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Chemical Control of White Grubs

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ABSTRACT

An exprerіment was conducted in Sultanpur Section of Pratap Farm under Setabganj Sugar Mills Ltd. to study the effectiveness of Furadan 3G, Dotan 5G, Heptachlor 20G, Heptachlor 30EC and Aldrin 5D at different doses on white grub population. The experimental plot was divided into two equal halves. One half was treated with Dieldrin 20EC @3.0 kg. a.i./ha prior to the last ploughing, the other half received no Dieldrin treatment. Dotan 5G and Furadan 3G were applied twice at one month's interval, and the rest were applied only once. Dotan and Furadan significantly reduced white grub population. But Furadan 3G @2.0 kg a.i./ha was found superior to Dotan and produced more than 62 Ton millable cane per hectare (TCH) compared to 24 TCH in the plots which received no chemical treatments.

INTRODUCTION

Several species of scarab beetles known as white grubs were identified as serious pests of sugarcane in different sugarcane growing zones of Bangladesh (Anon, 1979; Anon,1980) especially in Setabganj and Thakurgaon Sugar Mills areas. In a sugarcane field at Pratap farm of Setabganj Sugar Mills more than 60 grubs/square meter were found (personal observation). Soil insecticides belonging to the Chlorinated Hydrocarbon group like BHC, Aldrin, Dieldrin, Heptachlor etc, were reported to be effective against white grubs (Martorell and Gaud, 1967; Bull and Cullen, 1981). Isofenphos was also reported to be effective (Sharma *et. al.* 1981). But no concrete suggestion was available for white grub control. Moreover, nematodes were also found in those areas causing poor yield in unison with white grubs (Personal observation). In view of the severity of grubs and nematode problems, an experiment was set up with Furadan 3G, Dotan 5G, Heptachlor 20G, Heptachlor 30EC and Aldrin 5D.

MATERIALS AND METHODS

The experiment was laid out during the cropping season 1981-82 in Sultanpur Section of Pratap farm under Setabganj Sugar Mills area. The land was prepared with tractor plough and the prepared land was divided into two halves, each measuring

(70mx46m). In one half, Dieldrin 20EC @ 3.0 kg a.i./ha mixed with 300 gallons of water was sprinkled on the ground on 7.9.81 prior to final ploughigh and the other half was left untreated. The field was planted in October, 22, 1981. Then both the halves were treated on 20.3.82 with chemicals and the dosages were as follows :

A. Furadan 3G @ 1.5 kg a.i./ha
B. Furadan 3G @ 2.0 kg a.i./ha
C. Dotan 5G @ 1.5 kg a.i./ha
D. Heptachlor 20G @ 2.0 kg a.i./ha
E. Heptachlor 30EC @ 2.0 kg a.i./ha
F. Aldrin 5D @ 3.0 kg a.i./ha

Each plot size was 10m x 10m. The treatments were replicated four times in RCB. Sixty setts of lsd. 2/54 per trench were planted. All the chemicals were first broadcast in March, 1982 in the space between the two furrows made by country plough on both sides of cane rows. The chemicals were covered with a light layer of soil with the help of a trencher. The next day, the field was irrigated through furrows, Furadan 3G and Dotan 5G were applied for the second time on 26/4/82. The method of application was the same as above. This time no irrigation was given since there was rain on 27/4/82.

On 29th May and 10th December of 1982, larval population was counted. Five clumps were randomly selected from every alternate row in each plot except the first and the tenth rows. Clumps were uprooted by digging with spade (2' x 2') and all larvae of white graubs were counted and recorded. Weight of millable canes of five stools/plot was taken at the time of harvest in December. Finally total yield of each plot was recorded.

RESULTS AND DISCUSSION

Data collected in May indicated significant effect of Furadan 3G and Dotan 5G in reducing white grub population (Table 1). But the blanket application of Dieldrin 20EC did not affect the grub population although Martorell and Gaud (1967) reported that blanket application of Dieldrin would effectively control white grub. Further comparison between chlorinated pesticides (Heptachlor and Aldrin) and Carbamate (Furadan) and organophosphate (Dotan) together shows that chlorinated pesticides were inferior to other groups (Carbamate and organophosphorus) in the white grub control. The probable reason for such ineffectiveness of chlorinated hydrocarbon group (Heptachlor 20G, Heptachlor 30EC, Aldrin 5D) may be due to development of resistance in white grub to chlorinated hydrocarbon group resulting from continuous use of sublethal dose in the area.

Table 1. Effect of different chemicals on grub population recorded in the fourth week of May, 1982.

Treatments		Mean grub/5 clumps	
Name of chemicals.	Dose kg a.i./ha	Field treated with Dieldrin 20EC	Field not treated with Dieldrin 20EC
Furadan 3G	1.5	7.75* ab**	14.25 ab
Furadan 3G	2.0	6.75 a	6.00 a
Dotan 5G	1.5	10.50 abc	14.75 ab
Heptachlor 20G	2.0	18.75 cd	24.25 b
Heptachlor 30EC	2.0	13.75 abcd	35.00 b
Aldrin	3.0	17.00 bcd	18.75 ab
Control	—	22.00 d	29.50 b

*Values retransformed from angular transformation.

**Figures accompanied by the same letter are not significantly different as per DNMR Test.

Table 2. Effect of different pesticides on white grub population (all species) as recorded at harvest.

