

SCREENING OF SUGARCANE CLONES UNDER ZONAL YIELD TRIALS III, II, I AND ADVANCED YIELD TRIALS AGAINST SMUT DISEASE (*USTALIGO SCITAMINEA*) IN PLANT CANE

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ABSTRACT

A field trial was conducted on sugarcane genotype /clones against sugarcane smut disease (*Ustilago Scitaminea*) at Bangladesh sugarcane Research Institute (BSRI) farm, Ishurdi, Pubna during the cropping season 2010 -11 for plant cane. Forty-seven clones were inoculated by 1 g smut teliospore/liter of water equivalent to 10^5 - 10^6 spore /ml, for 30 minutes mixed with tween 20 for the inoculation of smut spore by dipping method. Among them 32 clones were (R) resistant ,6 Clones were (MR) moderately Resistant, 6 were (MS) Moderately susceptible,2 were (S) Susceptible and only one clone 15-08 highly susceptible found to sugarcane smut disease.

INTRODUCTION

Sugarcane (*Saccharum officinarum* L) is a cash cum industrial Crop in Bangladesh. Sugarcane is the Principal raw material for the production of white sugar and gur. In Bangladesh about forty-one diseases caused by fungi, bacteria viruses, mycoplasma etc are known to affect sugarcane at different stages of plant growth. Among the fungal diseases, Sugarcane Smut is economically most important disease. Sugarcane Smut is caused by *Ustilago scitaminea*, a basidiomycetous fungus (Rott; 2000) that exists in several physiological races (Agnihotri, 1983). Sugarcane smut causes serious losses in yield and in sucrose content (Hoy,

1986), Padmanaban *et, al.* (1988). This is a result of systematic nature of the losses in yield disease which leads to a grassy growth habit in susceptible varieties and complete crop loss (Comstock, 2000). When the smut appears during early stages (40-60) days of growth there is total loss. when it appears on 80-120 days old crops drastic reduction in yield and quality parameters Padmanaban *et, al.* (1988). Smut reduces the yield and quality of sugarcane and its severity is depended mainly on the races of the pathogen present, sugarcane variety and prevailing environmental conditions (Lee lovick,1988). The diseases cause yield losses that very between 20% to 77% depending on the cane varieties, growing

management practices and prevailing environmental conditions (Croft *el, al* 2000). Smut fungus is classified as one of the main illness of the Sugarcane Crop. Infected plants are usually stunted and produce slender canes with widely spaced nodes and a whip like source at the top of infected stalk on side shoots of standing cane (Lee lovick, 1978). Usually a successful disease management strategy requires a full understanding of the variation of pathogen population as a pre requisite to the development of resistant varieties. A high incidence of smut was observed in the promising clone 15-08 at BSRI farm as a result it had to be dropped from the breeding Programme.

Therefore, screening of sugarcane clones against smut disease is a prerequisite in the varietal development Programme before releasing varieties and finally recommended for commercial cultivation. The present study was conducted to determine the evaluation of clones for resistance to smut was made based on percentage of infected clumps.

Methodology

The study was carried at the Bangladesh sugarcane research institute in the season 2010 -11 for the plant cane. Some Sugarcane germplasm selected by BSRI clone for zonal yield trial III, II, I and advanced yield trial

(AYT) were selected for the experiment of plant cane. Methodology were followed for the experiment. The germplasm tested under field condition in the experimental farm of the BSRI. Known resistant high and susceptible clones cut from the apparently healthy seed and inoculated with spore suspension of *U. Scitaminea* in dipping method. The suspension was prepared by testing and crushing several smut wipes in tap water at about 105 to 106 spores per milliliter. The smut spore suspension mixed with Tween?? 20 for 30 minutes for the inoculation of smut spore by dipping method. The inoculated setts allowed to

germinate maintaining proper conditions. The pre germinated seedlings planted in single row plots of 30 m long and spaced at one half meter hills and line to line 1 meter. Setts per line 120. The data was expressed in percentage based on total number of cane clumps checked. The clones were grades as follows. Data on disease incidence were recorded started from 90 days after planting and continued after 12 months at the interval of one month. Then the evolution of clones for resistant smut was made based on percentage of smut infected clumps by adopting the scale used as follows (Begum *et al*, 2007)

Percentage of smut infected stools	Disease reactions (Grade)
0-3	Resistant (R)
3.1-5	Moderately Resistant (MR)
5.1-10	Moderately Susceptible (MS)
10.1-25	Susceptible (S)
25.1 and above	Highly susceptible

The check clones and variety were Isd 16 (Rs- Standard), I 139-06 (Susceptible – Standard). The Differential test clones were as follows for plant cane:

ZYT III:

1 112-01, I 39-04, I 91-05, I 94-05 and Isd 18 T2.

