

Evaluation of Some Promising Sugarcane Clones for Possible Resistance against Some Major Pests

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ABSTRACT

A field experiment was conducted to evaluate some promising sugarcane clones viz. I 103-93, I 172-93, I 110-93, I 93-93, I 67-93, I 204-93, I 154-93, I 44-93, I 88-93 and one standard variety Isd 16 during December 1997 to December 1998 at Bangladesh Sugarcane Research Institute (BSRI), Ishurdi, Pabna. Possible resistance of the clones against some major sugarcane insect pests namely, early shoot borer, top shoot borer, stem borer, rootstock borer, mealy bug, scale insect and white grub was investigated. The results of infestation of the major insect pests in different clones revealed that the clones were equally resistant to all the pests except top shoot borer. However, the significant difference in TSB infestation was found only in the month of April and October. The clones I 110-93 and I 67-93 seemed promising in respect of insect infestation.

Key words : Sugarcane clones, resistance, major pests, infestation.

INTRODUCTION

Sugarcane (*Saccharum officinarum* L.) is one of the most important cash-cum industrial crop in Bangladesh. It is a long durable crop which requires 12-16 months from planting to harvesting. Various factors are responsible for low yield of cane in Bangladesh compared to other sugarcane growing countries of the world. In Bangladesh sugarcane is attacked by nearly about seventy (70) species of insect pests (Anon., 1973-79; 1994). Among them 10 are considered as serious pests. In India average yield loss is about 20% and 15% in sugar recovery by insect pest (Avasthy, 1983). Alam (1967) reported insects pests alone caused damage ranging from 20-60% in the field.

Various pest management practices namely cultural, mechanical, biological and chemical are employed to control the pest. Among these recommendations our farmers mostly oriented with chemical control operation as it gives immediate control of the pests. But chemical pesticides are not easily available, expensive, some times do not give desirable results; moreover it creates environmental hazards. Continuous use of pesticide grow resistance to the target pest. Selection of insect resistant clones is the first step towards insect's management. As most of the major sugarcane pests are monophagous, there is a good scope for their control by developing resistant sugarcane varieties. Cultivation of insect resistant varieties is the first step towards insect management. However, development of a resistant sugarcane variety requires a long period of time hence, if clone having potential of high sugar yield is tolerant to major insect pests, would

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be more economic. Therefore, efforts need to be continued among the researchers to select suitable clones resistant to insect pests. In the present study ten promising clones have been selected to evaluate the possible resistance against some major insect pests.

MATERIALS AND METHODS

The field experiment was conducted during 1997-98 cropping season at BSRI farm. The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. The experimental materials included 11 sugarcane clones of which one was standard variety (Isd 16), remaining 10 were promising clones obtained from Breeding Division of BSRI. The clones/variety tested were I 103-93, I 172-93, I 197-93, I 110-93, I 93-93, I 67-93, I 88-93, I 204-93, I 154-93, I 44-93 and Isd 16. Conventional method was followed for plantation. The plot size was 10 x 12 m. There was no buffer row between plots. All normal agronomical practices like weeding, mulching, irrigation, fertilization, earthing-up, top dressing etc. were carried out as and when necessary.

Infestation of different sugarcane insect pests was recorded monthly from March upto harvest. The total number of canes were collected from one line (10m²) from each plot to determine the level of infestation by different insect pests. The canes of a line were uprooted every month from the standing plants. The total number of plants were counted and percentage of infested plants by a particular insect species was calculated. The percentage of infestation was calculated by using the formula,

$$\frac{B}{A} \times 100 \text{ where } A = \text{number of total plants and } B = \text{number of infested plants.}$$

RESULTS AND DISCUSSION

It was observed that TSB infestation was low in the months from March to June but increased from the month of July (Table 1). The clones did not vary significantly in the level of attack in all the months except in April and October. The significantly lowest TSB infestation (1.07%) in April was observed in the clone I 172-93 followed by I 67-93 (1.33%) and the highest infestation (6.33%) was recorded in the clone I 44-93. In October the lowest infestation (5.37%) was observed in the clone I 103-93 followed by I 197-93 (10.93%). The highest infestation of 50.87% was found in the clone I 154-93 in October. Both in April and October lowest TSB infested clones were statistically identical with that of Isd 16, the standard variety. In evaluating resistance of promising sugarcane cultivars to top shoot borer under field conditions. Pandey and Singh (1997) graded the varieties on economic threshold level at 15% incidence, viz. 0-15% resistant, 15.1-30.0% moderately resistant and 30.1-60.0% susceptible. According to Pandey's classification, the clones under present study were moderately resistant to TSB except I 154-93 which can be considered as susceptible (50.87% infestation).

