45	MR
10.	Isd 25	2.10	MR	2.90	MR	2.50	MR
11.	Isd 26	4.40	MS	7.35	S	5.88	MS
12.	Isd 27	1.20	R	4.85	MS	3.03	MR
13.	Isd 28	7.85	S	9.00	HS	8.43	HS
14.	Isd 29	4.95	MS	7.20	S	6.08	S
15.	Isd 30	4.50	MS	2.70	MR	3.60	MR
16.	Isd 31	7.25	S	8.80	HS	8.03	HS
17.	Isd 32	3.85	MR	5.05	MS	4.45	MS
18.	Isd 33	4.40	MS	6.90	S	5.65	MS
19.	Isd 34	3.85	MR	2.75	MR	3.30	MR
20.	L. Jaba-C	2.35	MR	3.70	MR	3.03	MR
21.	I 8-95	3.90	MR	7.40	S	5.65	MS
22.	I 12-95	2.20	MR	3.50	MR	2.85	MR
23.	I 22-95	5.80	MS	8.80	HS	7.30	S

24.	I 22-94	7.45	S	7.40	S	7.43	S
25.	I 13-96	5.05	MS	6.35	S	5.70	MS
26.	I 34-96	8.40	HS	7.10	S	7.75	S
27.	I 37-96	4.05	MS	4.25	MS	4.15	MS
28.	I 143-96	6.25	S	8.95	HS	7.60	S
29.	I 200-96	9.00	HS	8.80	HS	8.90	HS
30.	I 164-95	5.15	MS	4.85	S	5.00	MS
31.	I 20-96	4.10	MS	6.05	S	5.08	MS
32.	I 52-96	5.70	MS	2.70	MR	4.20	MS
33.	I 137-96	4.10	MS	5.55	MS	4.83	MS
34.	I 4-97	7.90	S	3.30	MR	5.60	MS
35.	I 45-97	5.30	MS	7.20	S	6.25	S
36.	I 74-97	5.30	MS	6.50	S	5.90	MS
37.	I 131-97	4.00	MR	1.40	R	2.70	MR
38.	I 183-97	2.50	MR	4.30	MS	3.40	MR
39.	I 202-97	2.95	MR	2.50	MR	2.73	MR

R- Resistant, MR-Moderately Resistant, MS-Moderately Susceptible, S-Susceptible and HS-Highly Susceptible

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