ZYT II :

1 25-04, I 150-05, I 94-06, I 223-06, I 310-06 and I 347 - 06

ZYT I :

I 76-07, I 133-07, I 157-07, I 167-07, I 200-07, I 85-06, I 164-07 and I 78-07.

AYT:

I 215-07, I 1-08, I 5-08, I 13-08, I 24-08, I 40-08, I 42-08, I 51-08, I 58-08, I 76-08, I 82-08, I 141-08, I 166-08, I 203-08, I 207-08, I 209-08, I 231-08, I 236-08, I 290-08, I 295-08, I 330-08, I 33-07, I 61-07, I 124-07, I 153-07, I 219-07, I 95-01, and I 24-00.

RESULTS AND DISCUS high SION

Data in table revealed that different sugarcane clones exhibited variation in their disease reaction to Smut (*Ustilago scitaminea*) for plant cane. Out of 47 clones Under

ZYT III ZYT II ZYT I and AYT categories reactions describe were as follows: Under ZYT III among five clones only I 112-01 was moderately resistant and the clones I 39-04, I 91-05, I 94-05 and Isd 18T2 were Resistant.

ZYT II, among six clones I 25-04, I 150-05, I 94-06 and I 223-06 clones were Resistant, and the clones I 310-06, I 347-06 moderately susceptible.

In ZYT I, Among eight clones six clones were resistant, the resistant clones were I 76-06 , I 133-07, I 157-07, I 167-07, I 200-07, I 85-06 and I 164-07 moderately resistant, I 178-07 moderately susceptible.

Under AYT, eighteen clones were resistant out of twenty-eight clones. The clones were I 215 -07, I 1-08, I13-08, I 58-08, I 82-08, I 166-08, I 203-08, I 207 -08, I-209-8, I 231-08, I 330-08, I 33-07, I 61-07 I 124-07, I 153-07, I 219-07, I 95-01 and I 24-00. The moderately resistant clones were I 42-08, I 141-08, I 236-08, I and 295-08. The clones were I 40-08, I 76-08 and I 290-08 moderately susceptible. The clones were I 24-08 and I 51-08 were susceptible and the clone I 5-08 was highly susceptible. The promising variety Isd 16 and I 139-06 Used for cultivation during the cropping seasons were showed as resistant and susceptible reaction against smut disease. The smut incidence of standard resistant variety of Isd 16 and standard susceptible clones I 139-06 were recorded. The highly susceptible clone smut

infection % was recorded 31.58 found in the clone I 5-08 at 2010-11 cropping year. The high incidence of smut was observed in the promising clones 15-08 at BSRI farm as a result it had to be dropped from the breeding Programme. The other susceptible and moderately susceptible clones were dropped for the breeding purpose. Which reveals that the conditions for the development of disease were congenial. The plausible reasons were the presence of the smut pathogen in an endemic area also due to the degeneration of variety for long time cultivation in the field (Agnihotri,1983). The categorization of sugarcane on their reactions to inoculation with smut disease using dipping method was used by Nasr and Ahmed (1974). Out of 47 clones tested using dipping method

were proven to be used as resistant to smut disease namely which compared to check resistant variety Isd 16 and the clones were susceptible to highly susceptible compared to check clone 1-139-06 (Please rewrite this paragraph).

CONCLUSION

From this study, it can be concluded that performance should be given in selecting those clones which were Resistant ® or moderately resistant (MR) to Smut disease. But the clones showing Moderately Susceptible (MS) to Susceptible (s) and highly susceptible (HS) reaction to smut should be dropped for commercial release and cultivation.

