SHORT COMMUNICATION

Pathological Test of BSRI Akh 45 Against Sugarcane Smut (*Ustilago scitaminea* Sydow)

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Sugarcane (*Saccharum officinarum* L) is a cash cum-food-cum industrial crop in Bangladesh. Among many causes, diseases play an important role to decrease the yield of sugarcane as well as sugar. Forty sugarcane diseases have been identified in Bangladesh. Smut is caused by *Ustilago scitamine* Sydow., a basidiomycetous fungus (Rott, 2000) that exists in several physiologic races (Agnihotri, 1983). The disease is one of the most prevalent one and has been responsible for the demise of several leading varieties (Hoy *et al.*, 1986). Smut reduces the yield and quality of sugarcane. Reduction in yield and quality of sugarcane varies widely in different sugarcane growing areas of the world and is dependent mainly on the races of the pathogen present, the sugarcane varieties and the prevailing environmental conditions (Lee-Lovick, 1978). The loss may go upto 100% when naturally infected setts are planted and the loss may range from 42.47 to 59.20% when artificially inoculated setts are planted (Bachchhav *et al.*, 1979; Goyal *et al.*, 1982). In Bangladesh, Rahman *et al.* (1998) reported that the yield of cane were ruduced by 83.92% and 59.45% in the infected canes of clone I 291-87 and, and sugar loss by 64.12% and 39.39%, respectively when compared with their healthy canes.

Smut resistant sugarcane cultivars often begin to display increasing smut susceptibility after years of commercial production because multiple races of the pathogen can overcome host plant resistance. The risk of severe damage usually precludes susceptible varieties from being grown in situations where smut is common. Chemical control is not practical for reducing the infection of smut. Seed selection and selective roguing of infected clumps/stools would assure a healthy crop. The most efficient and economic method for disease control, including sugarcane smut, is the use of resistant varieties (Phelps and Donelan, 1991). Comstock (2000) reported that sugarcane smut can be managed effectively through the propagation of resistant varieties. So the development and release of high quality smut resistant varieties remain the most economical and effective strategy for sustainable management of the disease. With this aim the promising clone I 157-07 (BSRI Akh 45) derived from a cross between Isd 19 × Poj 2878 was passed through a series of test against the smut disease during 2010-2011 to 2014-2015 and the results are presented in this paper.

The study was performed at experimental farm of Bangladesh Sugarcrop Research Institute (BSRI), Ishurdi during 2010-2011 to 2014-2015 cropping seasons with the clone I 157-07 (now BSRI Akh 45) in different test stages viz. Advanced Yield Trial

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(AYT), Zonal Yield Trial (ZYT) - I, II and III where the varieties Isd 39 and Isd 37 were used as resiatant and susceptible standard, respectively. The clone with resuistant and susceptible standard were also planted under different test stages in a randomized complete block (RCB) design with three replications. The widely used spore suspension method was followed for creating artificial epiphytotics of the disease (Ferreira *et al.*, 1980). In this technique, chlamydospores of *Ustilago scitaminea* were collected from different varieties and locations. The collected spores were kept in proofed plastic bag and preserved in refrigerator. The spores showing germination above 90% were used for making thick homogeneous suspension of 10^6 spores/ml. Tween 20 was added to the suspension @ 0.5 ml/litre for homogeneous mixture of spore. Two bud setts were inoculated by dipping in smut spore suspension for 30 minutes before planting. The inoculated setts (60 numbers in each row) were planted in 16 m long rows in the field with three replications. In the course of the study, all cultural practices remain the same as recommended for commercial sugarcane production. Data on disease incidence were recorded starting from 90 days after planting (i.e. after the first appereance of whips) and continued up to 12 months at an interval of one month. After recording smut affected clumps/stools were uprooted and buried. Then, evaluation of genotypes for resistance to smut was made based on percentage of infected clumps by adopting the scale used as follows (Begum *et al.*, 2007; Uddin *et al.*, 2016):

