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# Effect of Different Carbamate Insecticides in Controlling Early Shoot Borer and on the Yield of Sugarcane

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## ABSTRACT

Different carbamate insecticides namely Pillarfuran 5G, Alphafuran 5G, Forwafuran 5G, Cemifuran 5G, Kuridan 5G, Chazer 3G, Hayfuran 5G, Curaterr 5G, Cyren 15G and Pyriban 15G were used to evaluate their effectiveness against early shoot borer of sugarcane. The experiment was carried out at Jamalpur farm and Mohan farm under Thakurgaon Sugar Mills Ltd., Thakurgaon during the cropping season 2003-2004. The infestation of the pest was reduced statistically over the control plots. It was found Pillarfuran 5G, Alphafuran 5G, Forwafuran 5G, Cemifuran 5G, Kuridhan 5G, Chazer 3G, Hayfuran 5G, Curaterr 5G @ 2.00 kg ai $ha^{-1}$ and Cyran 15G, Pyriban 15G @ 2.25 kg ai $ha^{-1}$ applied in February reduced incidence of early shoot borer over 80% compared to check plots. Cane yield was also increased in treated plots ranging from 24.43 to 54.41%.

**Key words** : Effect, carbamate insecticides, early shoot borer, sugarcane.

## INTRODUCTION

Sugarcane early shoot borer, *Chilo infuscatellus Snellen* is one of the major pests throughout the cane growing areas of Bangladesh. It has been observed to thrive in drier conditions and prefers the absence of rain for their multiplication (Butani, 1961). The borer infests the crop during the early stages of the crop mainly before internode formation. The borer infests the young sugarcane plants and destroys about 25-50% shoots during hot weather but its damage to cane stalk after the formation of internode is little (Gupta, 1959). He also stated that the borers flourish well at an average maximum temperature range of 35.56-41.12$^0$c and 40-45% mean relative humidity. The newly hatched larvae crawl on leaves, move down wards entering into leaf sheath and bite holes on stalk at ground level and enter into the stem. Plenty of wet frass is found in between the leaf sheath and cane stalk of the infested plants. Early shoot borer destroys 26-65% mother shoots, 6.4% primary, 27.1% secondary, 75% tertiary tillers, huge yield loss (0.33-33.0%), recovery loss (2.0-12.0%) and maximum infestation (0.0-40.0%) (Krishnamurthy Rao, 1954; Khan and Krishnamurthy Rao, 1956). Large scale destruction of mother shoots at the early stages during dry months create gaps in the field resulting low yield. Due to early shoot borer attack characteristics thick dead heart symptom develops appears approximately 6-7 days after infestation which can be easily pulled out emitting an offensive smell. Padmanathan *et al.* (1975) found sevidol granules very effective against early shoot borer applied @ 11.2 kg $ha^{-1}$ 35 days after cane plantation. Siddiqui and Sinha (1968) found soil application of BHC both as post planting and planting time treatments are effective in the control of early shoot borer @ 1.0 kg ai $ha^{-1}$. Sandhu and Waraitch (1982) found that Fensulfothion (Dasanit 5G) significantly controlled this pest. The period of attack by early shoot borer (March to May) though their nature of infestation and damage vary greatly. The early shoot borer is the internal feeder-attacking shoot. Sandhu and Dhura (1977) reported that early borer of sugarcane can 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 7-benzofuranyl methyl carbamate) is a broad-spectrum systemic insecticide. The carbamate insecticides have both properties of killing insects by contact as well as systemic action. Therefore, the present study was aimed to suppress the early shoot borer insect pest that might be judicious and economical.

## MATERIALS AND METHODS

An experiment was carried out in 2003 to 2004 cropping season both at Jamalpur farm and Mohan farm, Thakurgaon Sugar Mills Ltd., under Old Himalayan Piedmont Plain (AEZ-I) soils of Bangladesh. The experiment was comprised of eleven treatments including one control viz., $T_0$ : Control (untreated), $T_1$ : Pillarfuran 5G, $T_2$ : Alphafuran 5G, $T_3$ : Forwafuran 5G, $T_4$ : Cemifuran 5G, $T_5$ : Kuridan 5G, $T_6$ : Chazer 3G, $T_7$ : Hayfuran 5G, $T_8$ : Curaterr 5G, $T_9$ : Cyren 15G and $T_{10}$ : Pyriban 15G. 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 vareity Isd 28 was used as planting material and planting was done through conventional sett placement end to end in the trenches in November 2002. Fertilizer was applied in three equal splits, the first split after as basal dose, the second at tiller completion stage (90 DAP) and the third at grand growth phase (180 DAP). Full amount of triple superphosphate (TSP), gypsum and one third of muriate of potash (MOP) were applied in trenches and thoroughly mixed with soil prior to sett plantation. The rest amount of MOP was applied as top dressing at 90 DAP and 180 DAP.

