



Screening of Some Sugarcane Genotypes to Wilt

Md. Imam Hossain^{1,*}, Md. Shamsur Rahman¹, Md. Elmur Reza², Md. Omar Khaiyam¹

¹Pathology Division, Bangladesh Sugarcrop Research Institute (BSRI) Ishurdi, Pabna, Bangladesh

²Entomology Division, Bangladesh Sugarcrop Research Institute (BSRI) Ishurdi, Pabna, Bangladesh

Email address:

imam4all@gmail.com (Md. I. Hossain)

*Corresponding author

To cite this article:

Md. Imam Hossain, Md. Shamsur Rahman, Md. Elmur Reza, Md. Omar Khaiyam. Screening of Some Sugarcane Genotypes to Wilt. *American Journal of Plant Biology*. Vol. 3, No. 4, 2017, pp. 125-128. doi: 10.11648/j.ajpb.20170204.12

Received: March 12, 2017; **Accepted:** April 11, 2017; **Published:** September 25, 2017

Abstract: A field trial was conducted on screening sugarcane genotypes against wilt disease at Bangladesh Sugarcane Research Institute (BSRI) farm, Ishurdi during the cropping season 2014-15 and 2015-16. Thirty four sugarcane genotypes were inoculated by the mixed inocula of 8 different isolates of wilt pathogen following hypodermic syringe method. Among them, 20 were found as resistant, 10 were moderately resistant, 2 (Isd 16 and Isd 28) were moderately susceptible and 2 (Isd 18 and Isd 19) were found as susceptible to wilt disease.

Keywords: Screening, Sugarcane Genotype, Wilt

1. Introduction

Sugarcane (*Saccharum officinarum*) is one of the most important cash crops in Bangladesh. It is cultivated in the tropical and Sub-tropical regions of the world. It is grown in all the districts of Bangladesh, but its commercial cultivation for industrial supply is mostly concentrated in the northern districts. In Bangladesh Sugarcane is mainly used for sugar and jaggary production purpose. Taking the average of last 10 years production, out of 6.56 million tons of cane 1914.28 (19.16%) thousand tons was used for Sugar production, 3724.38 (56.73%) thousand tons was used for jaggary production and 926.25 (14.11%) thousand tons was used for seed and chewing purpose, respectively (BBS, 2010). It is cultivated in an area of about 0.12 million hectares. Sugarcane (*S. officinarum* L) is one of the most important cash crops in Bangladesh. It is cultivated in the tropical and Sub-tropical regions of the world. It is grown in all the districts of Bangladesh, but its commercial cultivation for industrial supply is mostly concentrated in the northern districts. In Bangladesh Sugarcane is mainly used for sugar and jaggary production purpose. Taking the average of last 10 years production, out of 6.56 million tons of cane 1914.28 (19.16%) thousand tons was used for Sugar production, 3724.38 (56.73%) thousand tons was used for jaggary production and 926.25 (14.11%) thousand tons was used for seed and chewing purpose, respectively (BBS, 2010). It is

cultivated in an area of about 0.12 million hectares. It is a long duration crop which requires 12-14 months to mature (Yadava, 1991) so, the crop is subjected to many pests and diseases. Sugarcane disease cause heavy losses in yield and quality of sugarcane. An overall 20.22% loss of cane is caused by different disease which worked out to Tk. 250 corers annually (Talukder et al., 2005). Fungal diseases are one of the major concerns to agricultural production. Out of 40 sugarcane diseases in Bangladesh, wilt is considered as one of the most damaging (Talukder et al., 2010). There is hardly an area in Bangladesh is free from wilt disease (Malek et al., 1982). Wilt associated with *Cephalosporium sacchari* and *F. moniliforme* is found to be of considerable importance particularly late in the season in Bangladesh (Rahman, 1988). Singh et al. (1975) reported that *F. moniliformae*, *Aceremonium furcatum* and *A. terricola* are also associated with the wilt of sugarcane even if *C. sacchari* is an additional cause of the disease. Wilt occurs either alone or frequently in association with red rot pathogen (*Phylospora tucumanensis* Speg) or hastens the deterioration of the affected cane (Ganguly, 1964). Losses due to wilt, which are usually computed on the basis of the quantity of canes, dried or dead, found in the field after harvest, may vary from 2 to 10 t/ha (Parthasarthy, 1972). Depending on incidence of wilt, the yield reduction may go as high as 65% (Sharma, 1976). Ratoon cane generally record higher damage than the plant cane. The wilt disease not only reduces yield but also impairs

juice quality (Anon., 1959). Wilt is mainly seed piece transmissible but the fungus can survive in the soil for 27-31 months (Ganguly and Chand, 1963). In view of the sett and soilborne nature of wilt pathogen, various types of control measures have been recommended to manage sugarcane wilt. So far, no single method has been known to control the wilt disease syndrome in sugarcane. Therefore, screening of sugarcane genotypes against wilt 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 wilt pathogen.

