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Control of Sugarcane White Grubs with Some Organocarbamate Insecticides and Their Effects on Sugarcane Yield

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ABSTRACT

An experiment was conducted with some organocarbamate insecticides namely Kuridan 5G, Pardan 5G, Cemifuran 5G, Biesteren 5G, Alphafuran 5G, Hayfuran 5G, Sarafuran 5G, Furan 5G, Hextar 5G, Baifuran 5G, Newfuran 5G and Curaterr 5G to evaluate their effectiveness against white grubs and their effects on the yield of sugarcane. The experiment was carried out at Mohan farm under Thakurgaon Sugar Mills Ltd., Thakurgaon, Bangladesh during the cropping season 2004-2005. All those test insecticides applied @ 2.00 kg ai ha-1 in March and April significantly reduced the population of white grubs compared to check plots. Increased cane yield over control was recorded among the treatments ranging from 23.48 to 107.15%.

Key words: Sugarcane, white grubs, control, organocarbamate insecticides, yield

INTRODUCTION

The white grub is one of the major pests of sugarcane in Bangladesh. Different species of white grubs attack sugarcane and cause severe damage resulting in loss of yield. Its attack is mainly confined to the non- flooded sandy and sandy loam soils of northern cane growing areas of Bangladesh. Seventeen species of white grubs have so far been recorded in sugarcane fields in Bangladesh causing damage every year (SRTI, 1981; SRTI 1984). But all of them are not equally important in respect of damage. Among these, Brahmina sp., Holotrichia sp., Anomala sp. and Adoretus versutus are most damaging. Heavy infestation may cause 50-60% damages, even total loss of canes. The grubs feed on the roots and under ground portion of stalks rendering the plants looking pale and sickly, ultimately the affected shoot/cane dries up which can easily be pulled out. The canes from affected clumps become unfit for crushing and use as seed materials. The yield loss due to white grubs was found to be 23.07 to 38.17 t ha^{-1} (Miah *et al.*, 1986).

The attack by white grubs occur in the months of February to September but it is severe in March to April targeting sugarcane roots in the soil. Miah et al. (1986) reported that among different chemicals Furadan (Carbofuran) and Ekalux (Quinalfos) at 2.00 kg ai ha^{-1} effectively controlled white grubs. Mostafa *et al.* (1986) reported carbofuran (2,3-dihydro-2, 2-dimethyl benzofuran-7yl methylcarbamate) is a broad-spectrum systemic insecticide. The carbamate insecticides have both properties of killing insects by contact as well as systemic actions. The short life of carbofuran in soil is supported by Chowdhury *et al.* (2002) who reported that carbofuran after 30 days of application left no residues in soil indicating complete degradation of the pesticides. Therefore, the present study was taken to evaluate the control efficacy of some organocarbamate insecticides in reducing white grub population and their effects on the yield of sugarcane.

MATERIALS AND METHODS

The experiment was set up at Mohan farm under Thakurgaon Sugar Mills Ltd., Thakurgaon, Bangladesh during the cropping season 2004-2005. The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. There were 13 treatments including one control. The treatment Curaterr 5G (March + April) 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 variety Isd 31 was used and planting was done through conventional sett placement (end to end) in the trenches on November 26, 2004. All the test insecticides were granular in formulation and used @ 2.00-kg ai ha .The application of insecticides was done twice, once in March and then in April. Before irrigation, soi ridges surrounding individual plots were made to protect the flow of water from one plot to another. The fertilizer application, weeding, mulching and earthing up were done as normal cultural practices. For application of insecticides furrows were made on both sides of cane

rows and then insecticides (granular) were applied at the base of the plants and in the space between furrows and mixed with soil followed by irrigation. Data were recorded from 5 randomly selected clumps per plot. Soil was removed through digging pits 60 cm x 60 cm x 40 cm deep with spade. Larval population was counted in root zone and in soils of these pits. Data were taken twice, once in April and then in May 2005. The yield of canes per plot was recorded at harvest in December 2005.

RESULTS AND DISCUSSION

All the test insecticides significantly reduced white grub population over control (Table 1). Data collected in April showed that white grub population ranged from 0.33 to 4.67 among the treated plots whereas control plot had a population of 13.33 per 5 clumps. Control efficacy reached over 80% except Newfuran 5G, which showed 64.97% efficacy over control. After two application of insecticides (March and April), data collected in May showed that white grub population varied from 0.67 to 3.66 among the insecticide treated plots whereas in control plot that was 18.33 per 5 clumps.

Table 1. Effectiveness of different organocarbamate insecticides in controlling White grubs at Mohan Farm, Thakurgaon Sugar Mills Ltd, Thakurgaon, 2005.

