

Screening of Sugarcane Genotypes against Red Rot Caused by *Colletotrichum falcatum* Went.

M. J. Uddin, M. I. Talukder, M. S. Rahman, M. A. Hasan and K. S. Alam
Bangladesh Sugarcane Research Institute
Ishurdi, Pabna, Bangladesh

ABSTRACT

A field trial was conducted on screening sugarcane genotypes against red rot disease (*Colletotrichum falcatum* Went.) at two locations viz. Bangladesh Sugarcane Research Institute (BSRI) farm, Ishurdi and Regional Sugarcane Research Station (RSRS) farm, Thakurgaon during the cropping season 2010-11 and 2011-12. Thirty four sugarcane genotypes were inoculated by the mixed inocula of 15 different isolates of *Colletotrichum falcatum* following hypodermic syringe method. Among them, only 1 (I 215-07) was found as resistant, 13 were moderately resistant, 12 were moderately susceptible, 7 were susceptible and only 1 (Isd 18) was found as highly susceptible to red rot.

Key words: Red rot, screening, sugarcane genotype

INTRODUCTION

Red rot caused by *Colletotrichum falcatum* Went (Perfect stage: *Glomerella tucumanensis* Spegazzini, Arx & Muller) is the most serious disease of sugarcane in Bangladesh. 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 and 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 In the past some high yielding and high sugar content popular varieties have been withdrawn from commercial cultivation due to their susceptibility to red rot disease. The pathogen possesses many changing physiological races. It has been observed that some varieties during their release found tolerant to the existing isolates of *Colletotrichum falcatum* but after few years they become susceptible due to development of new pathotype (race). Owing to changing of 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, screening of sugarcane genotypes against red rot pathogen is a pre-requisite in the varietal development programme. Aiming to this, a field trial was conducted to find out the level of resistance of sugarcane genotypes against different isolates of red rot pathogen (*Colletotrichum falcatum* Went).

MATERIALS AND METHODS

A field experiment was conducted in two locations viz. BSRI Ishurdi farm and RSRS, Thakurgaon farm during the cropping season 2010-11 and 2011-12 with 34 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 15 isolates of *C. falcatum* 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 plant in the month of August. 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 described by Rahman *et al.* (2009) with slight modification of criteria for calculating disease index (Table 1).

Table1. 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	0
	b) Rare lesion (1/3rd or less spread of full width)	1
	c) Medium lesion (1/3rd to 2/3rd spread of full width)	2
	d) High lesion (coved the full width)	3
2.	<i>Nodal transgression (0-3)</i>	
	a) Lesion restricted in the inoculated internode	0
	b) One node crossed	1
	c) Two nodes crossed	2
	d) Three or more nodes crossed	3
3.	<i>Presence of white patches (0-2)</i>	
	a) White patch absent	0
	b) White patch restricted	1
	c) White patch progressive	2
4.	<i>Condition of top (0-1)</i>	
	a) Green	0
	b) Yellow/dry	1

The mean of the total numerical ratings/scores of 12 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)

RESULTS AND DISCUSSION

The results of different sugarcane genotypes in respect of their resistance/susceptibility against *C. falcatum* during the cropping season 2010-11 and 2011-12 are presented in the Table 2. Out of 34 sugarcane genotypes, only 1 (I 215-07) was found as resistant (R), 13 were moderately resistant (MR), 12 were moderately susceptible (MS), 7 were susceptible (S) and only 1 (Isd 18) was found as highly susceptible (HS) to red rot. During release of varieties for commercial cultivation all the varieties like Isd 2/54, Isd 16, Isd 19, Isd 20, Isd 32, Isd 33, Isd 34, Isd 36, Isd 37, Isd 38, Isd 39 and Isd 40 showed as resistant to moderately resistant reaction. But now, they are showing moderately resistant (MR) to susceptible (S) reaction. This happened because of changing of the pathotypes of the causal organism *Colletotrichum falcatum* and environmental factors. Some varieties like Isd 18 and Isd 28 have been withdrawn from commercial cultivation due their susceptibility to the disease. That is why; continuous breeding for resistant is inevitable to avoid epiphytotic to red rot (Kalaimani *et al.*, 2003). Among the genotypes I 215-07 and Isd 18T₂ showed as resistant (R) and moderately resistant (MR) reaction to red rot pathogen at two places (BSRI farm, Ishurdi & RSRS farm, Thakurgaon) for consecutive two cropping seasons of 2010-11 & 2011-12, respectively. These two genotypes seem to be resistant/moderately resistant against all isolates of *Colletotrichum falcatum*. Most of the genotypes showed different reactions at two places in two consecutive years. This may be because of environmental variation and change of pathotypes in two years. Similar results were also found by Rahman *et al.*, 2009; Begum *et al.*, 2007; Pundey *et al.*, 2007; and Solanky *et al.*, 2002 in some genotypes of sugarcane. Therefore to cope up this problem it is prime importance of breeding and selection of red rot resistant genotypes having good agronomic characters. In this context, the genotypes showing resistant and moderately resistant reaction may either be released for commercial cultivation provided having good agronomic character or to be used as a source of resistant in breeding programme for developing red rot resistant varieties.

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 2010-11 and 2011-12

Sl. No.	Sugarcane genotypes	Disease reaction against <i>Colletotrichum falcatum</i> Went in 2011		Disease reaction against <i>Colletotrichum falcatum</i> Went in 2012		Remarks
		BSRI farm, Ishurdi	RSRS farm, Thakurgaon	BSRI farm, Ishurdi	RSRS farm, Thakurgaon	
1.	Isd 2-54	MR	R	R	R	MR
2.	Isd 16	S	MR	R	R	S
3.	Isd 18	HS	S	HS	S	HS
4.	Isd 19	MR	S	R	R	S
5.	Isd 20	R	MR	R	R	MR
6.	Isd 28	S	S	R	MS	S
7.	Isd 32	MR	R	R	MR	MR
8.	Isd 33	MS	S	MS	MS	S
9.	Isd 34	MR	MR	MR	MS	MS
10.	Isd 36	MS	MR	MR	MS	MS
11.	Isd 37	MR	R	R	MR	MR
12.	Isd 38	R	MR	R	MS	MS
13.	Isd 39	R	R	R	MR	MR
14.	Isd 40	MR	MR	R	MR	MR
15.	I 112-01	MR	MR	R	R	MR
16.	Isd 18 T ₂	MR	MR	MR	MR	MR
17.	I 25-04	MR	S	MS	MR	S
18.	I 39-04	MR	R	R	MS	MS
19.	I 91-05	MR	MS	R	R	MS
20.	I 94-05	MR	MR	MR	S	S
21.	I 150-05	MR	MS	MR	MS	MS
22.	I 85-06	MR	MR	R	R	MR
23.	I 94-06	MR	MS	R	MR	MS
24.	I 223-06	MS	R	MS	R	MS
25.	I 310-06	R	S	MR	S	S
26.	I 347-06	R	R	R	MR	MR
27.	I 76-07	MS	MS	MR	MR	MS
28.	I 133-07	MR	R	R	MR	MR
29.	I 157-07	MR	MR	R	R	MR
30.	I 164-07	MR	MS	R	MS	MS
31.	I 167-07	MR	MS	MR	MS	MS
32.	I 178-07	MS	MR	MR	MS	MS
33.	I 200-07	R	R	MR	MR	MR
34.	I 215-07	R	R	R	R	R

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