Bangladesh J. Sugarcane, 32 : 63-67 *April, 2011*

Effects of Some Organocarbamate Insecticides in Controlling Top Shoot Borer and Yield of Sugarcane

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ABSTRACT

The experiment was conducted with different organocarbamates namely kildan 3G, arofuran 3G, carbomot 5G, ecofuran 5G, m-furan 5G, borer 5G, sarafuran 5G, foster 5G, shikari 5G, carbodhan 5G, raidfuran 5G, furadan 5G to evaluate their effectiveness against the top shoot borer of sugarcane, *Scirpophaga excerptalis* Walker at the experimental farm of Bangladesh Sugarcane Research Institute (BSRI), Ishurdi, Pabna and Regional Sugarcane Research Station (RSRS) Thakurgaon. It was revealed that kildan 3G, arofuran 3G, carbomot 5G, ecofuran 5G, shikari 5G, carbodhan 5G, raidfuran 5G @ 2.0kg ai ha^{-1} applied in March and May at BSRI and RSRS Thakurgaon reduced the incidence of the top shoot borer significantly. Insecticide treated plots gave higher yield compared to untreated plots.

Key words: Sugarcane, top shoot borer, organocarbamate, control, yield.

INTRODUCTION

Top shoot borer, *Scirpophaga excerptalis* Walker (Lepidoptera: Pyralidae) is a serious pest throughout the cane growing areas of Bangladesh. The period of severe attack by top shoot borer is from March to October and it is the internal feeder attacking shoot of sugarcane. Its infestation in the field ranges from 10 to 100%. It causes severe losses both in cane weight and sucrose content in infested canes. The top shoot borer infested canes contained 2% less sucrose (Miah *et al.,* 1980). Loss in cane weight due to top shoot borer infestation varied from 12.29- 46.68% and loss in sugar recovery due to this pest have been estimated 8.44% (Alam *et al.*, 2006). The characteristic symptoms are tunnel on the mid rib, parallel shot holes on the attacked leaves and if the attack is after internode formation, the growing point is killed and the formation of 'dead-heart'. Sandhu & Dhura (1977) reported that the top shoot borer of sugarcane could be effectively controlled by the use of systemic insecticides like carbofuran and phorate. Mostafa *et al.* (1986) reported carbofuran (2,3-dihydro-2, 2-dimethyl benzofuran-7-methylcarbamate) as a broad-spectrum systemic insecticide. The carbamate insecticides have both properties of killing insects by contact as well as systemic action. The present study was aimed to assess the effectiveness of certain insecticides in suppressing the top shoot borer, which might be judicious and economical.

MATERIALS AND METHODS

The experiment was set up at Bangladesh Sugarcane Research Institute (BSRI), Ishurdi, Pabna and RSRS, Thakurgaon during the cropping season 2007-2008.The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. There were thirteen (13) treatments including one control. The treatment furadan 5G was considered as standard. The plot size was 6m x 6m. Block to block distance was 2m and plot to plot distance was 1m. The sugarcane variety Isd 20 was used as planting material. Planting was done through conventional sett placement (end to end) in trenches in December, 2007 at BSRI, Ishurdi and RSRS, Thakurgaon. The test insecticides included granular formulation. Furrows were made on both sides of cane rows by spade. Granular insecticides were broadcasted in the furrow and on the space between the furrows and

covered with soils with the help of spade followed by irrigation. Intercultural operation was made when necessary. Each of the organocarbamate insecticides like kildan 3G, arofuran 3G, carbomot 5G, ecofuran 5G, m-furan 5G, borer 5G, sarafuran 5G, foster 5G, shikari 5G, carbodhan 5G, raidfuran 5G, furadan 5G @ 2.0kg ai ha^{-1} were applied in respective plots twice. First application was made in March and second in May. Data on top shoot borer infestation were recorded in July and in October. The yield of cane per plot was recorded at harvest. All the recorded data were analyzed statistically using LSD.

RESULTS AND DISCUSSION

Data collected in July showed that all the treatments had statistically significant effects in reducing the top shoot borer infestation over the control at BSRI. The control efficacy ranged from 57.40 to 93.08% in which m-furan 5G, borer 5G, sarafuran 5G, foster 5G and carbodhan 5G @ 2.0kg a.i. ha^{-1} failed to reach the desired level (over 80%) of efficacy over the control (Table 1). In October all treatments were statistically significant in reducing the top shoot borer infestation over the control and the efficacy ranged from 45.76 to 89.67%. The treatments with m-furan 5G, borer 5G, sarafuran 5G and foster 5G @ 2.0kg a.i. ha^{-1} failed to show the desired level of efficacy (over 80%) whereas kildan 3G, arofuran 3G, carbomot 5G, ecofuran 5G, shikari 5G, carbodhan 5G and raidfuran 5G gave the desired level of efficacy. The efficacy of pooled data indicated that kildan 3G, arofuran 3G, carbomot 5G, ecofuran 5G, shikari 5G and raidfuran 5G @ 2.0kg a.i .ha^{-1} applied in March and May gave over 80% control (Table 1). The control efficacy (pooled data) ranged from 51.58 to 88.93%.