2. Materials and Methods

A field experiment was conducted at Bangladesh Sugarcrop Research Institute (BSRI), Ishurdi farm during the cropping season 2014-15 and 2015-16 with 34 sugarcane genotypes comprising commercial varieties, clones under zonal

yield trial (ZYT) III, II, I and advanced yield trial (AYT). Apparently healthy two budded setts of each genotype were planted in single rows of 20 m length. Row to row distance was 1 m. A mixture of spore suspension (106/ml) of 8 isolates of wilt pathogen collected from different cane growing areas of the country used as inocula. The collected isolates were cultured on Potato Dextrose Agar (PDA) 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. The punctured point (done by special inoculating needle, 2 cm long and 2 mm dia.) 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 three months of inoculation and graded according to symptomatic method for calculating disease index (Table 1).

Table 1. Criteria for determination of disease index for screening sugarcane genotypes to wilt.

Sl. No.	Criteria/Characters	Numerical rating/ Score
1.	Lesions width above the inoculated internode (0-3)	
	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
2.	d) High lesion (covered the full width)	3
	Nodal transgression (0-3)	
	a) Lesion restricted in the inoculated internode	0
	b) One node crossed	1
3.	c) Two nodes crossed	2
	d) Three or more nodes crossed	3
	Presence of pith (0-2)	
	a) Pith/holo absent	0
4.	b) Pith/holo restricted	1
	c) Pith/holo progressive	2
	Condition of top (0-1)	
4.	a) Green	0
	b) Yellow/dry	1

The mean of the total numerical ratings/scores of 15 canes was taken for assessing the disease index and disease reaction of each genotype against wilt pathogen was done based on following scale:

Table 2. Scoring index for determining disease reaction for screening sugarcane genotypes to wilt.

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)

3. Results and Discussion

The results of different sugarcane genotypes in respect of their resistance/ susceptibility against wilt pathogen during the cropping season 2014-15 and 2015-16 are presented in the Table 3. Out of 34 sugarcane genotypes, 20 were found as resistant, 10 were moderately resistant, 2 (Isd 16 and Isd 28)

were moderately susceptible and 2 (Isd 18 and Isd 19) were found as susceptible to wilt disease. During release of varieties for commercial cultivation all the varieties like Isd 16, Isd 18, Isd 19, and Isd 28 showed as resistant (R) to moderately resistant (MR) reaction. But now, they are showing resistant (R) to moderately susceptible (MS) and susceptible (S) reaction. This happened because of changing of the pathotypes (races) of the wilt pathogen 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 wilt. Among the 17 varieties prevailing under commercial cultivation, 11 varieties viz. Isd 2/54, Isd 20, Isd 32, Isd 33, Isd 34, Isd 36, Isd 38, Isd 39, Isd 40, BSRI Akh 43, BSRI Akh 44 and BSRI Akh 45 showed resistant and 1 variety Isd 37 showed moderately resistant reaction. Similar results were also reported by Begum et al. (2007), Anon. (2004) and Rahman (2001). Sugarcane genotypes viz. 2/54, Isd 32, Isd 38, Isd 39, Isd 40, BSRI Akh 43, BSRI Akh 44, BSRI Akh

45, I 290-08, I 127-09, I 130-09, I 85-10, I 7-11, I 111-11, I 230-11 and I 249-11 showed as resistant (R) reaction to wilt pathogen at BSRI farm, Ishurdi for consecutive two cropping seasons of 2014-15 & 2015-16, respectively. These 16 genotypes seem to be resistant against all isolates of wilt pathogen. Most of the genotypes showed different reactions in two consecutive years. This may be because of environmental variation and change of pathotypes in two years. Similar results were also found by Begum *et al.* (2007), Rahman *et al.* (1985), Rahman *et al.* (1984) and

Malek *et al.* (1982) in some genotypes of sugarcane. Therefore to cope up this problem it is prime importance of breeding and selection of wilt 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 wilt resistant varieties.

Table 3. Reaction of different sugarcane genotypes against mixed isolates of wilt pathogen causing wilt disease at BSRI farm, Ishurdi during the cropping season 2014-15 and 2015-16.