Reaction of s.ugarcane clones to smut disease (*Ustilago scitaminea*) in Plant cane PY (2010-11)

Sr. No.	Name of the Variety/clones	Disease incidence (%)	Disease rating
	Commercial varieties/Clones	-----	-----
1.	Isd 16 (Rs-standard)	0	R
2.	I 139-06 (Susceptible Standard)	8.95	MS

Sr. No.	Name of the Variety/clones	Disease incidence (%)	Disease rating	Sr. No.	Name of the Variety/clones	Disease incidence (%)	Disease rating
-	ZAT III	-----	-----	-	ZAT II	-----	-----
1.	I 112-01	4.41	M R	1.	I 25-04	0	R
2.	I 39-04	0	R	2.	I 150-05	1.43	R
3.	I 91-05	0	R	3.	I 94-06	0	R
4.	I 94-05	1.25	R	4.	I 223-06	1.7 5	R
5.	I Isd 18 T2	1.54	R	5.	I 310-06	5.12	MS
				6.	I 347-06	7.74	MS

Sr. No.	Name of the Variety/clones	Disease incidence (%)	Disease rating	Sr. No.	Name of the Variety/clones	Disease incidence (%)	Disease rating
-	ZYT I	-----	-----	-	AYT	-----	-----
1.	I 85-06	1.19	MR high	1.	I 215-07	0.5	R
2.	I 76-07	1.06	R	2.	I 1-08	1.92	R
3.	I 133-07	1.53	R	3.	I 5-08	31.58	HS
4.	I 157-07	1.71	R	4.	I 13-08	0	R
5.	I 164-07	4.16	MR	5.	I 24-08	11.66	S
6.	I 167-07	0	R	6.	I 40-08	5.86	MS
7.	I 178-07	7.78	MS	7.	I 42-08	4.00	MR
8.	I 200-07	0	R	8.	I 51-08	11.66	S
				9.	I 58-08	0	R
				10.	I 76-08	7.24	MS
				11.	I 82-08	2.52	R
				12.	I 141-08	3.62	MR
				13.	I 166-08	1.3	R
				14.	I 203-08	0	R
				15.	I 207-08	0	R
				16.	I 209-08	0	R
				17.	I 231-08	2	R
				18.	I 236-08	3.87	MR
				19.	I 290-08	8.20	MS
				20.	I 295-08	4.26	MR
				21.	I 330-08	1.98	R
				22.	I 33-07	0	R
				23.	I 61-07	0	R
				24.	I 124-07	0	R
				25.	I 153-07	0	R
				26.	I 219-07	0	R
				27.	I 95-01	2.59	R
				28.	I 24-00	0	R

REFERENCES

- Begum, F; Talukder, M.I and Iqbal, M.2007. Performance of various Clones for resistant to Sugarcane Smut (*Ustilago Scitaminea* Sydow). Pak. Sugar Journal . Nov.-Dec..PP16-18.
- Agnihotri, V.P. 1983. Diseases of sugarcane Oxford and IBH Publishing company. PP 65-86.
- Ahmed, H.U. 1974. Disease problems of Sugarcane in Bangladesh. Bangladesh Sugar journal.
- Rott, P; Baily, A. Comstock. J.C.; Croft, B.J and Saumtally, A. S (Eds) 2000. A guide to sugarcane diseases. Published by CIRAD and Issct; p.339.
- Comstock, J.C. 2000. A guide to sugarcane disease (Eds: p. Rott. Baily, J.C. Comstock. B.J. Croft and A.S. Saumtally) CIRAD and ISSCT, pp.181-185.
- Hoy, J.W.1886 Incidence of s. cane smut in Louisiana and its effect on yield. Plant Dis., 70: 59-60.
- Padmanaban, P; Alexander, K.C. and Shanmugan N. 1988. Some metabolic changes induced in Sugarcane by *Ustilago scitaminea*, Indian phytopath., 41: 229-232.
- Croft, B., J Irawan and N. Berding. 2000. Screening Australian sugarcane clones for smut reaction in Indonesia: Initial results. In: Proceedings of Aust. society of S.cane Technologists 22: 170-177.
- Lee- lovick, G. 1978. Smut of s. cane *Ustilago scitaminea*. Review of Plant Pathology 57: 181-188.
- Nasr, I.A. and MS. Ahmed, 1974. Sugarcane smut in the Sudan Int. sugar journal 67: 76.