

Effectiveness of Some Cartap Insecticides in Controlling Stem Borer and Their Effect on the Yield of Sugarcane

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ABSTRACT

Six Cartap insecticides namely Real 4G, Care 4G, Chairman 4GR, Mikado 4G, Rentap 4G and Razex 4G were evaluated for their effectiveness against stem borer of sugarcane. The experiment was carried out at 2 locations viz BSRI farm, Ishurdi, Pabna and Regional Sugarcane Research Station (RSRS) farm during the cropping season 2008-2009. Compared to untreated control all the tested chemicals significantly controlled stem borer but Real 4G and Care 4G applied @ 3.0 kg ai ha⁻¹ in June, July and August (three times) were more in effective controlling stem borer of sugarcane. Yield increase over control was of 2.57 to 15.30% in BSRI, Ishurdi site and 7.80 to 34.10% in RSRS, Thakurgoan site recorded in insecticide treated plots.

Key words: Sugarcane, stem borer, cartap insecticides, effective control

INTRODUCTION

Sugarcane is a major industrial crop in Bangladesh. It covers about 2.05% of total cultivable land and annual cane production of 7-7.5 million ton (Pal *et al.*, 2005). Sugarcane is vulnerable to a number of pests and diseases (Agnihotri, 1983). Sugarcane stem borer, *Chilo tumidicostalis* Hampson is one of the most destructive pests of sugarcane growing areas of Bangladesh (Alam and Miah, 1997). Incidence of stem borer starts from the end of April and continues up to November. However, it is most abundant in June to September. Infestation in the field may be as high as 80% (Alam and Miah, 1997). Total crop losses by stem borer infestation were recorded in Setabgonj sugar mills during 1973-1974 cropping season (Karim and Islam, 1977). Different authors reported on the losses due to stem borer attack. Heavy infestation due to the stem borer may cause yield loss ranging from 8.2 to 12.6% (Khanna *et al.*, 1957). Gupta and Avasthey (1960) also reported 25-70% and 12-60% losses in cane yield due to primary and secondary infestation in different varieties, respectively along with 0.5-3.5 unit loss of sugar recovery in West Bengal. Due to stem borer infestation, heavy losses in yield incurred every year of Bangladesh. When attack reaches as high as 100%, loss in yield and loss in recovery range from 8.2-70.0% and 3.0-48.6%, respectively. Stem borers are the internal feeders and feed internal tissues voraciously and the plants ultimately die. Upon hatching larvae immediately enter into the plants, feed the tissue and damage the cane. The newly hatched larvae move slowly towards the base of the leaf lamina and enter into 2-4 top most internodes by boring many entry holes. Due to the primary infestation, top leaves completely dry up & resulting dead head and infested plant is visible from the distance. Copious red colour frasses ooze out from the bored holes. Aerial roots come out profusely from the nodes adjacent to the damaged internodes. At late infestation stage, the grown up larvae come out and migrate to the neighbouring canes to cause secondary infestation. The secondary infested canes show the entry holes with oozing out excreta with saw dust like damaged tissues.

Stem borers are the internal feeder. They feed internal tissues voraciously making the plants ultimately die. The aim of the study is to attack the first instar larvae when they start entering the plants.

Cartap insecticide is a systemic insecticide with stomach and contact action. Cartap hydrochloride is used for controlling chewing and sucking insect (Lepidoptera and Coleoptera) at almost all stages of development on sugarcane. These chemicals should be applied at the root zone. So that plants uptake the chemicals through the system and make the plant toxic, ultimately prohibiting the larvae in entering the plants. Some chemicals to be applied in the foliage to make the plants toxic, so that the larvae cannot bite holes for entering the plants. Only few chemicals are recommended against this pest. Further investigation to find out effective chemical is needed. Stem borer is a serious problem in cane cultivation & without managing the pest it is difficult to achieve good harvest.

Cartap is practically nontoxic to mammals. It has virtually no effects on fish about 3 days after application in field conditions. It has almost no effects to natural enemies of insect pests. It can control the insect resistant to other insecticides. The present study was undertaken to evaluate the efficacy of six cartap insecticide against stem borer.

MATERIALS AND METHODS

The experiment was set up at two locations one at RSRS, Thakurgaon and other one at BSRI farm, Ishurdi, Pabna during the cropping season 2008-2009. The experiment was comprised of seven treatments including one untreated control viz., T_0 : Control (untreated), T_1 : Real 4G, T_2 : Care 4G, T_3 : Chairman 4GR, T_4 : Mikado 4G, T_5 : Rentap 4G and T_6 : Razex 4G. The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. The plot size was 6m x 6m. Block to block distance was 2m and plot to plot distance was 1m. The variety Isd 32 was used as planting material and planting was done through conventional sett placement (end to end) in the trenches in November, 2008. All test insecticides were granular in formulation and used @ 3.00 kg ai ha⁻¹. The application of insecticides was done June, July and August at the same dose. Fertilizers were applied as per recommended dose, method and time (FRG, 2005). Intercultural operations were done as and when required (Rahman and Pal, 2003).