At RSRS, Thakurgaon data collected in July indicated significant reduction of the top shoot borer incidence by all the test chemicals and the efficacy ranged from 62.67 to 82.47%. Here it was observed that kildan 5G, m-furan 5G, borer 5G, sarafuran 5G and foster 5G @ 2.0 kg a.i. ha^{-1} failed to reach the desired level (over 80%) of efficacy (Table 2). Final data collection was done in October. The test chemicals showed significant difference in top shoot borer reduction over the control in which kildan 3G, arofuran 3G, carbomot 5G, ecofuran 5G, m-furan 5G, shikari 5G, carbodhan 5G and raidfuran 5G gave above 80% efficacy. While borer 5G, sarafuran 5G and foster 5G showed 75.85 to 78.81% efficacy. Pooled data indicated that kildan 3G, arofuran 3G, carbomot 5G, ecofuran 5G, shikari 5G carbodhan 5G and raidfuran 5G @ 2.0kg ai ha^{-1} applied in March and May gave over 80% control (Table 2). The control efficacy (pooled data) ranged from 69.26-84.66%.

Result presented in Table 1 and Table 2 showed that insecticide treated plots increased the yield of cane over the untreated plots. Yield difference among the treatments was observed at BSRI, Ishurdi, Pabna and RSRS, Thakurgaon. Comparatively higher yield was obtained at BSRI than RSRS, Thakurgaon. The yield increase over control in different treatments varied from 7.78 to 28.62 and 7.40 to 17.42% at BSRI and RSRS, Thakurgaon respectively. The highest yield (52.04 t ha^{-1}) was recorded in sarafuran 5G treated plots at BSRI, on the other hand carbodhan 5G gave highest yield (46.16 t ha^{-1}) at RSRS, Thakurgaon. In an experiment Miah and Akhter (1985) noted that yield id Furadan treatments might be due to profuse root development though increased mitotic index that enhanced nutrient uptake resulting increased cane yield. Biswas *et al.* (1994) suggested application of Furadan and Curaterr (commonly carbofuran) against white grubs @ 2.0 kg ai ha^{-1} and they recommended the same dose rate for the control of the top shoot borer. Several experiments were conducted under BSRI, Ishurdi, Pabna with lower dosage i.e.1.0 kg ai ha^{-1} & 1.5 kg ai ha^{-1} of carbofuran insecticides. All dosage of insecticides failed to show the desired level of efficacy (over 80%) (SRTI, 1981; SRTI, 1988a; SRTI, 198b; SRTI, 1990). The effectiveness of any insecticide showing 80% (or above) mortality of pest or reduction of pest infestation is the requirement for approval of Pesticide Technical Advisory Committee (PTAC), a government body of Bangladesh. From the study it might be concluded that kildan 3G, arofuran 3G, carbomot 5G, ecofuran 5G, shikari 5G, carbodhan 5G, raidfuran 5G @ 2.0kg ai ha^{-1} applied in March and May effectively control top shoot borer and might be recommended for the control of the top shoot borer.

Table 1: Efficacy of some carbofuran insecticides in controlling top shoot borer and yield of sugarcane, BSRI, Ishurdi, 2007- 2008.

