

Loss Assessment Due to Attack of Borers in Sugarcane

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ABSTRACT

An experiment was conducted to estimate the weight and recovery losses caused by top shoot borer, stem borer and rootstock borer at the experimental farm of Bangladesh Sugarcane Research Institute (BSRI), Ishurdi, Pabna during the cropping season 2002-2003. Results revealed that mean weight losses were 12.29% and 46.68% for top shoot borer (TSB), 12.01% and 34.51% for stem borer (SB) and 10.07% and 55.28% for rootstock borer (RSB) at 10% and 100% infestation level respectively. Losses in mean percent recovery were 8.44%, 10.95% and 8.48% at 100% infestation by TSB, SB and RSB respectively. The result proves that recovery loss due to pest infestation generally increased with the increase in infestation.

Keywords: Sugarcane, borers, loss assessment.

INTRODUCTION

Sugarcane is a major cash crop in Bangladesh but its production per unit area is considerably lower than many other sugarcane producing countries of the world. Sugarcane pests specially borers are serious problem in cane cultivation. Among major pests, top shoot borer (*Scirpophaga excerptalis* Walker), stem borer (*Chilo tumidicostalis* Hampson) and rootstock borer (*Emmalocera depressella* Swinhoe) are the most destructive. Alam (1967) reported that these pests alone can cause damage ranging from 20-60% under field conditions. Considerable yield losses which are estimated to be around 20% in cane yield and 15% in sugar recovery have also been reported (Avasthy, 1983). Due to their infestation, losses in yield incurred every year are estimated to be 21-48% by top shoot borer (Karim and Islam, 1977), 8.2-12.6% by stem borer, *Chilo tumidicostalis* Hampson (Khanna et al. 1957), 8.55% (Miah et al., 1986) and upto 10% by rootstock borer (Gupta and Avasthy, 1952). Justification of management of a pest depends on the importance or economic loss by the pest. Economic loss may be expressed in terms of yield loss and sucrose loss or both. The yield loss and sucrose loss varying on the level of infestation. Little work has been done in this aspect in Bangladesh. But now it is necessary to know how much loss is caused due to what level of infestation. Because it is to be ascertained at what level of infestation control measures should be taken, that will be economical. Therefore, the experiment was undertaken to find out losses due to borers' attack at different infestation levels in sugarcane.

MATERIALS AND METHODS

The experiment was conducted at the experimental farm of Bangladesh Sugarcane Research Institute (BSRI), Ishurdi, Pabna during the cropping season 2002-2003. Three inconsistent apparently resistant to susceptible varieties viz. Isd 2-54, Isd 16 and Isd 28 were planted in an area of 0.75 ha of land which was allowed for natural infestation by Top shoot borer (TSB), Stem borer (SB) and Rootstock borer (RSB). Planting was done through conventional sett placement in the trenches. Fertilizer application, irrigation, weeding, mulching and earthing-up were done as and when necessary. No pest control measures were applied. At harvest, samples of 20 canes were prepared containing infested and uninfested canes comprising 0%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90% and 100% of each variety. Thus investigation consists of 13 treatments including one control (healthy canes). The treatments were replicated thrice for weight and sucrose analysis and statistical analysis was done for comparison.

RESULTS AND DISCUSSION

It was observed that substantial yield loss occurs due to attack of top shoot borer (TSB) in all test varieties viz. Isd 2-54, Isd 16 and Isd 28. In case of Isd 2-54, no significant differences were observed in weight loss among 0 to 50% infestation but onward infestations differed significantly in weight loss. In case of Isd 16, all categories of infested canes differed significantly over healthy canes. No significant differences were observed in weight loss among 0 to 40% infestation but onward infestations differed significantly in weight loss. No significant differences were observed among 50% to 90% infestation in weight loss but 100% infestation differed over all level of infestation. In case of Isd 28, weight loss in all level of TSB infested canes (10 to 100%) differed significantly over healthy canes. No significant differences in weight loss were observed among 50 to 100% infestation but weight loss due to 100% infestation differed significantly over 10 to 40% infestation. No significant differences in weight loss were observed between 10 to and 20% infestation and simultaneously weight loss for 20 to 60% infestations did not differ significantly.

