

Effect of Detrashing on Stem Borer Infestation and Yield Contributing Characters of Sugarcane

M.N. Alam^{1*}, S. Akhter,¹ M.N.A. Siddiquee,² N. Islam¹ and N. Akhter³

¹ Bangladesh Sugarcrop Research Institute, Regional Station, Gazipur-1701

² Entomology Division, Bangladesh Sugarcrop Research Institute, Ishurdi, Pabna

³ Department of Entomology, Sher-e-Bangla Agricultural University, Dhaka

ABSTRACT

An experiment was conducted to find out the effects of detrashing on the level of stem borer infestation and yield contributing characters of sugarcane at Regional Sugarcrop Research Station, Gazipur during cropping seasons 2010-2011 and 2011-2012. Detrashing was done at 20, 30, 40 and 50 days intervals when the plant started its stem formation. Data were collected on stem borer infested cane, length of cane, girth of cane, individual cane weight and brix content (%). The highest percent infestation was obtained from control plot which significantly deferred from treated plots including standard (Rajex 4G) in both cropping seasons. Percent infestation in control plot in 2010-2011 and 2011-2012 were 23.44% and 20.73% respectively whereas there were 7.02% and 9.73% in Rajex 4G and also less in detrashed plots. The yield parameters such as cane length, individual cane weight, cane girth and Brix% of non-infested canes were higher than the borer infested canes. Cultural practice detrashing reduced pest infestation, contributed on yield and so can be used for controlling the infestation of stem borer at certain level and get higher production.

Key words: sugarcane, stem borer, detrashing, infestation, yield

INTRODUCTION

In Bangladesh, Sugarcane is one of the major cash crop, which is attacked by a number of insects like scale insects, stem borer, top borer etc. The sugarcane borers are the major devastator to cause considerable loss in sugarcane. Sugarcane borers like stem borer (*Chilo infuscatellus* Snellen), root borer (*Emmolocera depressella* Swin), top borer (*Scirpophaga excerptalis* Walk) and Gurdaspur borer (*Bissetia steniellus* Hamp) are responsible for damaging sugarcane crop by boring and chewing throughout the season (Khanzada, 1992). The stem borer bores into the stem and feeds on the internal tissues (Kabir, 2004). The stem borer is a severe pest which destroys young sugarcane, shoots during April-June annually. The caterpillars feed inside the stem and cut off the growing point (Khanzada, 1992). The damage by stem borer was noticed in the early stage of the crop (Rao and Rao, 1966). It is polyphagous insect (Kalara and David, 1971). Naidu (2009) reported that due to infestation of stalk borer losses of sugarcane yield was upto 33% and reduction in sugar recovery 1.7-3.07% in India.

*Corresponding Author: M.N. Alam, Senior Scientific Officer
email:jimbsri@yahoo.com

Detrashing refers to the removal of unwanted bottom unproductive dry and green leaves at regular intervals. The reason for detrashing is to make more photosynthesis available for stalk growth, enable CO₂ enrichment in the crop canopy, reduce pest incidence and bud sprouting; and facilitate easy harvesting of sugarcane. Detrashing sugarcane crops during the fifth, seventh and ninth month of growth has been recommended in India for control of the spotted sugarcane borer. Pre-trashing of mature sugarcane reportedly reduces numbers of the African sugarcane borer by 30% or more (Carnegie, 1991). Detrashing of sugarcane during 5th and 7th months decreases the infestation of internode borer (Sugarcane-NETAFIM)

MATERIALS AND METHODS

The experiment was conducted at Regional station, Bangladesh Sugarcane Research Institute, Gazipur during 2010-11 and 2011-12 cropping seasons following RCB and replicated three times. The treatments detrashing at 20 days, detrashing at 30 days, detrashing at 40 days, detrashing at 50 days and Rajex 4G @75kg/ha (standard) were included in the experiment. Detrashing was done four times during growth stage of cane in the field. The two eyed setts of sugarcane variety Amrita was planted in 6m x 5m size plot. Line to line distance was 1m and plot to plot was 2 m. Removal of old leaves from the standing sugarcane plants was started from May months of the year. Data were collected on stem borer infestation, sugarcane length, individual cane weight, cane girth and brix (%). Intercultural operations like weeding, earthing up, mulching, and irrigation were done as usual. Data on stem borer population were taken in every month from June up to harvest. At the time of data collection ten sugarcane stalks were considered as sample size. Statistical analysis was done and treatment means were compared with the control using LSD (Least significant difference) value. Percentage of infested sugarcane was calculated by the following formula:

$$\% \text{ infested cane} = \frac{\text{Number of infested cane in the plot}}{\text{Total number of cane (infested + noninfested)}} \times 100$$