The tested clones of sugarcane were infested by stem borer and the infestation started in April and continued to December (Table 2). There was no significant difference in the level of stem borer infestation in different sugarcane clones. A lower SB infestation was observed in all the clones during the months from April to September (0.13 to 7.00%) thereafter it increased to a maximum in October (25.63 to 50.87%) and declined in November and December. The stalk basis SB infestation to other clones of sugarcane

was reported to vary from 13.99 to 44.81% (Anon., 2000). The range of SB infestation in the present study is similar to that of report of BSRI (Anon., 2000). The insignificant difference of SB infestation between Isd 16 and the BSRI clones indicates that clones are equally resistance against SB as the variety Isd 16.

Rootstock borer was found from April to December in all the clones (Table 3). RSB infestation did not differ significantly among the tested clones and the standard variety Isd 16. The overall infestation was higher in April and then a little decrease was observed in May and continued to December. A maximum infestation (42.40%) was found in the clone I 103-93 in November. The insignificant level of infestation indicates that the clones have similar resistance as of the variety Isd 16 and may be promising as regard to RSB infestation. Ali *et al.* (2001) reported that root borer infestation ranged from 30.0-50.0% in Co 1148 for few years which has similarity with the present result. Although the relationship between environmental factor(s) on the level of infestation has not been analysed. One of the probable reason of higher percentage of RSB infestation in November and December might be due to the low rainfall during those months (Table 5).

All the tested clones/variety were infested by early shoot borer (ESB) during the month of March and April (Table 4). Thereafter the ESB infestation was not noticed in any of the clones. In March, the level of infestation was higher than in April. The infestation in different clones ranged from 0.70 to 3.43% and 0.13 to 0.43% in March and April respectively. Although the level of infestation in different clones/variety did not vary significantly in either month, the clones I 67-93 and I 172-93 had a very low infestation (<1%) in March while the clones I 103, I 110-93, I 88-93 and I 203-93 had higher level (>3%) of ESB attack. Percentage of ESB infestation in standard variety (Isd 16) was 1.73. The advanced clones showed similar resistance against early shoot borer. The infestation by ESB during the early stage of cane growth was reported by Kalyanaraman *et al.* 1963. Early shoot borer infestation (0.23% to 2.92%) in different clones was reported in annual report of BSRI (Anon., 2001).

Mealy bug infestation in advanced sugarcane clones and standard variety were not found during the period from March (90 DAP) to October (300 DAP). The infestation occurred in November and December (Table 4). It was found that in both months variations in mealybug infestation was not significant, indicating no difference in resistance between variety Isd 16 and the advanced clones. The mealybug infestation ranged from 6.67-14.67% in November while 41.33 to 50.00% in December. The mealybug infestation was reported in other sugarcane clones ranged from 7.12 to 95.61% (Anon., 2001). The results indicated that the advanced clones were similar in resistance against the pest as of variety Isd 16. Although mealybug infestation occurred in high percentage in December. The pest could not cause serious damage to the crop as the crop was quite mature

The scale insect infestation was found in November and December before which it did not attack sugarcane. There was no significant variations in the level of infestations by SI in different tested clones/ variety. However, the infestation ranged from 6.33 to 16.33% in November while 10.67 to 13.33% in December (Table 4). Similar SI infestation (4.33 to 26.67%) was reported in BSRI (Anon., 1995). The significant difference of attack in different clones indicated that all the clones equally resistant against scale insect.

White grub infestation was only noticed in April and a few plants were attacked by the pest (Table 4). The lowest WG infestation of 0.23 to 0.53% was recorded in the clone

I 93-93 and the variety Isd 16. Although WG is a major pest at Setabganj, Dinajpur, the minimum level of infestation at Ishurdi might be due to the soil factor. There is a report that the white grubs got the status as major sugarcane pest since 1980-81 cropping season in the northern cane growing areas of Bangladesh (Anon., 1994).

The results revealed that advanced sugarcane clones had different levels of susceptibility against different insect pests. The data showed that infestation by ESB on different clones ranged from 0.17 to 3.43%; TSB, 0.93 to 50.87%; RSB, 1.70 to 42.40%; SB (stalk basis) 0.17 to 50.87%; mealy bug 6.67 to 50.0%; scale insect 6.33 to 19.33% and by white grub 0.23 to 2.40%. On the basis experimental findings clones I 110-93 and I 67-93 might be grouped comparatively less susceptible to major pests. The result (infestation levels) also suggests that control measures must be taken against the major pests from the beginning if those are released as varieties to keep the level below economic injury.