All the test insecticides were granular in formulation. Furrows were made on both sides of cane rows and insecticides were then applied at and between the furrows and was incorporated with soils with the help of spade followed by irrigation. Before irrigation, soil ridges surrounding individual plots were made to protect on rush of water from one plot to another. Intercultural operation was done as and when necessary. Considering the above observation application of insecticides was done on February followed by irrigation. Data were taken twice, once in March and other one in May. The yield of canes per plot was recorded at harvest. Data on early shoot borer infestation were recorded in March and May by counting total and infested canes in individual plot and the per cent infestation was computed by using the formula:

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

## RESULTS AND DISCUSSION

From the Table 1 (March data) it is observed that all the insecticides were not equally effective in reducing the early shoot borer infestation. Among the treatments Kuridan 5G, Chazer 3G, Hayfuran 5G, Cyren 15G and Pyriban 15G reduced the early shoot borer infestation more than 80% and all the treatments were statistically significant over control. In May data all the treatments Pillarfuran 5G, Alphafuran 5G, Forwafuran 5G, Cemifuran 5G, Kuridan 5G, Chazer 3G, Hayfuran 5G, Curaterr 5G, Cyren 15G and Pyriban 15G reduced the early shoot borer infestation more than 80% and all the treatments were statistically significant over control. Though these insecticides have short active life both in soils and plants yet these chemicals effectively controlled the target pest. The short life of carbofuran in soil is supported by the work of Chowdhury *et al.* (2002) who reported that carbofuran after 30 days of incubation, no carbofuran residues were detected in soil indicating complete degradation of the pesticide.

For cane yield, the treatment Cemifuran 5G showed maximum yield of 56.76 MTH followed by Alphafuran 5G (55.09 MTH) and range of percent increase was 24.43 to 54.41. From Table 2 it was revealed that all the treatments in March and May reached the desired level of efficacy (80.00 %). All the treatments were statistically significant in reducing the pest control. For cane yield, the treatment Cemifuran 5G showed maximum yield of 57.59 MTH followed by Alphafuran 5G (56 09 MTH) and range of percent increase was 28.85 to 46.54l. Pyriban 15G, Pillarfuran 5G, Alphafuran 5G, Forwafuran 5G, Cemifuran 5G, Kuridan 5G, Cyren 15G, Chazer 3G and Hayfuran 5G may be recommended for the effective control of sugarcane early shoot borer.

**Table 1. Efficacy of new carbamate insecticides in controlling early shoot borer, Jamalpur farm, TSM, Ltd., 2003-2004.**