RESULTS AND DISCUSSION

Detrashing of sugarcane crops has been recommended during fifth, seventh and ninth month of growth in India for control of the spotted sugarcane borer. Pre-trashing of mature sugarcane reportedly reduced numbers of the African sugarcane borer by 30% or more (Carnegie, 1991). Detrashing of sugarcane during 5th and 7th months decreased the infestation of internode borer (Sugarcane-NETAFIM). Results of detrashing on per cent infestation of stem borer and yield components of sugarcane in the present study presented as follows;

Stem borer infestation

In cropping season 2010-11, the highest (23.44%) infestation was found in control treatment followed by detrashing at 40 days (14.37%) and lowest (7.02%) in the standard plot which was treated with Rajex 4G @75 kg ha⁻¹. The control plot significantly differed from all detrashing treated plots and standard. Similarly, in cropping season 2011-12 the highest (20.73%) infestation was found in control which significantly differed from all other treatments (Table 1). This revealed that the cultural practice detrashing reduces the infestation of stem borer. Figure 1 shows the pool data on infestation (%) of stem borer, the highest (22.08%) borer infestation in control treatment (no detrashing) followed by detrashing at 30 days interval (14.11%) and the lowest (9.73%) in Rajex 4G (standard).

Cane length

Length of non-infested canes was higher than the infested canes in both cropping seasons 2010-11 and 2011-12. There was no significant difference among the treatments for non-infested sugarcane but have significantly different within the treatments in infested cane. In case of infested cane the highest cane length was found in treatment Rajex 4G @75 kg ha⁻¹ at 3.10 and 2.81m in cropping seasons 2010-11 and 2011-12 respectively. Cane length in control plot was significantly different from other treatments in both cropping seasons. The highest (3.53 m) cane length was found in non-infested cane of detrashing at 50 days interval treated plot which was not significant but in infested cane the length of cane was 2.88m during 2010-11 (Table 2). On the other hand the cane length was observed highest (3.54m) in treatment Rajex 4G @75 kg ha⁻¹ in cropping season 2011-12 followed by detrashing at 20 days (3.45 m) interval (Table 3). Joshi (1965) reported that there was a reduction in length of cane due to attack of internode borer.

Individual cane weight

Individual cane weight is an important parameter for yield of sugarcane. The results revealed in table 2 that due to borer infestation individual cane weight of non-infested sugarcane was noticeably higher than the infested sugarcane in both cropping seasons 2010-11 and 2011-12. Rao (1971) reported that the borer reduced cane weight, sucrose and CCS (Commercial Cane Sugar). During 2010-11 in case of borer infested sugarcane there was no significant difference among the treatments. Highest cane weight (2.09 kg cane⁻¹) was found in Rajex 4G followed by 2.08 kg cane⁻¹ detrashing at 40 days and detrashing at 50 days (Table 2). But in cropping season 2011-12 the highest cane weight was obtained from Rajex 4G @75 kg ha⁻¹ treatment (1.89 kg cane⁻¹; Table 3). Falloon (1998) and Kennedy (1999) reported that the increased borer infestation exerted considerable adverse effect on the sugarcane plant growth and its cane weight.

Stalk girth

Cane girth is an important parameter which significantly effects yield of cane. Cane girth increases with the increase of integrated management of sugarcane cultivation inspite of varietal character. In both cropping seasons 2010-11 and 2011-12 the girth of sugarcane was little higher in non-infested sugarcane at 30 days (8.59 cm) and at 50 days (8.72 cm) respectively than the infested sugarcane. There was no significant difference among the treatments in non-infested sugarcane but had significant difference in infested sugarcane in both cropping seasons 2010-11 and 2011-12. In case of infested sugarcane during 2010-11 the highest (8.20 cm) cane girth was found in standard that was identical with the treatment detrashing at 30 days interval but significantly differed with other treatments whereas during 2011-12 cropping season the highest girth (7.46 cm) was found in detrashing at 50 days interval that was not significant with standard and detrashing at 30 days interval (Table 2 & 3).