Table 1 shows loss in weight due to top shoot borer (TSB) infestation in 3 varieties. More was the infestation the more was the loss in weight. Significant loss of weight was found with increase in level of infestation. Mean loss in weight was highly negatively correlated i.e. weight significantly reduced with the increase in level of infestation.

Table 1. Loss in weight due to different level of Top shoot borer infestations in different varieties. BSRI, Ishurdi, Pabna. 2003.

Treatments (infestation)	Loss in weight due to Top shoot borer infestations							
	Mean Weight				Percent loss in weight			
	Isd 2-54	Isd 16	Isd 28 (sq. root)	Mean	Isd 2-54	Isd 16	Isd 28	Mean
0% infestation	6.73 a*	7.97 a	9.73 a (94.77)	8.14	-	-	-	-
10% infestation	6.33 a	6.50 b	8.60 b (73.99)	7.14	5.94	18.44	11.61	12.29
20% infestation	6.17 a	6.40 b	7.97 bc (64.64)	6.85	8.32	19.70	18.09	15.85
30% infestation	5.83 ab	6.33 b	7.30 cd (53.38)	6.49	13.37	20.58	24.97	20.27
40% infestation	5.73 abc	6.03 bc	7.17 cd (52.08)	6.31	14.86	24.34	26.31	22.48
50% infestation	5.73 abc	5.37 cd	7.03 cde (49.74)	6.04	14.86	32.62	27.75	25.80
60% infestation	4.87 bcd	5.20 cd	7.00 cde (49.41)	5.69	27.64	34.76	28.06	30.10
70% infestation	4.50 d	4.90 d	6.67 de (44.45)	5.36	33.14	38.52	31.45	34.15
80% infestation	4.67 cd	4.77 d	6.43 de (41.52)	5.29	30.61	40.15	33.92	35.01
90% infestation	4.33 d	4.87 d	6.03 de (37.96)	5.08	35.66	43.91	38.03	37.59
100% infestation	3.83 d	3.70 e	5.50e (31.06)	4.34	43.09	53.58	43.67	46.68
LSD (0.05)	1.164	0.933	18.74	r = -0.98**	-	-	-	-

Figures in parenthesis are transformed mean

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

** Highly negatively significant at 1% level as per correlation test.

In case of recovery significant loss was found due to infestation of TSB in Isd 28 only (Table 2). Also highly negative correlation was found in recovery loss as infestation increased i.e. as infestation increased recovery decreased.

Table 2. Loss in Recovery due to different level of Top shoot borer infestations in Different varieties. BSRI, Ishurdi, Pabna, 2003.

Treatments (infestation)	Loss in recovery due to TSB infestation							
	Percent recovery (Mean)				Percent loss in recovery			
	Isd 2-54	Isd 16	Isd 28	Mean	Isd 2-54	Isd 16	Isd 28	Mean
0% infestation	10.97	10.73	10.65 a*	10.78	-	-	-	-
10% infestation	10.87	11.90	10.45 a	11.07	0.91	-10.90	1.88	-2.70
20% infestation	10.97	11.57	10.46 a	11.00	0.00	-7.83	1.78	-2.01
30% infestation	10.98	11.47	10.27 ab	10.91	-0.09	-6.90	3.57	-3.42
40% infestation	10.90	11.69	9.75 abcd	10.78	0.64	-8.95	8.45	+0.05
50% infestation	10.90	11.09	9.43 bcd	10.47	0.64	-3.36	11.46	+2.91
60% infestation	10.82	11.10	10.07 abc	10.66	1.37	-3.45	5.45	+1.10
70% infestation	10.88	11.01	9.25 cd	10.38	0.82	-2.61	13.15	+3.79
80% infestation	10.96	10.96	8.83 de	10.25	0.10	-2.14	17.09	+5.02
90% infestation	10.64	10.86	9.19 cd	10.23	3.01	-1.21	13.71	+5.17
100% infestation	10.87	10.68	8.10e	9.88	0.91	0.47	23.94	+8.44
LSD (0.05)	NS	NS	0.959	r=-0.91**	-	-	-	-

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

** Highly negatively significant at 1% level as per correlation test.

In case of Stem borer (SB) significant weight loss was found with the increase in level of infestation in all varieties (Table 3). Also highly negative correlation was found in the mean weight loss i.e. loss in weight increased with the increase in level of infestation.

