

Evaluation of Some Sugarcane Genotypes against Red Rot (*Colletotrichum falcatum* Went.) Disease

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ABSTRACT

Red rot (*Colletotrichum falcatum* Went.) is one of the most important sugarcane diseases in Bangladesh. Substitution of susceptible varieties by resistant ones is one of the most successful and reliable method to combat the disease. Therefore, a field trial was conducted for screening of sugarcane genotypes to find out the level of resistance against red rot at two locations viz. BSRI farm, Ishurdi and RSRS farm, Thakurgaon during the cropping season 2013-14 and 2014-15. Forty sugarcane genotypes were inoculated by the mixed inocula of 33 different isolates of *Colletotrichum falcatum* following hypodermic syringe method. Among them, 13 were found as resistant, 15 were moderately resistant, 9 were moderately susceptible, only 1 (I 159-09) was susceptible and 2 (Isd 18, Isd 28) were found as highly susceptible to red rot. The genotypes showing resistant reaction to red rot should be included in releasing sugarcane varieties for commercial cultivation.

Key words: Evaluation, red rot, sugarcane genotype, *Colletotrichum falcatum*

INTRODUCTION

Red rot caused by the fungus *Colletotrichum falcatum* Went (*Glomerella tucumanensis* Speg. Arx & Muller, 1954) was first described as a disease of sugarcane from Java in 1893 (Went, 1893). It is therefore one of the oldest known diseases of sugarcane. Following this first description, red rot was soon observed in other cane producing countries and it is now one of the most distributed diseases of sugarcane. It has caused the failure of a number of varieties and has had serious economic effects in many sub-tropical countries (Singh and Sing, 1989). In Bangladesh, an overall 20.22% loss of cane is caused by different disease which worked out to Tk. 250 corers annually (Talukder *et al.*, 2005). Out of 40 sugarcane diseases in Bangladesh, red rot is considered as one of the most damaging one (Talukder *et al.*, 2010). It is a sett transmissible fungal disorder and mainly responsible for the deterioration of many promising sugarcane cultivars (Agnihotri, 1990). It continues to be a serious problem whenever susceptible varieties are grown (Kalaimani *et al.*, 2004). In some cases under water logged condition, incidence of red rot was found upto 100% (Rahman *et al.*, 1998). In the past some high yielding and high sugar content popular varieties have been withdrawn from commercial cultivation due to their susceptibility to red rot disease. It has been observed that some varieties during their release found tolerant to the existing

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isolates of *Colletotrichum falcatum* but after few years they become susceptible due to development of new pathotype (race). Due to changing the race of pathogen, evaluation process has to be continued so that resistant clones are ready in the pipeline to replace the susceptible ones (Shukla *et al.*, 2005). Therefore, evaluation of sugarcane genotypes against red rot pathogen is a pre-requisite in the varietal development programme. That's why; a field trial was conducted to find out the level of resistance of sugarcane genotypes against different isolates of red rot pathogen.

MATERIALS AND METHODS

A field experiment was conducted in two locations viz., BSRI Ishurdi farm and RSRS farm, Thakurgaon during the cropping season 2013-14 and 2014-15 with 40 sugarcane genotypes comprising commercial varieties, clones under zonal yield trial (ZYT) III, II, I and advanced yield trial (AYT). A mixture of spore suspension (10^6 /ml) of 33 isolates of *C. falcatum* Went collected from different cane growing areas of the country used as inocula. The collected isolates were cultured on oat meal agar (OMA) medium for 10-12 days to sporulate and mixed inoculum was prepared from the fresh culture. Inoculation was done at the age of 8 months of planting canes. Fifteen canes of each clone were inoculated in the middle of the third internode above the ground level following hypodermic syringe method where puncture was done by special made needle (2 cm long and 2 mm dia.). The punctured point was covered and wrapped by insulating tape in order to keep away from oxidation and contamination. The inoculated canes were examined by splitting longitudinally after two months of inoculation and graded according to symptomatic method (Srinivasan and Bhat, 1961; Rahman *et al.*, 1996; Rahman *et al.*, 2009; Uddin *et al.*, 2013) with slight modification as described in Table 1.

The mean of the total numerical ratings/scores of 10 canes was taken for assessing the disease index and disease reaction of each genotype against *C. falcatum* was done based on following scale:

Disease index (Score)	Disease reaction (Grade)
0.00 – 2.00	Resistant (R)
2.10 – 4.00	Moderately Resistant (MR)
4.10 – 6.00	Moderately Susceptible (MS)
6.10 – 8.00	Susceptible (S)
Above 8.00	Highly Susceptible (HS)

Table 1. Criteria for determination of disease index for screening sugarcane genotypes against *C. falcatum*