Table 1. Infestation level of Top shoot borer (TSB) in different promising sugarcane clones of BSRI, Ishurdi, Pabna, 1997-98.

Clones/ Variety	Mean percentage of TSB infested cane in different months									
	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
I 103-93	3.60	3.30ab	6.07	5.67	11.33	13.43	14.67	5.37b	16.10	15.33
I 172-93	0.93	1.07b	2.43	2.77	11.20	15.00	10.00	12.37b	15.90	12.67
I 197-93	3.83	3.93ab	5.00	2.03	15.33	15.00	15.33	10.93b	18.30	17.33
I 110-93	4.77	5.23ab	5.70	2.40	11.33	15.37	13.00	12.30b	20.50	19.00
I 93-93	4.80	5.17ab	5.97	2.07	11.49	13.00	14.33	28.07ab	23.07	21.00
I 67-93	1.10	1.33b	2.63	4.43	9.67	14.00	10.67	23.57ab	19.60	17.67
I 88-93	5.47	5.80a	7.33	1.70	11.37	18.33	15.33	23.93ab	15.80	14.67
I 204-93	4.40	6.00a	7.37	1.40	12.33	12.33	14.07	12.70b	17.00	16.00
I 154-93	2.60	3.00a	4.03	2.47	11.70	15.63	13.50	50.87a	22.20	21.33
I 44-93	5.87	6.33a	7.33	1.67	11.67	14.07	12.97	19.10b	16.83	16.33
Isd 16	2.20	2.03ab	5.13	2.40	13.33	10.67	11.67	24.80ab	17.17	19.43
Probability	NS	0.0054	NS	NS	NS	NS	NS	0.0392	NS	NS

Table 2. Infestation level of Stem borer (SB) in different promising sugarcane clones of BSRI, Ishurdi, Pabna, 1997-98.

[illegible]

Table 3. Infestation level of Rootstock borer (RSB) in different promising sugarcane clones of BSRI, Ishurdi, Pabna, 1997-98.

[illegible]

Table 4. Infestation level of Early shoot borer (ESB), Mealybug (MB), Scale Insect (SI) and White grubs (WG) to different promising sugarcane clones of BSRI, Ishurdi, Pabna, 1997-98.

Clones/ Variety	Mean (%) ESB infestation		Mean (%) MB infestation		Mean (%) SI infestation		Mean (%) WG infestation
	March	April	November	December	November	December	April
I 103-93	3.43	0.20	14.00	49.33	12.00	11.67	0.90
I 172-93	0.88	0.20	8.33	50.00	9.33	12.67	0.93
I 197-93	2.57	0.27	8.67	41.33	8.00	12.90	0.77
I 110-93	3.03	0.17	14.67	49.00	12.33	12.67	0.77
I 93-93	1.97	0.17	10.67	45.00	12.33	11.70	0.23
I 67-93	0.70	0.17	8.33	43.00	10.33	10.07	0.57
I 88-93	3.20	0.13	12.67	44.67	6.33	13.00	0.67
I 204-93	3.33	0.37	6.67	48.67	12.67	10.33	2.40
I 154-93	1.97	0.43	11.33	50.00	12.00	12.67	1.13
I 44-93	1.40	0.17	10.33	48.33	16.33	13.33	0.80
Isd 16	1.73	0.17	12.67	44.67	6.33	11.00	0.53
Probability	NS	NS	NS	NS	NS	NS	NS

Table 5. Monthly temperature, total rainfall, average humidity and bright sunshine of the experiment site BSRI, Ishurdi, Pabna, 1997-98.

Month	Temperature (°C)			Average rainfall (mm)	Average humidity (%)	Average bright sunshine (hours)
	Maximum	Minimum	Average			
December' 97	26.41	13.83	20.12	Nil	79.16	5.46
January' 98	23.03	10.03	16.53	4.77	72.90	4.88
February' 98	27.28	13.96	20.62	14.31	75.10	6.39
March' 98	31.04	17.70	24.47	38.48	73.79	6.94
April' 98	33.26	22.62	27.94	38.93	76.74	7.45
May' 98	34.96	26.30	30.63	190.25	80.69	6.56
June' 98	35.45	27.06	31.26	66.48	86.11	6.52
July' 98	32.76	26.51	29.64	365.00	93.94	3.46
August' 98	32.62	26.67	29.65	274.00	92.62	3.82
September' 98	32.90	25.49	29.20	295.00	90.65	4.91
October' 98	35.29	22.22	28.76	34.19	82.13	8.16
November' 98	32.56	19.63	26.10	14.63	82.22	6.94
December' 98	26.75	11.83	19.29	Nil	84.62	3.59

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