Table 3. Loss in weight due to different level of Stem borer infestations in different varieties. BSRI, Ishurdi, Pabna. 2003.

Treatments (infestation)	Loss in weight due to Stem borer infestation							
	Mean Weight				Percent loss in weight			
	Isd 2-54 Ln (x+1)	Isd 16	Isd 28	Mean	Isd 2-54	Isd 16	Isd 28	Mean
0% infestation	6.60 a* (2.025)	6.57 a	10.57 a	7.90	-	-	-	-
10% infestation	6.23 ab (1.976)	6.33 ab	8.33 b	6.96	5.61	3.65	21.19	12.01
20% infestation	5.87 b (1.927)	5.93 abc	8.43 b	6.74	11.06	9.74	20.25	14.79
30% infestation	5.70 b (1.896)	5.93 abc	7.77bc	6.47	13.64	9.74	26.49	18.20
40% infestation	6.13 ab (1.963)	5.97 abc	7.80 bc	6.63	7.12	9.13	26.21	16.18
50% infestation	6.03 ab (1.950)	5.87 c	6.77 cd	6.12	8.64	15.22	35.96	22.63
60% infestation	5.67 b (1.897)	5.47 c	6.10 de	5.75	14.09	16.74	42.29	27.31
70% infestation	5.73 b (1.907)	5.43c	6.33 de	5.94	13.18	17.35	36.90	24.91
80% infestation	5.00 c (1.791)	5.73 bc	6.40 de	5.71	24.24	12.79	39.45	27.81
90% infestation	5.03 c (1.796)	5.67 bc	6.00 de	5.57	23.79	13.70	43.45	29.58
100% infestation	4.83 c (1.763)	5.37 c	5.33 e	5.18	32.12	18.26	49.57	34.51
LSD (0.05)	0.093	0.686	1.092	r=0.95	-	-	-	-

Figures in parenthesis are transformed mean

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Table 4 shows loss in recovery due to attack of SB. Significant loss in recovery was found in variety Isd 16 and in the mean. As level of infestation increased loss in recovery also increased and it was negatively highly significant.

Table 4. Loss in Recovery due to different level of Stem borer infestations in Different varieties. BSRI, Ishurdi, Pabna. 2003.

Treatments (infestation)	Loss in recovery due to SB infestation							
	Percent recovery (Mean)				Percent loss in recovery			
	Isd 2-54	Isd 16	Isd 28	Mean	Isd 2-54	Isd 16	Isd 28	Mean
0% infestation	11.09	11.83 abc*	10.60	11.17	-	-	-	-
10% infestation	11.25	11.91 ab	10.28	11.15	-1.44	-0.68	3.02	0.3
20% infestation	11.42	12.03 a	10.11	11.19	-2.98	1.69	4.62	1.11
30% infestation	10.89	11.80 abc	10.25	10.96	2.34	0.25	3.30	1.96
40% infestation	11.14	11.89 abc	9.52	10.85	-0.45	0.51	10.19	3.42
50% infestation	11.18	11.63 abc	9.29	10.70	-0.81	1.69	12.36	4.41
60% infestation	10.92	11.58 abc	9.58	10.69	1.53	2.11	9.62	4.42
70% infestation	10.69	11.27 bc	9.64	10.53	3.61	4.73	9.06	5.80
80% infestation	10.27	11.23 c	9.82	10.44	7.39	5.23	7.36	6.66
90% infestation	9.83	11.37 abc	9.81	10.34	11.36	3.89	7.45	7.57
100% infestation	10.40	10.42 d	9.04	9.95	6.22	11.92	14.72	10.95
LSD (0.05)	NS	0.681	NS	r = -0.97**	-	-	-	-

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Table 5 and 6 show loss in weight and recovery due to attack of rootstock borer (RSB). In case of weight significant loss in weight was found in all varieties and mean. But in case of recovery significant loss was found only in Isd 28. Highly negatively correlation was found both in mean weight loss and recovery loss.

