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Effect of Granular Insecticides on White Grubs and Top Shoot Borer and Yield of Sugarcane

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ABSTRACT

The experiment was carried out in 1986-87 and 1987-88 cropping seasons in Pratap Farm under Setabganj Sugar Mills Ltd. Dinajpur. Soil applications of Furadan 5G and Curaterr 3G @ 2.5 kg ai/ha along the cane rows (var. Latari Jaba C) followed by irrigation during March and April in November planted fields controlled the white grubs effectively. The top shoot borer infestation was also reduced significantly ($P<0.05$) over the untreated control in all the treated plots with insecticides even at the application rate of 2.0 kg ai/ha. All the treatments with insecticides and their applied doses showed increased cane yield ranging from 78.9-102.0% in 1986-87 and 32.9-58.4% in 1987-88 cropping season over the untreated control.

INTRODUCTION

The white grubs got the status as major sugarcane pest since 1980-81 cropping season in the northern cane growing areas of Bangladesh (Anon., 1981). Several species of white grubs from these areas have been identified of which *Holotrichia seticollis* Moser; *Holotrichia serrata* (F); *Anomala polita* Blanchard; *Anomala varicolor* Gyllenhal and *Brahmina* sp. are most destructive. Identification of the white grubs was made through the courtesy of the International Institute of Entomology, U. K.

Since then a series of experiments were conducted to control the white grubs incidence with several insecticides namely Heptachlor 20G/30EC, Dieldrin 20EC/40WP, Aldrin 5D, Dotan 5G, and Furadan 3G at different concentrations and with different methods of application (Miah *et. al.* 1983 and 1986). Among the test chemicals Furadan and Dotan @ 2.0 and 1.5 kg ai/ha respectively gave promising results in reducing the grub population. Chlorinated insecticides (Heptachlor and Dieldrin) at higher rates of even up to 4.0 kg ai/ha failed to control the white grubs (Miah, *et. al.* 1985). Reports available from India showed that control of the grubs in the field by the soil application of chlorinated hydrocarbon insecticides did not bring satisfactory solutions to the problem (Prasad and Thakur, 1959 and Patel *et al.* 1967).

The white grubs and the top shoot borer attack the canes jointly at the tillering stage in the sandy areas of nonflooded zones during the middle of March and continue till the harvest of the crop. This joint invasion results in total crop failure.

Sandhu *et al.* (1972) reported that carbofuran showed better performance in controlling the top shoot borer population in fourth brood. The dose rate of soil application of the chemical was 6.67 kg. ha. ai. and the rate was assumed to be comparatively higher. Biswas (1984) observed that the chemicals which were controlling the white grubs had a positive effect in lowering the TSB population in the treated areas (personal observation). In those experiments Furadan (Carbofuran) @ 2.0 kg ai/ha reduced the pest population and increased the cane yield.

Hence the present study was carried out in 1986-87 and 1987-88 to investigate whether the doses of some granular insecticides meant for controlling white grubs might prove equally effective in reducing TSB population in the predominently grub prone sandy areas of Pratap farm under Setabganj Sugar Mills Ltd., Dinajpur

MATERIALS AND METHODS

The top shoot borer and the white grubs were abundant in both 1986-87 and 1987-88 cropping seasons. The experiment was laid out in a randomized complete block design with three replications. The size of the plots was 12m X 8m, block to block distance was 2m and plot to plot 1m in both the years. Variety used was Latari Jaba-C (L. J. C) planted in November. The treatments were two doses (2.0 kg and 2.5 kg ai/ha) each of Furadan (3%), Curaterr (3%) and Furadan (5%) granular formulations and the untreated control.

Furrows were made along the cane rows by a bullock-driven plough and the chemicals were broadcasted in the furrows as well as in the space between the furrows, covered with soils and then irrigated. Before irrigation, individual plots were surrounded by soil ridges to protect onrush of water from one plot to another. The chemicals were applied once in March (tillering stage) and then in April (tillering stage) maintaining one month gap between two applications. Pre-application data on the top shoot borer infestation was recorded per plot for each of the treatment including the untreated control. Pre-application count of grubs was not taken because the chemcials were applied synchronized with adult (bettle) emergence when they were at their pre-ovipostion or egg laying stage during late February/ early March. It would be difficult to detect grubs for records during March as most of the beetles remain under soils for oviposition. Miah and Shahjahan (1983) reported the middle of March as the peak period of emergence of all the beetles. Application of chemicals and collection of data were done on the basis of their observations.