Treatments		Mean grubs/5 stool	
Name of chemicals	Dose kg a.i./ha	Field treated with Dieldrin 20EC	Field not treated with Dieldrin 20EC
Furadan 3G	1.5	10.47*ab**	3.90 a
Furadan 3G	2.0	5.49 a	6.69 ab
Dotan 5G	1.5	11.30 ab	11.30 b
Heptachlor 20G	2.0	16.12 b	11.06 b
Heptachlor 30EC	2.0	15.61 b	12.60 b
Aldrin 5D	3.0	20.12 b	8.58 ab
Control	—	18.89 b	15.12 b

*Value retransformed from angular transformation.

**Figures accompanied by the same letter are not significantly different as per DNMR Test.

White grub population (larvae and adults) at harvest also shows significant effect of Furadan at both the doses, other treatments being similar to the untreated (Table 2). Adults of *Brahmina* sp. and *Holotrichia* sp. were recognised at harvest. The different treatments did not have any selective response to the two species except Furadan 3G @ 2 0 kg a.i./ha on *Brahmina* (Table 3). The results with Furadan 3G are similar to that obtained by Srivastava *et. al.* (1982) who used Carbofuran 50SP to control *Holotrichia* in peanut. Aldrin 5D in the present experiment and Aldrin 30EC (Srivastava *et al.* 1982) proved inferior to carbofuran compound in white grub control and yield, although Aldrin 5D was suggested for controlling white grub (Butani, 1981). In this experiment Furadan 3G was applied twice and population of white grub was significantly lower than the control plots (Tables 1 & 2). This result is in true conformity with that when Furadan was applied twice @ 1.0 kg a.i /ha to control cotton ash weevil in India (Parameswaran and Balasubramanian, 1980), where larvae fed on cotton roots. Highest dose of Furadan in this experiment was @ 2.0 kg a i./ha compared to 4-8 kg a.i./ha in Central America (Watve *et. al.* 1981), where grub population was reduced to a great extent and total control was not achieved. Satisfactory chemical control has been assumed to be difficult (Prewitt and Summers, 1981) and integrated approach has been suggested by several workers (Prewitt and Summers, 1981; Abreu, 1981) including flooding for 5 days (Watve *et. al.* 1981).

Table 3. Effect of different chemicals on *Brahmina* spp. population.

Treatments		Mean number of grubs/5 stools*	
Name of chemicals	Dose kg a.i./ha.	Field treated with Dieidrin 20EC	Field not treated with Dieldrin 20EC
Furadan 3G	1.5	1.69 b**	0.83 a
Furadan 3G	2.0	0.46 a	0.90 a
Dotan 5G	1.5	1.11 ab	1.73 a
Heptachlor 20G	2 0	2.03 b	1.73 a
Heptachlor 30EC	2.0	2.16 b	1.59 a
Aldrin 5D	3.0	2.16 b	1.72 a
Control	—	2.06 b	1.88 a

*Value transformed to angular transformation.

**Figures accompanied by the same letter are not significantly different as per DNMR Test.

The yield of millable cane was significantly increased followni Furadan 3G application (Table 4). Blanket application of Dieldrin 20EC also added some increase in yield, though this increase was not statistically significant. There was no significant difference in yield following application of Dotan 5G, Heptachlor 20G, Heptachlor 30EC and Aldrin 5D. Plots with no pesticide produced 24.40 MTH compared to 62.70 MTH which was due to Furadan 3G @ 2.0 kg a.i./ha. Higher yields from Furadan treatment was also reported by Ramirez (1981) in Costa Rica. The soil of this experiment was nematode infested. Roots in the plots treated with Furadan were healthier than the untraeted as well as those treated with other pesticides. Furadan being a nematicide also controlled nematode resulting in improved growth of plants leading to higher yields (Ramirez, 1981). It probably influenced rapid cell division in roots (Thomson *et. al.*, 1981) facilitating better up take of nutrients. Thus Furadan contrtolled rubs and nematodes leaving nutrients of animal origin which are superior to the nutrients of plant origin (Sahrawat, 1976). Furadan treated plants were more green which was probably due te efficient uptake of Nitrogen, Potash, Zinc and Iron (Venugopal and Litsinger, 1980).

Table 4. Effect of different chemicals on the yield of cane.

Treatments		Yield (MTH)	
Name of chemicals	Dose kg a.i./ha.	Field treated with Dieldrin 20EC	Field not treated with Dieldrin 20EC
Furadan 3G	1.5	59.54 b*	50.72 b
Furadan 3G	2.0	62.70 b	62.57 b
Dotan 5G	1.5	36.45 a	33.20 a
Heptachlor 20G	2.0	28.48 a	26.75 a
Heptachlor 30EC	2.0	33.39 a	20.90 a
Aldrin 5D	3.0	31.35 a	27.58 a
Control	—	32.43 a	24.40 a

LSD (5%)=13.64

*Figures accompained by the same letter are not significantly different.

Therefore, the poor plant growth and yield in STSM farm infested by white grubs and nematodes may be minimized to a great extent by two applications of Furadan 3G @ 2.0 kg a.i./ha once in March and the other in April, followed by irrigation. No irrigation is necessary if there is rain after application. Further works are required to find out if application of Furadan at the time of planting would do any better. The

poor yield of cane in STSM and TSM zones is caused jointly by white grubs and nematodes attacks where chlorinated hydrocarbon (insecticides), presently in commercial use cannot control nematode, although grub population may be reduced to a negligible extent.

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