| Treatents | % ESB infestation | | | | Yield (M. ton $ha^{-1}$) | |
|---|---|---|---|---|---|---|
| | 1st data (March) | | 2nd data (May) | | | |
| | Mean (Ln + 1) | % Efficacy | Mean | % Efficacy | Mean | % increase over control |
| Control | 9.15 a * (2.54) | - | 13.95 a ** | - | 36.76 c ** | - |
| Pyriban 15G @ 2.25 kg ai $ha^{-1}$ | 1.35 e (0.79) | 85.25 | 2.54 b | 81.79 | 52.78 ab | 43.58 |
| Pillarfuran 5G @ 2.0 kg ai $ha^{-1}$ | 2.42 bc (1.23) | 73.35 | 2.35 b | 83.15 | 51.29 ab | 40.53 |
| Alphafuran 5G @ 2.0 kg ai $ha^{-1}$ | 2.03 bcde (1.10) | 77.81 | 2.38 b | 82.93 | 55.09 ab | 49.86 |
| Forwafuran 5G @ 2.0 kg ai $ha^{-1}$ | 2.61 b (1.26) | 71.48 | 2.38 b | 82.93 | 48.87 ab | 30.22 |
| Cemifuran 5G @ 2.0 kg ai $ha^{-1}$ | 2.24 bcd (1.17) | 75.52 | 2.12 b | 84.80 | 56.76 a | 54.41 |
| Kuridan 5G @ 2.0 kg ai $ha^{-1}$ | 1.46 de (0.89) | 84.04 | 2.54 b | 81,79 | 49.44 ab | 34.49 |
| Cyren 15G @ 2.25 kg ai $ha^{-1}$ | 1.51 cde (0.91) | 83.50 | 2.29 b | 83.58 | 50.09 ab | 36.26 |
| Chazer 3G @ 2.0 kg ai $ha^{-1}$ | 1.53 cde (0.92) | 83.28 | 2.51 b | 82.01 | 46.76 b | 27.20 |
| Hayfuran 5G @ 2.0 kg ai $ha^{-1}$ | 1.48 cde (0.90) | 83.83 | 2.80 b | 79.93 | 45.74 bc | 24.43 |
| Curaterr 5G @ 2.0 kg ai $ha^{-1}$ (Standard) | 2.01 bcde (1.09) | 78.03 | 2.70 b | 80.65 | 50.93 ab | 38.55 |
| LSD (5%) | 0.3276 | | 1.235 | | 9.528 | |

* Figures in parentheses are observed mean

** Figures accompanied by the same letters are not significantly different

**Table 2. Efficacy of new carbamates insecticides in controlling early shoot borer, Mohan farm, TSM, Ltd., 2003-2004.**

| Treatents | % ESB infestation | | | | Yield (M. ton $ha^{-1}$) | |
|---|---|---|---|---|---|---|
| | 1st data (March) | | 2nd data (May) | | | |
| | Mean (Ln + 1) | % Efficacy | Mean | % Efficacy | Mean | % increase over control |
| Control | 11.03 a * (2.47) | - | 12.61a * (2.59) | - | 39.30 d ** | - |
| Pyriban 15G @ 2.25 kg ai $ha^{-1}$ | 1.04 de (0.69) | 90.57 | 2.42 b (1.22) | 80.81 | 54.59 abc | 38.91 |
| Pillarfuran 5G @ 2.0 kg ai $ha^{-1}$ | 1.62 bc (0.96) | 85.31 | 1.64 b (0.93) | 86.99 | 53 97 abc | 37.33 |
| Alphafuran 5G @ 2.0 kg ai $ha^{-1}$ | 1.58 bcd (0.93) | 85.68 | 2.27 b (1.13) | 82.00 | 56.66 ab | 44 17 |
| Forwafuran 5G @ 2.0 kg ai $ha^{-1}$ | 2.10 b (1.12) | 80.96 | 1.72 b (0.99) | 86.36 | 51.40 bc | 30.79 |
| Cemifuran 5G @ 2.0 kg ai $ha^{-1}$ | 1.65 bc (0.97) | 85.04 | 2.23 b (1.11) | 82.32 | 57.59 a | 46.54 |
| Kuridan 5G @ 2.0 kg ai $ha^{-1}$ | 0.92 e (0.64) | 91.66 | 2.18 b (1.10) | 82.71 | 51.59 bc | 33.27 |
| Cyren 15G @ 2.25 kg ai $ha^{-1}$ | 1.01 de (0.68) | 90.84 | 2.06 b (1.11) | 83.66 | 52.62 abc | 33.89 |
| Chazer 3G @ 2.0 kg ai $ha^{-1}$ | 1.01 de (0.69) | 90.84 | 2.26 b (1.17) | 82.08 | 51.96 abc | 32.21 |
| Hayfuran 5G @ 2.0 kg ai $ha^{-1}$ | 0.96 e (0.66) | 91.30 | 1.78 b (1.01) | 85.88 | 50.64 c | 28 85 |
| Curaterr 5G @ 2.0 kg ai $ha^{-1}$ (Standard) | 1.33 cde (0.84) | 87.94 | 1.83 b (1.02) | 85.49 | 52.80 abc | 34.35 |
| LSD (5%) | 0.2639 | | 0.4966 | | 5.728 | |

* Figures in parentheses are observed mean

** Figures accompanied by the same letters are not significantly different

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