Sl. No.	Sugarcane genotypes	Disease reaction against wilt pathogen at BSRI farm, Ishurdi during		Remarks
		2014-2015	2015-2016	
1.	Isd 2-54	R	R	R
2.	Isd 16	S	MS	MS
3.	Isd 18	S	MR	S
4.	Isd 19	MS	S	S
5.	Isd 20	R	R	R
6.	Isd 28	MR	S	MS
7.	Isd 32	R	R	R
8.	Isd 33	R	S	R
9.	Isd 34	R	R	R
10.	Isd 36	R	R	R
11.	Isd 37	MR	R	MR
12.	Isd 38	R	R	R
13.	Isd 39	R	R	R
14.	Isd 40	R	R	R
15.	BSRI Akh 43	R	R	R
16.	BSRI Akh 44	R	R	R
17.	BSRI Akh 45	R	R	R
17.	I 290-08	R	R	R
18.	I 127- 09	R	R	R
19.	I 130-09	R	R	R
20.	I 64-10	R	MR	MR
21.	I 85-10	R	R	R
22.	I 99-10	R	MR	MR
23.	I 101-10	R	MR	MR
24.	I 103-10	R	MR	MR
25.	I 106-10	MR	R	MR
26.	I 118-10	R	MR	MR
27.	I 131-10	R	MR	MR
28.	I 7-11	R	R	R
29.	I 111-11	R	R	R
30.	I 168-11	MS	MS	MS
31.	I 198-11	R	MS	MR
32.	I 212-11	R	MR	MR
33.	I 230- 11	R	R	R
34.	I 249-11	R	R	R

References

- [1] Anonymous, 1959. Ad-hoc Expert Sub-Committee of the I. C. S. C. Sugarcane Research in India. Jour. Sug. Res. and Dev., 3: 180-181.
- [2] Anonymous, 2004. Bangladesh Sugarcane Research Institute (BSRI), Ishurdi, Pabna. p. 69.
- [3] Begum, F., Talukder, M. I., Iqbal, M. and Rahman, M. A. 2007. Comparative Resistance of Thirty Sugarcane Clones to wilt Disease of Sugarcane. Bangladesh J. Sugarcane, 29: 137-139.
- [4] BBS (Bangladesh Bureau of Statistics). 2010. Year Book of Agricultural Statistics of Bangladesh, Ministry of Planning, Government of the People's Republic of Bangladesh. Dhaka, Bangladesh. Publishing Co. Amsterdam, 2: 131-137.
- [5] Ganguly, A. and Chand, J. N. 1963. Longevity of *Cephalosporium sacchari* Butler causing wilt disease of sugarcane. Sci. & Cult., 29: 347-348.
- [6] Malek, M. A., Rahman, S. and Kamal, M. M. 1982. Relative resistance of some sugarcane varieties to wilt. Bangladesh J. Sugarcane, 4: 71-74.
- [7] Parthasarthy S. V. 1972. Sugarcane in India. The K. C. P. Ltd., Madras: 685.

- [8] Rahman, S. 1988. Loss due to diseases in sugarcane. A paper presented in the 3rd Bi-annual Conferences of Bangladesh Phytopathological Society held at BAU, 8-9 December, 1988, Mymensingh, Bangladesh.
- [9] Rahman, S. 2001. A contract research project report prepared on Screening of sugarcane germplasms for resistance to red rot, wilt and red rot-wilt complex. p. 5.
- [10] Rahman, S., Malek, M. A., Kamal, M., Nahar, N., Talukder, I. and Kalimuddin. 1984. Resistance of Some Foreign Varieties to Wilt of Sugarcane. *Bangladesh J. Sugarcane*, 6: 63-64.
- [11] Rahman, S., Malek, M. A., Kamal, M., Nahar, N., Talukder, I. and Kalimuddin. 1985. Screening of Imported Sugarcane Clones to *Cephalosporium sacchari*. *Bangladesh J. Plant Pathology* 1(1): 41-43.
- [12] Sharma, M. N. 1976. Wilt disease of sugarcane. *Sugarcane Pathol. Newsl*, 15/16: 30-33.
- [13] Singh, K., Singh, R. P. and Agrihorti, V. P. 1975. Taxonomy and pathogenicity of fungi causing sugarcane wilt syndrome. *Indian Phytopath*, 28: 86-91.
- [14] Talukder, M. I., Kamal, M. M., Iqbal, M. and Rahman, S. 2005. *Bangladeshe Akher Rog- Balaisomuho O Tar Protikar*. A booklet in Bangla (Publication No. 111) published by BSRI, Ishurdi, Pabna.
- [15] Talukder, M. I., Kamal, M. M., Iqbal, M., Rahman, S. and Rahman, M. S. 2010. *Bangladeshe Akher Rog-Balaisomuho O Tar Protikar (First Edition)*. A booklet in Bangla published by BSRI, Ishurdi, Pabna.
- [16] Yadava, R. L. 1991. *Sugarcane production technology-constraints and potentialities*. Oxford and IBH Publishing Co. Pvt. Ltd. 66 Janpath, New Selhi, 110001.