Brix content (%)

Borer infestation reduced sugarcane Brix (%) in both cropping seasons and was higher in non-infested than infested sugarcane. In cropping season 2010-11 the highest brix (18.01%) was found in detrashing at 20 days whereas in cropping season 2011-12 the highest (18.60%) in control treatment (Table 2 & 3). Naidu (2009) reported that due to infestation of stem borer sugar recovery reduced up to 3.07% in India. In both cropping seasons in case of non-infested sugarcane among the treatments there was no significant difference. But in infested sugarcane there was significant difference among the treatments. In cropping season 2010-11 the lowest brix (9.21%) was found in control treatment which was significant from all treatments. Similarly, in cropping season 2011-12 the lowest (10.66%) was found in control treatment and significant from all other treatments (Table 2 & 3). It is concluded that detrashing reduces the problem of infestation of several insect-pests. As well as it helps in maintaining clean field that enhances air movement and enriches CO₂ within the crop canopy providing an ideal micro-climate for unrestricted growth of sugarcane, more food material is made available for stalk growth, reduces bud sprouting due to accumulation of water inside the sheath in some varieties. However, all these leaves are not productive, only top eight to ten leaves are required for optimum photosynthesis. In fact the bottom green leaves are dependent on the upper productive leaves and sharing the food reserves which could be used for stalk growth. Therefore, in sugarcane it is important to remove excess lower dry and green leaves.

Table 1: Effects of detrashing on the infestation of sugarcane stem borer at RSRS, Gazipur during 2010-2011 and 2011-2012 cropping years

Treatments	Stem borer infested sugarcane (%)	
	2010-2011 season	2011-2012 season
Detrashing at 20 days	13.34 b*	12.75 d
Detrashing at 30 days	12.32 bc	15.90 c
Detrashing at 40 days	14.37 b	14.64 c
Detrashing at 50 days	10.24 bc	17.76 b
Rajex 4G @75 kg ha ⁻¹	7.02 c	9.73 e
Control (No detrashing)	23.44 a	20.73 a
LSD (5%)	6.27	1.73

*Figures accompanied by same letters are not significantly different at 5% level as per LSD test.

Table 2: Effects of stem borer infestation on yield contributing characters of sugarcane variety Amrita at RSRS, Gazipur during cropping year 2010-2011

Treatments	Cane length (m)		Individual cane weight (kg)		Cane girth (cm)		Brix (%)	
	Infested	Non - infested	Infested	Non - infested	Infested	Non - infested	Infested	Non - infested
Detrashing at 20 days	2.61bc	3.18	1.37	1.98	7.64b	8.28	11.95ab	17.86
Detrashing at 30 days	2.84ab	3.30	1.45	2.03	7.67ab	8.59	12.71a	18.01
Detrashing at 40 days	2.77ab	3.43	1.47	2.08	7.52b	8.62	12.71a	16.09
Detrashing at 50 days	2.88ab	3.53	1.37	2.08	7.41b	8.23	12.63a	17.39
Rajex 4G @ 75 kg ha ⁻¹	3.10a	3.18	1.53	2.09	8.20a	8.48	12.08a	17.41
Control (No detrashing)	2.30c	3.03	1.22	1.93	7.75ab	8.43	9.21b	15.99
LSD (5%)	0.37	NS	NS	NS	0.55	NS	2.08	NS

Legend: LSD=Least significance difference, m= meter, cm= centimeter, kg= kilogram, ha= hectare, NS=Not significant

Table 3: Effects of stem borer infestation yield contributing characters of sugarcane variety Amrita at RSRS, Gazipur during cropping year 2011-2012