Treatments (Chemicals)	% TSB infestation (Mean)				Pooled data (% TSB infestation)	Yield data (t ha^{-1})
	02.07.09	% Efficacy	02.10.08	% Efficacy		
T_1. Kildan 3G @ 2.0kg ai ha^{-1} (March + May)	3.32c (11.02)	83.61	2.04 c (6.68)	83.99	8.85 (83.80)	49.17ab
T_2. Arofuran 3G @ 2.0kg ai ha^{-1} (March + May)	2.14d (4.65)	93.08	1.99c (6.35)	84.78	5.50 (88.93)	49.35ab
T_3. Carbomot 5G @2.0kgai ha^{-1} (March + May)	2.65cd (7.12)	89.41	2.09c (7.10)	82.98	7.11 (86.19)	49.35ab
T_4. Ecofuran 5G @ 2.0kg ai ha^{-1} (March + May)	2.94cd (8.67)	87.11	1.63d (4.31)	89.67	6.49 (88.39)	49.26ab
T_5. M-furan 5G @ 2.0kg ai ha^{-1} March + May)	5.18b (27.06)	59.76	2.98b (19.04)	54.37	23.05 (57.06)	47.78ab
T_6. Borer 5G @ 2.0kg ai ha^{-1} (March + May)	5.07b (25.89)	61.50	3.09b (21.18)	49.24	23.53 (55.37)	47.96ab
T_7. Sarafuran 5G @ 2.0kg ai ha^{-1} (March + May)	5.09b (26.37)	60.79	3.10b (21.29)	48.98	23.83 (54.88)	52.04a
T_8. Foster 5G @ 2.0kg ai ha^{-1} (March + May)	5.32b (28.65)	57.40	3.12b (21.80)	45.76	25.22 (51.58)	46.02Bc
T_9. Shikari 5G @ 2.0kg ai ha^{-1} (March + May)	4.77b (10.16)	84.89	2.12c (7.38)	82.31	8.77 (83.60)	50.74a
T_{10}.Carbodhan 5G@2.0kg ai ha^{-1} (March + May)	5.29b (28.04)	58.30	2.22c (8.19)	80.95	18.11 (69.62)	43.61cd
T_{11}. Raidfuran5G @2.0kg ai ha^{-1} (March + May)	2.35cd (5.70)	91.52	2.07c (6.91)	83.44	6.30 (87.48)	45.18bc
T_{12}. Furadan 5G @ 2.0kg ai ha^{-1} (March + May)	3.16c (10.56)	83.85	1.99c (6.37)	84.73	8.46 (84.29)	47.96ab
Control (Untreated)	8.20a (67.25)	(-)	3.75a (41.73)	(-)	(-)	40.46d
LSD (5%)	0.9781	(-)	0.2261	(-)	(-)	3.702

Figures in parenthesis are observed mean, pooled data are calculated from observed mean.

* Means followed by the same letter in a column are not significantly different at 5% level as per LSD.

Table2 : Efficacy of some carbofuran insecticides in controlling top shoot borer and yield of Sugarcane, RSRS, Thakurgaon, 2007- 2008.

Treatments (Chemicals)	% TSB infestation (Mean)				Pooled data (% TSB infestation)	Yield data (t ha^{-1})
	08.07.09	% Efficacy	08.10.08	% Efficacy		
T_1- Kildan 3G @ 2.0kg ai ha^{-1} (March + May)	11.98de	77.54	2.45cde (10.68)	83.57	11.33 (80.55)	44.35ab
T_2- Arofuran 3G @ 2.0kg ai ha^{-1} (March + May)	9.46e	82.26	2.28de (8.96)	86.21	9.21 (84. 23)	42.80b
T_3-Carbomot 5G @2.0kgai ha^{-1} (March + May)	9.95e	81.35	2.34de (9.40)	85.54	9.68 (83.44)	42.22b
T_4- Ecofuran 5G @ 2.0kg ai ha^{-1} (March + May)	9.35e	82.47	2.24e (8.55)	86.85	8.95 (84.66)	43.33ab
T_5- M-furan 5G @ 2.0kg ai ha^{-1} (March + May)	15.59cd	70.77	2.59bcd (12.54)	80.71	14.07 (75.74)	44.17ab
T_6- Borer 5G @ 2.0kg ai ha^{-1} (March + May)	18.56bc	65.20	2.73bc (14.48)	77.72	16.52 (71.46)	42.57b
T_7- Sarafuran 5G @ 2.0kg ai ha^{-1} (March + May)	16.49bc	69.08	2.69bc (13.77)	78.81	15.13 (73.94)	42.91b
T_8- Foster 5G @ 2.0kg ai ha^{-1} (March + May)	19.91b	62.67	2.80b (15.70)	75.85	17.81 (69.26)	44.09ab
T_9- Shikari 5G @ 2.0kg ai ha^{-1} (March + May)	9.79e	81.65	2.42cde (10.35)	84.08	10.07 (82.86)	43.19ab
T_{10}-Carbodhan 5G@2.0kg ai ha^{-1} (March + May)	10.44e	80.43	2.34de (9.65)	85.15	10.05 (82.79)	46.16a
T_{11}-Raidfuran 5G @2.0kg ai ha^{-1} (March + May)	9.85e	81.53	2.48cde (11.0)	83.08	10.41 (82.30)	44.13ab
T_{12}- Furadan 5G @ 2.0kg ai ha^{-1} (March + May)	9.76e	81.70	2.29de (8.86)	86.37	9.31 (84.03)	43.24ab
Control (Untreated)	53.34a (-)	(-)	4.16a (65.00)	(-)	59.17 (-)	39.31c
LSD (5%)	4.201		0.3153			2.591

Figures in parenthesis are observed mean, pooled data are calculated from observed mean.

* Means followed by the same letter in a column are not significantly different at 5% level as per LSD.

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