Table 1. Disease rating scale

Infected clump incidence (%)	Disease rating	Reaction group
0.0 – 3.0	1	Resistant (R)
3.1 – 5.0	2	Moderately resistant (MR)
5.1 – 10.0	3	Moderately susceptible (MS)
10.1 – 25.0	4	Susceptible (S)
above 25.0	5	Highly susceptible (HS)

The results of five years experiment in plant cane showed that BSRI Akh 45 is resistant to smut, while Isd 39 is resistant and Isd 37 is susceptible in reaction. The results of pathological test are presented in Table 2.

Table 2. Reaction of sugarcane varieties against smut disease at BSRI farm, Ishurdi during 2010-2011 to 2014-2015

Cropping season (Test stage)	BSRI Akh 45		Isd 39		Isd 37	
	Incidence (%)	Reaction	Incidence (%)	Reaction	Incidence (%)	Reaction
2010-2011 (AYT)	0.00	R	0.00	R	26.26	HS
2011-2012 (ZYT-I)	2.73	R	0.00	R	10.94	S
2012-2013 (ZYT-II)	0.00	R	0.00	R	20.00	S
2013-2014 (ZYT-III)	0.00	R	0.00	R	6.77	MS
2014-2015 (ZYT-III)	4.08	MR	4.76	MR	22.9	S
Average	*1.362*	*R*	*0.958*	*R*	*17.374*	*S*

Note: R = Resistant, MR = Moderately resistant, MS = Moderately susceptible, S = Susceptible, HS = Highly susceptible

BSRI Akh 45, Isd 39 and Isd 37 showed different reactions in different cropping seasons. This may be due to environmental variations and change of races/strains/pathotypes of isolates in different years. Different sugarcane cultivars in the world may react differently to sugarcane smut isolates. For example cultivar H50-7209 is susceptible to smut in South Africa, but resistant in Tiwan (Nzioki *et al.*, 2010). NCo376 which has been considered as resistant cultivar in China (You-Xiong *et al.*, 2011), is out of production due to its high susceptibility to sugarcane smut in the Ethiopian Sugarcane plantation (Firehun *et al.*, 2009). Chona (1943) found the same variety showed 12-50% smut infection in one locality and 35-40% infection in another locality. In Bangladesh, the variety Isd 37 showed smut infection in Rajshahi, Pabna, Natore and North Bengal (Natore) sugarmills areas but was not observed in Joypurhat, Shympur (Rangpur), Mohimagonj (Gaibandha), Setabgonj (Dinajpur), Thakurgaon and Panchagor surarmills areas (BSFIC observation). A high incidence of smut was observed in the promising clone I 291-87 at BSRI farm and dropped from breeding programme (Anon., 1995). A successful disease infection depends upon available inoculum, susceptible host, and conditions favourable for infection (Agrios, 2004). Smut can cause total crop loss in susceptible varieties, especially if infected seed cane (sett) is used as planting material (Croft *et al.*, 2008b). The variety Isd 39 and Isd 37 used for resistant and susceptible standard, respectively also showed same reaction during the reporting period. BSRI Akh 45 and Isd 39 showed as resistant reaction (R & MR) to the disease in all cropping seasons and seemed resistant against the mixed virulent isoletes of *Ustilago scitaminea* (Table 2).

Considering the disease reaction in different cropping season, BSRI Akh 45, a newly released sugarcane variety having good agronomic characters was found resistant in our climatic conditions. It was found much resistant than Isd 37, the susceptible standard but slightly less resistant to Isd 39, the resistant standard when their overall disease reactions to smut were compared. It was assessed that the variety BSRI Akh 45 could successfully replace the susceptible commercial varieties if any in the field. It should be kept in mind that the disease free seed of smut smut resistant varieties should also be treated before plantation and monitored for disease incidence during cultivation years together.

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