Treatments	White grub population (5 clumps plot^{-1})			
	April data	% Efficacy over control	May data	% Efficacy over control
Kuridan 5G@ 2.0 kg ai. ha^{-1} (March + April)	2.00 bcd*	85.00	2.00b	89.09
Pardan 5G@ 2.0 kg ai. ha^{-1} (March + April)	1.67cd	87.47	2.67b	85.43
Cemifuran 5G @ 2.0 kg ai. ha^{-1} (March+April)	2.33bcd	82.52	0.67b	96.34
Biesteren 5G @ 2.0 kg ai. ha^{-1} (March + April)	1.67cd	87.47	3.66b	80.03
Alphafuran 5G @ 2.0 kg ai. ha^{-1} (March+April)	1.67cd	87.47	1.33	92.74
Hayfuran 5G @ 2.0 kg ai. ha^{-1} (March + April)	3.67bc	72.47	3.33b	81.83
Sarafuran 5G @ 2.0 kg ai. ha^{-1} (March+April)	0.33d	97.33	3.33b	81.83
Furan 5G @ 2.0 kg ai. ha^{-1} (March + April)	1.33cd	90.02	2.33b	87.29
Hextar 5G@ 2.0 kg ai. ha^{-1} (March + April)	2.00bcd	85.00	3..33b	81.83
Baifuran 5G@ 2.0 kg ai. ha^{-1} (March + April)	2.33bcd	82.52	2.00b	89.09
Newfuran 5G@ 2.0 kg ai. ha^{-1} (March + April)	4.67b	64.97	1.33b	92.74
Curaterr 5G @ 2.0 kg ai. ha^{-1} (March+April) (Standard)	2.00bcd	85.00	1.67b	90.74
Control	13.33 a		18.33a	
LSD (5%)	2.994		3.832	

*Figures followed by the same letter (s) are not significantly different at 5% level as per LSD test.

No significant difference was observed among the test insecticides in respect of white grub population but all test insecticides significantly differed from control. All insecticides treated plots showed above 80% efficacy over control, which ranged from 80.03 to 96.34%. Miah *et al.* (1986) reported the effects of Furadan (Carbofuran) and Ekalux (Quinalfos) both at 2.0 kg ai ha^{-1} which significantly controlled the pests. But only Furadan was recommended for white grubs because it showed 190.89% yield increase over control while Ekalux showed 74.83%. Biswas *et al.* (1994) also suggested application of Furadan and Curaterr (commonly carbofuran) against white grub @ 2.0 kg ai ha^{-1}.

Table 2. Effectiveness of different organocarbamate insecticides on the yield of sugarcane at Mohan Farm, Thakurgaon Sugar Mills Ltd, Thakurgaon, 2005.

Treatments	Yield (t ha^{-1})	% Efficacy over control
Kuridan 5G@ 2.0 kg ai. ha^{-1} (March + April)	59.17 bc*	68.81
Pardan 5G@ 2.0 kg ai. ha^{-1} (March + April)	72.22a	105.81
Cemifuran 5G @ 2.0 kg ai. ha^{-1} (March + April)	58.24bc	65.97
Biesteren 5G @ 2.0 kg ai. ha^{-1} (March + April)	58.33bc	66.23
Alphafuran 5G @ 2.0 kg ai. ha^{-1} (March + April)	43.33e	23.48
Hayfuran 5G @ 2.0 kg ai. ha^{-1} (March + April)	72.69a	107.15
Sarafuran 5G @ 2.0 kg ai. ha^{-1} (March + April)	53.33cd	51.98
Furan 5G @ 2.0 kg ai. ha^{-1} (March + April)	57.22bc	63.07
Hextar 5G@ 2.0 kg ai. ha^{-1} (March + April)	52.96cd	50.93
Baifuran 5G@ 2.0 kg ai. ha^{-1} (March + April)	47.13de	34.34
Newfuran 5G@ 2.0 kg ai. ha^{-1} (March + April	63.80b	81.90
Curaterr 5G @ 2.0 kg ai. ha^{-1} (March + April) (Standard)	63.15b	79.97
Control	35.09f	
LSD (5%)	7.833	

*Figures followed by the same letter (s) are not significantly different at 5% level as per LSD test.

It revealed that all test insecticides showed significantly higher cane yield over control (Table 2). The yield increase over control in different treatments varied. The yield of sugarcane ranged from 43.33 to 72.69 t ha^{-1} among insecticide treated plots whereas the control plots (untreated) had yield of 35.00 t ha^{-1} only which differed significantly over all other test insecticides. Insecticide treated plots received increased cane yield over control plots which ranged from 35.34 to 107.15%. Hayfuran 5G had the highest yield of 72.69 t ha^{-1} showing 107.15% increased yield followed by Pardan 5G which gave 72.22 t ha^{-1} showing 105.81% increased yield over control and both insecticides (Hayfuran 5G and Pardon 5G) were superior to all other insecticides in respect of cane yield. Alphafuran 5G had the lowest yield among insecticide treated plots which gave 43.33 t ha^{-1} and differ significantly over all other test insecticides. The result of the present findings has similarity with that of Miah *et al.* (1986) who reported 190.89% yield increase due to effective control of white grubs with Furadan 3G (carbofuran). Yield increase in Furadan (Carbofuran) treatments might be due to profuse root development through increased mitotic index that enhanced nutrient uptake resulting in increased cane yield (Miah and Akhter, 1985). Pesticide Technical Advisory Committee (PTAC, 1980), a government body requires 80% control to approve the use of an insecticide in agriculture. From the study it might be concluded that Kuridan 5G, Pardan 5G, Cemifuran 5G, Biesteren 5G, Alphafuran 5G, Hayfuran 5G, Sarafuran 5G, Furan 5G, Hextar 5G, Baifuran 5G and Newfuran 5G @ 2.0 kg ai ha^{-1} March and April application of might be recommended for the control of white grubs.

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