Final data on the top shoot borer infestation and the only data on the population of the white grubs were recorded per plot after one month of the last chemcial application. For the white grubs, 5 clumps/plot were randomly uprooted by digging an

area of 60 cm X 60 cm to a depth of 40 cm from each clump with a spade. The soils so dug were checked carefully for recording all the larvae (adults if present) attacking canes in a plot. The yield of canes per plot was recorded at harvest. Weight of the uprooted cane stalks of 5 clumps per plot for the white grubs population count were recorded and added to the weight of the cane yield at harvest.

RESULTS AND DISCUSSION

All the granular insecticide treated plots irrespective of the doses showed significantly ($P<0.05$) reduced white grubs population compared to those of untreated control in both the years (Table 1). It was also observed that the application rate of 2.5 kg ai/ha of Curaterr 3G, Furadan 3G and Furadan 5G treated plots gave significantly ($P<0.05$) lower population levels of white grubs than in plots treated with 2.0 kg ai/ha of the same insecticides during the year 1986-87 only.

Table 1. Effects of different granular Insecticides in controlling white grubs and top shoot borer, Pratap Farm, STSM Ltd., Dinajpur.

Chemicals	Dose (kg ai/ha)	Whitegrub population/5 clumps/plot		Top shoot borer infestation (%)	
		1986-87	1987-88	1986-87	1987-88
Furadan 3G	2.0	21.7b *	6.0 b	1.59b (4.71)+	0.59c (4.01)
Furadan 3G	2.5	8.7 c	5.0 b	1.40b (7.99)	1.37c (3.99)
Curaterr 3G	2.0	14.0 bc	7.0 b	2.25b (9.86)	0.56c (4.69)
Curaterr 3G	2.5	6.3 c	3.0 b	3.01b (6.21)	1.11c (6.21)
Furadan 5G	2.0	19.7 b	6.0 b	0.97b (6.04)	1.56c (5.61)
Furadan 5G	2.5	10.0 c	4.7 b	0.72b (6.30)	1.04c (4.60)
Untreated-check	—	82.8 a	14.7 a	21.08b (6.80)	33.55a (3.12)

* Similar letters in the columns do not differ significantly at 5% level as per DNMR test.

+ Figures in parenthesis are % infestation before insecticide application.

Though significant differences ($P<0.05$) were observed among the doses of the most of the insecticides in terms of the white grubs population in 1986-87, no such differences could be observed among the doses of the insecticides in the 1987-88

crop season. Miah *et al.* (1986) reported the effects of different chemicals on grubs, among those chemicals Furadan (carbofuran) and Ekalux (quinalfos) both at 2.0 kg ai/ha significantly controlled the pest. The work shows confirmity with the present findings.

Results also showed that the infestation of top shoot borer was almost similar all over the whole experimental plot in both the years. In all the insecticide treated plots with two doses gave signfificantly higher reduction ($P<0.05$) of the top shoot borer infestation in both the crop season as compared to those of the untreated plots (Table 1). Similar result was obtained by Sandhu and Dhura (1977) who reported good control of top borer using Carbofuran @1.0 kg ai/ha in India.

Table 2. Yield of cane showing cost/benefit ratio after using different granular insecticides in 1986-87 and 1987-88 cropping season.

Treatments		Yield (MTH)		Increased yield over control (MTH)		Price of increased yield (Tk.)		Cost of additional labour and Insecticides (Tk.)		Net profit over control (Tk.)	
Chemicals	Dose (kg ai/ha)	1986-87	1987-88	1986-87	1987-88	1986-87	1987-88	1986-87	1987-88	1986-87	1987-88
Furadan 3G	2.0	65.5 a	49.1 a	31.0	13.8	20353.6	10188.9	8661.6	8661.6	11592.0	1527.3
"	2.5	69.6 a	51.3 a	35.2	16.1	23070.9	11853.9	10602.0	10602.0	12468.9	1251.9
Curaterr 3G	2.0	66.9 a	52.6 a	32.5	17.3	21325.0	12760.1	8424.0	8424.0	12900.0	4336.1
"	2.5	68.0 a	55.8 a	33.6	20.6	22033.8	15154.4	10305.0	10305.0	11728.8	4849.4
Furadan 5G	2.0	66.9 a	46.9 a	32.6	11.7	21311.9	8619.7	5900.0	5900.0	15411.9	2719.7
"	2.5	61.7 a	46.9 a	27.2	11.6	17852.9	8538.6	7150.0	7150.0	10702.8	1388.6
Control	—	34.5 b	35.2 a	—	—	—	—	—	—	—	—

" Figures in columns accompanied by similar letters do not differ significantly at 5% level as per DNMR test.