Treatments	Cane length (m)		Individual cane weight (kg)		Cane girth (cm)		Brix (%)	
	Infested	Non-infested	Infested	Non-infested	Infested	Non-infested	Infested	Non-infested
Detrashing at 20 days	2.63b	3.45	1.37ab	1.72	7.26b	8.66	12.41b	18.23
Detrashing at 30 days	2.52b	3.10	1.41a	1.85	7.36ab	8.32	13.76a	19.40
Detrashing at 40 days	2.63b	3.26	1.33b	1.78	7.24b	8.33	12.26b	19.06
Detrashing at 50 days	2.70ab	3.42	1.38ab	1.85	7.46a	8.72	12.15b	18.53
Rajex 4G @75 kg ha ⁻¹	2.81a	3.54	1.35ab	1.89	7.37ab	8.41	12.84b	18.33
Control (No detrashing)	2.31c	3.10	1.36ab	1.70	7.26b	8.34	10.66c	18.60
LSD (5%)	0.14	NS	0.05	NS	0.15	NS	1.20	NS

Legend: LSD=Least significance difference, m= meter, cm= centimeter, kg= kilogram, ha= hectare, NS=Not significant

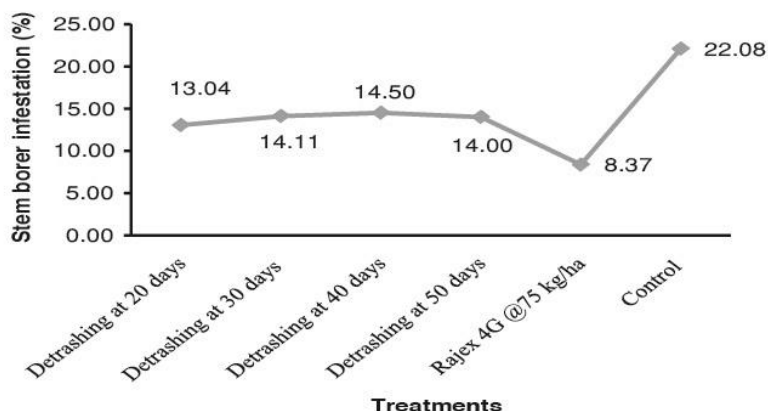


Figure 1. Effects of detrashing on infestation of sugarcane stem borer at different frequency (Pooled data)

REFERENCES

- Carnegie, A.J.M. 1991. Sugarcane borers in Africa and recent work on *Eldana saccharina*. Paper presented to International Society of Sugarcane Technologists Entomology Workshop, West Palm Beach, Florida, USA, 11-15 March, 1991. In:
- Polszek A, ed. 1998. African Cereal Stem Borers: Economic importance, taxonomy, natural enemies and control. Wallingford, UK: CAB International.
- Falloon, T. 1998. Stalk borer damage level as a measure of the impact of biological control programme against *Diatracea saccharalis* (F.) in Jamaica. *J. of the Jamaican Association of Sugar Technologists*, 39(3):35-38.
- Joshi, R.G. 1965. Reduction in sugarcane quality and quantity due to borer attack. 20th Convention of DSTA, Pune, 231-240.
- Kabir, S.M.H. 2004. Stem borer, Asiatic Society of Bangladesh.
- Kalara, A.N and David, H. 1971. Sex attraction in sugarcane stalk borer, *Chilo auricilius* Dudgeon. *Indian J. Agric. Sci.*, 41 (1):21-24.
- Kennedy, F.J.S. and Nachiappan, R. 1999. Certain anatomical, physical and chemical basis for differential preference of early shoot borer, *Chilo infuscatellus* Snellen in sugarcane. Mededelingen Van de Facultat Landbouwtenschappen, Rijksuniversiteit Gent, 57 (3A):637-644.
- Khanzada, A.G. 1992. Sugarcane stem borer *Chilo infuscatellus* Snellen (Crambidae: Lepidoptera)-A review *J. of Agric. Res.*, 33 (1):57-64.
- Naidu, P. 2009. Integrated Pest Management (IPM) in Sugarcane. Assignment part of module B.XII - 2009. 7p.
- Rao, B.H.K and Rao, A.S. 1966. *Proceeding of 34th Conference of Sugar Technologist Association*, India, pp. 123-126.
- Rao, V.P and Nagarkatti, S. 1971. *Indian Sugar*, 21 (3):219-225. Sugarcane-NETAFIM. Tamil Nadu Agricultural University (TNAU), Coimbatore Tnau Agrotech Portal.