Table 5. Loss in weight due to different level of Root stock borer infestations in Different varieties. BSRI, Ishurdi. 2003.

Treatments (infestation)	Loss in weight due to Root stock borer infestation							
	Mean weight				Percent loss in weight			
	Isd 2-54	Isd 16	Isd 28	Mean	Isd 2-54	Isd 16	Isd 28	Mean
0% infestation	5.90 a*	7.90 a	10.63 a	8.14	-	-	-	-
10% infestation	5.43 ab	6.90 b	9.63 ab	7.32	7.97	12.66	9.41	10.07
20% infestation	5.73 ab	6.53 bc	9.60 ab	7.29	2.88	17.34	9.69	10.44
30% infestation	5.57 ab	6.53 bc	9.37 b	7.16	5.59	17.34	11.85	12.04
40% infestation	5.77 ab	6.13 cd	8.67 b	6.86	2.20	22.41	11.44	15.72
50% infestation	5.43 ab	5.57 de	8.60 b	6.53	7.97	29.49	19.10	19.78
60% infestation	5.23 ab	5.07 e	7.33 c	5.88	11.36	35.82	31.04	27.76
70% infestation	5.43 ab	4.30 f	6.53 cd	5.42	7.97	45.57	38.57	33.42
80% infestation	5.17 b	3.90 f	6.50 cd	5.19	12.37	50.63	38.83	36.24
90% infestation	4.30 c	3.73 f	5.47 de	4.50	27.12	52.78	48.54	44.72
100% infestation	3.43 d	3.00 g	4.50 e	3.64	41.86	62.03	57.67	55.28
LSD (0.05)	0.702	0.679	1.123	r = -0.98**	-	-	-	-

Figures in parenthesis are transformed mean

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So it reveals that no significant differences in percent recovery were found between healthy canes and TSB/SB/RSB infested canes for Isd 2-54 and between healthy canes and TSB/RSB infested canes for Isd 16. But significant differences in percent recovery were found between healthy canes and TSB/RSB infested canes for Isd 28. The reduction in sucrose content is variable depending on the variety, age of the crop infested and intensity of attack. The result proves that though recovery loss due to pest infestation is different for different varieties but generally decreased with the decrease in infestation.

Table 6. Loss in Recovery due to different level of Root stock borer infestations in Different varieties. BSRI, Ishurdi., Pabna. 2003.

Treatments (infestation)	Loss in recovery due to RSB infestations							
	Percent recovery (Mean)				Percent loss in recovery			
	Isd 2-54	Isd 16	Isd 28	Mean	Isd 2-54	Isd 16	Isd 28	Mean
0% infestation	11.12	12.54	11.17a*	11.61	-	-	-	-
10% infestation	11.54	12.03	10.54abcd	11.37	-3.78	4.07	5.64	1.98
20% infestation	10.94	12.20	10.09cde	11.08	1.62	2.71	9.67	4.67
30% infestation	10.56	12.44	10.75abcd	11.25	5.04	0.80	3.76	3.20
40% infestation	11.10	12.05	10.94ab	11.36	0.18	3.91	2.06	2.05
50% infestation	11.27	12.08	10.49abcd	11.28	-1.35	3.67	6.09	2.77
60% infestation	11.14	11.70	10.33bcde	10.06	-0.18	6.70	7.52	4.68
70% infestation	11.09	11.07	9.61e	10.59	0.27	11.72	13.97	8.65
80% infestation	10.46	11.64	9.94de	10.68	5.94	11.64	11.01	9.53
90% infestation	10.52	10.89	10.22bcde	10.54	7.82	13.16	8.50	9.83
100% infestation	9.92	11.40	10.76abc	10.69	10.79	10.97	3.67	8.48
LSD (0.05)	NS	NS	0.808	$r = -0.95^{**}$	-	-	-	-

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** Highly negatively significant at 1% level as per correlation test.

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