(Price of Furadan 3G @ Tk. 58.8/kg, Curaterr 3G @ Tk. 57.0/kg, Furadan 5G @ Tk. 62.5/kg, cane/MT-Tk 656.4 in 1986-87 and Tk. 736.7 in 1987-88)

The insecticide treated plots contributed increased cane yield over the untreated plots (Table 2). As indicated in the Table 2 the cane yields were significantly higher ($P<0.05$) in all the insecticide treated plots as compared to those of the untreated ones during 1986-87 crop season only. This yield increase ranged from 78.9 to 102.0% over the untreated control. Using Furadan 3G at the doses of 1.5 and 2.0 kg ai/ha Miah *et al.* (1986) obtained 172.6–190.9% higher cane yield over the control. When several nematicides including carbofuran were tried against sugarcane nematodes Reyes and Beguico (1977) obtained yield increase of 28% over the control plots treated with carbofuran. On the other hand in 1987-88, the yield response due to the white grubs and the top shoot borer control by insecticides

application was not significant. The yield increase for the insecticidal treatments was ranged from 39.6 to 58.4% over untreated control.

As regards cost/benefit ratio of these chemical treatments in 1986-87 Furadan 5G @2.0 kg ai/ha gave the best economic return as it offered the maximum net profit of Tk. 15411.85 per hectare over control followed by Curaterr 3G @2.0 kg ai/ha and Furadan 3G @2.5 kg ai/ha (Table 2). In 1987-88 cropping season the insecticidal treatments showed lower trend in cane yield compared to the previous year. This year Curaterr 3G @2.5 kg ai/ha offered the net return of Tk. 4849.45 only over the control followed by the Curaterr 3G @ 2.0 kg ai/ha and Furadan 5G @2.0 kg ai/ha with a net profit of Tk. 4336.07 and Tk. 2719.68 respectively.

Considering upon the present findings of the experiments Furadan and Curaterr (commonly carbofuran) might be suggested for recommendation against white grub @ 2.0 kg ai/ha and the same dose rate may also be tried against top shoot borer control. However, further investigation for the reduction of doses and the change in time of application according to the brood/appearance of the pest may be looked into in future.

REFERENCES

Anonymous, 1981. Annual Report, 1981. Sugarcane Research Institute, Ishurdi, Pabna, Bangladesh. pp. 67-79.

Miah, M. A. H.; Khuda, A. K. M. Q. E.; Alam, M. A.; Biswas, M. M. and Shahjahan, M. 1983. Chemical control of whitegrubs. *Bangladesh J. Sugarcane,* **5** : 1-7.

Miah, M. A. H. and Shahjahan, M. 1983. The problems of white grubs in Bangladesh and their control. Proceedings of 5th Convention of Bangladesh Society of Sugarcane Technologists, September, 23-25, 1983, held at SRTI, Ishurdi, Pabna. pp. 71-78.

Miah, M. A. H.; Biswas, M. M. and Mannan, A. 1985. Effects of Heptachlor and Dieldrin on white grubs of sugarcane (Coleoptera : Scarabaeidae). *Bangladesh J. Sugarcane,* **7** : 13-16.

Miah M. A. H.; Biswas, M. M. and Mannan, A. 1986. Effect of some insecticides on white grub control and yield of sugarcane. *Tropical Pest Management,* **32** : 338-340.

Patel, R. M.; Patel, G.G. and Vyas, H. N. 1967. Further observation on the biology and control of white grub, *Holotrichia* spp. near *consanguinea* Blanch., in soil affecting groundnut in Gujrat. *Indian J. Ento.,* **29** : 170-176.

Prasad, S. K. and Thakur, C. 1959. White grub, *Lachnosterna consanguinea* Blanch. a new menace to sugarcane. *Indian J. Ento.*, **21** : 184-189.

Reyes, T. T. and Beguico, E. D. 1977. Effect of some nematicides on the control of nematodes attacking sugarcane and on seed piece germination and yield. Proc. Control Counc. Philipp. Con. **8** : 77-78.

Sandhu, J. S. and Dhura, M. S. 1977. Prospects of chemicals control of top borer *(Tryporyza nivella). Sugar News,* (Oct.–Nov.), 9 : 30-35.

Sandhu. J. S.; Kanwar, R. S. and Tripathi, G. M. 1972. Preliminary studies on chemcial control of Top borer (*Scirpophaga nivella* Fab.) through systemic insecticides in Punjab (India). *The International Sugar Journal*, **74** : 131-132.