Sl. No.	Criteria/Characters	Numerical rating/ Score
1.	<i>Lesions width above the inoculated internode (0-3)</i> a) Very rare lesion or no lesion developed b) Rare lesion (1/3rd or less spread of full width) c) Medium lesion (1/3rd to 2/3rd spread of full width) d) High lesion (covered the full width)	0 1 2 3
2.	<i>Nodal transgression (0-3)</i> a) Lesion restricted in the inoculated internode b) One node crossed c) Two nodes crossed d) Three or more nodes crossed	0 1 2 3
3.	<i>Presence of white patches (0-2)</i> a) White patch absent b) White patch restricted c) White patch progressive	0 1 2
4.	<i>Condition of top (0-1)</i> a) Green b) Yellow/dry	0 1

RESULTS AND DISCUSSION

The results of disease reactions of various genotypes during 2013-14 and 2014-15 cropping seasons against mixed isolates of red rot pathogen are presented in Table 2. Out of 40 sugarcane genotypes, 13 genotypes were found resistant (R) in both cropping season. The resistant genotypes were Isd 2-54, Isd 34, Isd 37, Isd 39, BSRIKh 44, I 157-07, I 133-07, I 209-08, I 130-09, I 30-10, I 35-10, I 37-10 and I 101-10. Of them, 15 genotypes were found as moderately resistant (MR) and they were Isd 19, Isd 20, Isd 32, Isd 36, Isd 38, Isd 40, BSRIKh 41, I 164-07, I 33-07, I 200-07, I 290-08, I 127-09, I 64-10, I 85-10, I 99-10. Among the tested genotypes 12 showed moderately susceptible (MS) to highly susceptible (HS) against red rot. Out of 12 genotypes, nine genotypes viz., Isd 16, Isd 33, BSRIKh 43, I 167-07, I 207-08, I 295-08, I 227-09, I 103-10 and I 131-10 were found moderately susceptible (MS). Only one (I 159-09) genotype was susceptible (S) and two genotypes (Isd 18 & Isd 28) were highly susceptible (HS) but showed different reactions in different years (Table 2). This may be because of environmental variation and change of pathotypes in different years by many authors (Uddin *et al.*, 2013; Rahman *et al.*, 2009; Begum *et al.*, 2007) in some genotypes. During release of varieties for commercial cultivation all the varieties like Isd 16, Isd 33, Isd 37, Isd 38 and BSRIKh 43 showed as resistant to moderately resistant reaction. At present, they are showing moderately susceptible (MS) to susceptible (S) reaction.

Table 2. Reaction of different sugarcane genotypes against mixed isolates of *Colletotrichum falcatum* Went. causing red rot disease at BSRI farm, Ishurdi and RSRS farm, Thakurgaon during the cropping season 2013-14 and 2014-15

Sl. No.	Sugarcane genotypes	Disease reaction against <i>Colletotrichum falcatum</i> Went. during		Final disease reaction
		2013-14	2014-15	
1	Isd 2-54	R	R	R
2	Isd 16	MS	MR	MS
3	Isd 18	HS	S	HS
4	Isd 19	R	MR	MR
5	Isd 20	MR	MR	MR
6	Isd 28	HS	S	HS
7	Isd 32	MR	MR	MR
8	Isd 33	MS	R	MS
9	Isd 34	R	R	R
10	Isd 36	MR	R	MR
11	Isd 37	R	R	R
12	Isd 38	MR	MR	MR
13	Isd 39	R	R	R
14	Isd 40	MR	R	MR
15	BSRIAkh 41	MR	MR	MR
16	BSRIAkh 43	MR	MS	MS
17	BSRIAkh 44	R	R	R
18	I 157-07	R	R	R
19	I 164-07	MR	MR	MR
20	I 167-07	R	MS	MS
21	I 33-07	MR	MR	MR
22	I 133-07	R	R	R
23	I 200-07	MR	R	MR
24	I 207-08	R	MS	MS
25	I 209-08	R	R	R
26	I 290-08	MR	MR	MR
27	I 295-08	MR	MS	MS
28	I 127-09	MR	MR	MR
29	I 130-09	R	R	R
30	I 227-09	MS	MR	MS
31	I 30-10	R	R	R
32	I 35-10	R	R	R
33	I 37-10	R	R	R
34	I 64-10	MR	MR	MR
35	I 85-10	R	MR	MR
36	I 99-10	MR	MR	MR
37	I 101-10	R	R	R
38	I 103-10	MR	MS	MS
39	I 131-10	MS	MS	MS
40	I 159-09	S	MS	S

This probably happened because of changing of the pathotypes of the causal organism *Colletotrichum falcatum* and environmental factors. Similar observations were found by other scientists (Pundey *et al.*, 2007 and Solanky *et al.*, 2002). Some varieties like Isd 18 and Isd 28 have been withdrawn from commercial cultivation due their susceptibility to the disease. For this reason, continuous breeding for resistant variety is inevitable to avoid epiphytotics to red rot (Kalaimani *et al.*, 2003). Therefore, to solve this problem it is necessary to continue breeding and selection of red rot resistant genotypes having good agronomic characters. In this circumstances, the genotypes showing resistant and moderately resistant reaction may either be released for commercial cultivation provided having good agronomic characters or to be used as a source of resistant in breeding programme for developing red rot resistant varieties.

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