All test insecticides were applied in furrows which were made by spade on both sides of cane rows and incorporated with soils with the help of spade. Before irrigation, soil ridges surrounding individual plots were made to protect the flow of water from one plot to another. Data were taken in July, August, September and final in October. The yield of canes per plot was recorded at harvest.

For efficiency study, percent infestation was computed by counting total and infested canes for individual plot and the per cent infestation was computed by using the formula:

$$\% \text{ SB Infestation} = \frac{\text{Number of infested canes}}{\text{Total number of canes}} \times 100$$

RESULTS AND DISCUSSION

From Table 1 the percent stem borer infestation of July (2009) indicated that these was no significant difference in stem borer incidence among the plots treated with chemicals at BSRI Ishurdi, Pabna. The level of stem borer control was achieved from 47.06 to 75.88% which indicated that all the chemicals fails to reach the desired level (80%) of effectiveness. Infestation rates of August and September, 2009 were statistically significant in reducing the stem borer infestation compared to untreated control. The rate of Infestation of August and September was ranged from 40.22 - 70.65% and 31.48 - 72.16%, respectively which could not show the desired level of effectiveness (80%). The

percent SB infestation of October (2009) recorded in chemical treated plot had significant difference in reducing the stem borer infestation compared to untreated control plot. Here insecticides Real 4G, Care 4GR and Razex 4G gave desired level of effectiveness (over 80%), whereas the insecticides Chairman 4G, Mikado 4G and Rentap 4G failed to show the desired level of efficiency (Table 1). The pooled values (47.70 - 75.76) indicated that all the tested insecticides failed to fulfill the desired level of effectiveness.

From Table 2 it was found that the percent SB infestation in chemical treated plots of July 2009 at RSRS, Thakurgaon were significantly lower compared to untreated control. Results of July also indicated that the highest control (91.57%) of stem borer was achieved in Rezex 4G treated followed by Mikado 4G (87.15%) and Real 4G (85.14%) which applied @ 3.0 kg ai ha⁻¹. The SB infestation obtained in August showed that chemical treated plots were significantly lower compared to untreated control. Here the level of control ranged from 72.29 - 87.71% in which Chairman 4GR and Mikado 4GR failed to reach the desired level (80%) of control. The SB infestation of treated plots in September and October (2009) showed that the results were exceptable (over 80%) except those of Chairman 4G, Mikado 4G and Rentap 4G treated plots. The pooled values revealed that Real 4G, Care 4G and Rezex 4G applied in June, July and August gave over 80% control (Table 2).

Result presented in Table 3 showed that insecticide treated plots numerically increased the yield of cane compared to untreated control plots at BSRI Ishurdi but, statistically not significant. The results of the yield of cane of chemical treated plots at RSRS, Thakurgaon were statistically significant to that of untreated control plots. The highest yield was obtained in Real 4G treated plots which was statistically identical to those of Care 4G, Mikado 4G, Rentap 4G and Razex 4G treated plots. The Yield increase over control in different treatments varied from 2.57 - 15.30% and 7.80 - 34.10% in BSRI, Ishurdi and RSRS, Thakurgaon, respectively. The highest yield (75.45tha⁻¹) was recorded in Razex 4G treated plots at BSRI site and (85.93tha⁻¹) was recorded in Real 4G treated plots at RSRS, Thakurgaon site. Therefore effective control of sugarcane stem borer could be achieved by applying Real 4G, Care 4G and Razex 4G applied @ 3.0 kg ai ha⁻¹.

During the period for 1973-78 field trials were conducted to control stem borer with insecticides like Padan 4G, Orthene 5G, Monitor 500, Furadan 3G, Sevidol 8G, Basudin 10G, Fendal 5G, Cytrolane 10G, Disyston 10G, Sevin 5G, Terracur 5G, Dursban 20EC, Supracide 40EC, Azodrin 10EC and Nuvacron 40WSC at BSRI and sugarmills farms but none could show promising control of the pest (Shahjahan *et al.*, 1983). In 1979-80 studies were conducted with insecticides like Tyfanon 57EC, Nogos 10EC, Dursban 20EC, Carbicron 10WSC and Nuvacron 40 WSC but none showed significant control of the pest. Studies were also conducted in 1979-80 and in 1982 with Padan 10G against stem borer which gave promising results in controlling the pest and this chemical was under cartap group (Shahjahan *et al.*, 1983). Results of the present study and some previous studies reveal that only cartap group of insecticides have so far been shown effective to control the stem borer. And from the present finding Real 4G, Care 4G and Razex 4G may be safely recommended against sugarcane stem borer with three applications during the stem borer abundance period.

Table 1 Effectiveness of some Cartap insecticides in controlling sugarcane stem borer at BSRI, Ishurdi, 2008-2009.

Treatments	% SB infestation on				Pooled values
	July/09	Aug./09	Sept./09	Oct./09	
T ₁ - Real 4G @ 3.0 Kg ai ha ⁻¹ in June, July, August	0.81 (52.35)	1.49bc (59.51)	1.38b (70.45)	2.82b (80.47)	47.70
T ₂ - Care 4G @ 3.0 Kg ai ha ⁻¹ in June, July, August	0.63 (62.94)	1.67bc (54.62)	2.68ab (42.61)	2.72b (81.16)	60.33
T ₃ - Chairman 4GR @ 3.0 Kg ai ha ⁻¹ in June, July, August	0.90 (47.06)	2.20b (40.22)	2.48ab (46.90)	4.11b (71.54)	51.43
T ₄ - Mikado 4G @ 3.0 Kg ai ha ⁻¹ in June, July, August	0.41 (75.88)	1.67bc (54.62)	3.20ab (31.48)	4.32b (70.08)	58.02
T ₅ - Rentap 4G @ 3.0 Kg ai ha ⁻¹ in June, July, August	0.85 (50.00)	2.00bc (45.65)	2.69ab (42.40)	4.51b (68.77)	51.71
T ₆ - Razex 4G @ 3.0 Kg ai ha ⁻¹ in June, July, August (Standard)	0.41 (75.88)	1.08c (70.65)	1.30b (72.16)	2.26b (84.35)	75.76
T ₀ - Untreated (control)	1.70	3.68a	4.67a	14.44a	-
LSD (5%)	NS	0.9001	2.666	3.205	

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

*Figure in parenthesis is percent effectiveness over control.

Table 2. Effectiveness of some Cartap insecticides in controlling sugarcane stem borer at RSRS, Thakurgaon, 2008-2009.

Treatments	% SB infestation on				Pooled values
	July/09	Aug./09	Sept./09	Oct./09	
T ₁ - Real 4G @ 3.0 Kg ai ha ⁻¹ in June, July, August	0.37b (85.14)	0.43b (87.71)	1.86b (81.99)	9.79c (82.52)	84.34
T ₂ - Care 4G @ 3.0 Kg ai ha ⁻¹ in June, July, August	0.50b (79.92)	0.69b (80.29)	1.91b (81.51)	9.81c (82.49)	81.05
T ₃ - Chairman 4GR @ 3.0 Kg ai ha ⁻¹ in June, July, August	0.70b (71.89)	0.76b (78.29)	3.12b (69.80)	15.32bc (72.65)	73.16
T ₄ - Mikado 4G @ 3.0 Kg ai ha ⁻¹ in June, July, August	0.32b (87.15)	0.97b (72.29)	2.81b (72.80)	15.02bc (73.19)	76.36
T ₅ - Rentap 4G @ 3.0 Kg ai ha ⁻¹ in June, July, August	0.53b (78.7)	0.56b (84.00)	2.53b (75.51)	20.24b (63.87)	75.52
T ₆ - Razex 4G @ 3.0 Kg ai ha ⁻¹ in June, July, August (Standard)	0.21b (91.57)	0.55b (84.29)	1.67b (83.83)	9.85c (82.42)	85.53
T ₀ - Untreated (control)	2.49a	3.50a	10.33a	56.02a	-
LSD (5%)	1.411	1.475	1.478	8.748	

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

*Figure in parenthesis is percent effectiveness over control.

Table 3. Effectiveness of cartap insecticides on yield of sugarcane after controlling sugarcane stem borer at BSRI, Ishurdi and RSRS, Thakurgaon, 2008-2009.

Treatments	Yield (t ha ⁻¹)			
	BSRI, Ishurdi		RSRS, Thakurgaon	
	Mean	% increase over control	Mean	% increase over control
T ₁ - Real 4G @ 3.0 Kg ai ha ⁻¹ in June, July, August	71.26	8.89	85.93a	34.10
T ₂ - Care 4G @ 3.0 Kg ai ha ⁻¹ in June, July, August	70.07	7.08	78.24ab	22.10
T ₃ - Chairman 4GR @ 3.0 Kg ai ha ⁻¹ in June, July, August	67.60	3.30	69.08bc	7.80
T ₄ - Mikado 4G @ 3.0 Kg ai ha ⁻¹ in June, July, August	67.12	2.57	75.56abc	17.92
T ₅ - Rentap 4G @ 3.0 Kg ai ha ⁻¹ in June, July, August	71.29	8.94	76.20abc	18.63
T ₆ - Razex 4G @ 3.0 Kg ai ha ⁻¹ in June, July, August (Standard)	75.45	15.30	75.46abc	17.76
T ₀ - Untreated (control)	65.44	-	64.08c	-
LSD (5%)	NS		11.82	

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

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